

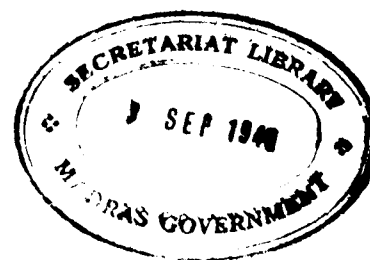
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ROYAL BOTANIC GARDENS, KEW

BULLETIN OF
MISCELLANEOUS
INFORMATION

1939



LONDON

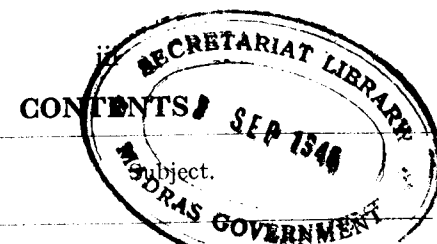
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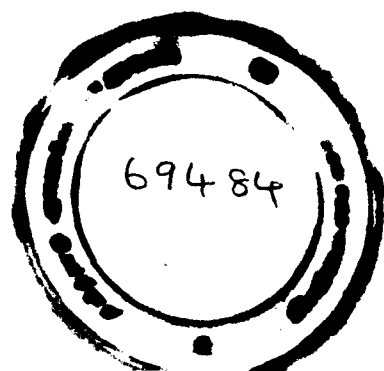
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BULLETIN OF MISCELLANEOUS INFORMATION No. 1 1939 ROYAL BOTANIC GARDENS, KEW

I—CONTRIBUTIONS TO THE FLORA OF TROPICAL AMERICA : XXXVIII.*

PLANTAE HINTONIANAE : IX†.—A. A. BULLOCK.

The following new binomials have been found to be necessary while working out Mr. Hinton's recent Mexican collections of *Mimosaceae*. The maintenance of the numerous genera segregated from *Acacia* and *Mimosa* by Britton and Rose (N. Amer. Fl. **23**, parts 2 and 3 : 1928) would, in the writer's opinion, serve no useful purpose. They correspond at most to sections or groups of lower rank as recognized by other authors. For reasons given below only a few transferences have been made, all in connexion with Mr. Hinton's collections.

Many of the new species of *Mimosaceae* described by Britton and Rose are unrepresented by authenticated specimens at Kew, and no opinion can be expressed as to their taxonomic value. The keys are extremely difficult and the descriptions very inadequate, and it seems probable that these authors did not take into account the possibility of the existence of habitat and other intraspecific variations, with the result that their species may be too narrowly circumscribed. Until an opportunity arises of examining type-material, transference in such cases is clearly undesirable.

Acacia delicata (Britt. et Rose) Bullock, comb. nov.—*Acaciella delicata* Britt. et Rose in N. Amer. Fl. **23**, 100 (1928).

Tecpan, District of Galeana, State of Guerrero, 20 m., by the trail, Nov. 1937 (fl., young fr.), *Hinton* 10896, "flowers white."

This specimen appears to be conspecific with the Kew specimen of *Palmer* 298 (1894-5) the type collection of the species, although the stipe of the very young fruit indicates that it will, when mature, be somewhat longer.

Acacia igualensis (Britt. et Rose) Bullock, comb. nov.—*Acaciella igualensis* Britt. et Rose in N. Amer. Fl. **23**, 102 (1928).

District of Temascaltepec, State of Mexico : Volcán, 1450 m., Nov. 1932 (fl.), *Hinton* 2500, "a shrub 3 m. high"; *ibid.*, Aug. 1935 (fl.) *Hinton* 8136; Tejupilco, 1400 m., Dec. 1933 (fr.), *Hinton* 5412, "a shrub 2 m. high."

The above specimens appear, from the description, to belong to this species.

* Continued from K.B. 1933, 384.

† Continued from K.B. 1938, 294.

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* Owing to an error in pagination this and subsequent pages are numbered 100 too high.

Acacia Langlassei (Britt. et Rose) Bullock, comb. nov. *Senegalia Langlassei* Britt. et Rose in N. Amer. Fl. **23**, 116 (1928).

Pasion, District of Montes de Oca, State of Guerrero, 400 m., Oct. 1937 (fl.), *Hinton* 10785, "flowers white."

The type-locality "La Botella" is in Michoacan or Guerrero, according to Langlassé's label, and to Britton and Rose. The present specimen matches the type collection perfectly. Langlassé's notes, not recorded by Britton and Rose, may be of interest: "Arbre de 12 à 15 m. Branches épineuses. Fleurs blanc jaunâtre." Langlassé also gives the vernacular name "Rabo de Iguanà" and states that the tree occurs in alluvial soil. Mr. Hinton notes that it occurs "[n] R[ipa] F[luminis]".

Acacia procumbens Bullock, nom. nov. *Acaciella prostrata* Britt. et Rose in N. Amer. Fl. **23**, 102 (1928), non *Acacia prostrata* Lodd. Bot. Cab. t. 63 (1822).

District of Temascaltepec, State of Mexico: Temascaltepec, 1750 m., Aug. 1932 (fl.), *Hinton* 1423, "recumbent on ground"; Chorrera, 1230 m., on a dry hill, Aug. 1932 (fl.), *Hinton* 1291. Manchon-Palmita, District of Mina, State of Guerrero, on the llano, Sept. 1936 (fl.), *Hinton* 9418, "procumbent, flowers white."

These specimens match the Kew specimen of *Pringle* 4478, the type-collection, except that they have somewhat larger leaflets, and are clearly taken from more luxuriant plants.

Mimosa moreliensis (Britt. ex Britt. et Rose) Bullock, comb. nov. *Mimosopsis moreliensis* Britt. ex Britt. et Rose in N. Amer. Fl. **23**, 178 (1928).

Tequesquipan, District of Temascaltepec, State of Mexico, March 1935 (fr.), *Hinton* 7446.

This specimen is a fair match of an unnumbered specimen in the Kew Herbarium collected by Arsène at the type locality. The pinnae and leaflets are, however, distinctly larger.

Desmanthus interior (Britt. et Rose) Bullock, comb. nov. *Acuan interior* Britt. et Rose in N. Amer. Fl. **23**, 134 (1928).

Acatitlán, District of Temascaltepec, State of Mexico, on the llano, Sept. 1933 (fl.), *Hinton* 4795; *ibid.*, Aug. 1935 (fl., fr.), *Hinton* 8218, "a shrub 1.5-3 m. high." Pungarabato, District of Coahuila, State of Guerrero, on the llano, Oct. 1934 (fr.), *Hinton* 6885, "a shrub 2 m. high."

These specimens provide a fair match of the Kew specimen of *Arsène* 2521, the type number, but the legumes on Mr. Hinton's fruiting specimens are longer, with a longer beak; the leaves also are larger, with more numerous leaflets.

The generic name *Desmanthus* Willd. (1806) is antedated by *Acuan* Medic. (1786), but is conserved under the International Rules.

II—CONTRIBUTIONS TO THE FLORA OF TROPICAL AMERICA: XXXIX.

RESULTS OF A RECENT COLLECTING EXPEDITION TO BRITISH GUIANA.—N. Y. SANDWITH.

The following notes and descriptions are based mainly on the collections made in British Guiana by the writer in August and September, 1937. He was the botanical member of a party of entomologists led by Dr. O. W. Richards which stayed for some weeks at Colony House, Mazaruni Station, and worked the neighbouring secondary growth and virgin forest. He was also privileged to accompany Mr. T. A. W. Davis, Assistant Conservator of Forests, on two short camping expeditions, the first to the wallaba forests near the 14th milepost along the Bartica-Potaro road, the second to forests by the Labbakabra Creek at a distance of some six miles to the north of Mazaruni Station. The large trees were not flowering well so near the end of the long rainy season, but the saprophytes were appearing in great profusion, and many interesting species were collected.

With the kind help of the Forest Department a trip to the Kaieteur Falls, lasting over a fortnight, was arranged and successfully carried out, and the party had the great good fortune to spend eleven days collecting in this wonderful district. During that time the writer was able to make about 280 gatherings, two of his objects being to prepare several duplicate sets of many of the extraordinary endemics which abound on the Kaieteur Savannah, and to re-collect new species (especially *Utriculariae*) detected on the recent Cambridge University Expedition. Although both the season and duration of the visit more or less coincided with those of Jenman and Tutin, some additional discoveries have naturally been made. Two days were also spent in struggling through the fearful chaos of rocks underlying the gloomy forests of the gorge; but the actual foot of the Falls was not reached.

Specimens of several families have been sent to specialists, and it is hoped that further botanical results of the expedition will be published in later papers. A few records made on recent trips of the Forest Department to the Demerara and Berbice Rivers are included.

THEACEAE.

Ternstroemia verticillata Klotzsch ex Wawra.

Kaieteur Savannah, Sept. 2nd, 1937, *Sandwith* 1295. A small tree in thickets on rocky ground. Flowers sweet-scented. Sepals white with deep red centre within. Petals yellow.

The sepals are less acute, being sometimes actually rounded, and the leaves are not regularly and copiously gland-dotted beneath; otherwise the material agrees well with the type in the Berlin Herbarium.

BOMBACACEAE.

Catostemma Altsoni *Sandwith* in Kew Bull. 1928, p. 366; 1931, p. 54.

This species was described from a single collection made on the Kurupung River in 1925, the material being distinguishable from both *C. commune* Sandwith and *C. fragrans* Benth. by the much larger flowers on long pedicels, the calyx splitting into 3 instead of 2 lobes. The glabrous leaves resembled those of *C. commune* rather than those of *C. fragrans*, but the distribution of the small bracteoles favoured the latter species. The style was incorrectly described as glabrous, further examination having shown that it is stellate-pubescent in the lower third. The style-branches were much longer than those of either ally. Seedling leaves and fruits were not represented.

During the last few years no less than three collections of a very distinct *Catostemma* have been made in the sandy wallaba (*Eperua*) forests of the Essequibo-Mazaruni Divide, near the Bartica-Potaro road to the south of Bartica. This tree grows plentifully in association with *C. fragrans*, but is more closely related to *C. commune*, which it resembles in the compound leaves of the seedlings, the irregular venation of the glabrous leaves, the stellate-pubescent lower third of the style, and the short style-branches. It is immediately distinguished from *C. commune* by the very long and narrow cusps of the seedling leaflets (a character of the simple seedling leaves of *C. fragrans*), by the small bracteoles which are scattered near the middle of the pedicel or even far below it, and the long pedicels. Above all, it differs from both species in the stiffly coriaceous mature leaves, the margins of which are frequently revolute, in the very much larger flowers, with the calyx splitting into 3 instead of 2 lobes, and in the larger, conspicuously acuminate fruit.

Comparison with the material of *C. Altsoni* has convinced the writer that the Bartica-Potaro road tree is to be referred for the present to that species, with which it obviously agrees in many characters of foliage and inflorescence. The type specimens of *C. Altsoni* differ in the more regular and parallel appearance of the secondary nerves of the leaves which are often rounded at the base, in the longer stamens, and especially in the conspicuously longer style-branches. The constancy of these characters should eventually be checked by further collections of *C. Altsoni* in the same region, but it may be noted here that a certain variability has been observed in the length of the style-branches of *C. fragrans*. Meanwhile, a description of the Bartica-Potaro road tree has been drawn up which may provisionally be regarded as a supplementary, or even an emended, description of *C. Altsoni*.

Arbor excelsa, circiter 30 m. alta. *Folia plantarum incipientium* trifoliolata; foliola oblanceolata vel elliptica, apice longe anguste caudato-acuminata, acumine lineari-subulato vulgo 2-3 cm. longo supra medium 1.2-2 mm. lato, terminalia basi cuneata, lateralia obliqua latere inferiore rotundata, in exemplis visis 10-18.5 cm. longa, 3.5-6.2 cm. lata, glabra, supra nitida, chartacea, costa in terminali centrali, in lateralibus excentrica, utrinque subtiliter

reticulata, nervis primariis utroque costae latere circiter 8-12 plus minusve ut in *C. commune* arcuatis, reticulatione valde irregulari quoqueversus versante; petiolus glaber, sulcatus, ad 14 cm. longus, apice basique velut petioluli breves incrassatus nigrescens. *Ramuli arboris maturae* glabri, saepius breves foliis apice fasciculatis. *Folia matura* vulgo obovata, rarius obovato-oblonga vel fere elliptica, apice generis typico, basi in petiolum valde attenuato-cuneata, ad 16 cm. longa, ad 8.2 cm. lata, utrinque glabra, nitidula, crasse coriacea marginibus saepius revolutis, costa lata valde conspicua utrinque praesertim subtus prominente, nervis ceteris supra subplanis haud conspicuis subtus prominentibus, reticulatione irregulari; petiolus 1-4.8 cm. longus. *Flores* in quoque fasciculo complures, saepe ad 10, albi, speciosi, fragrant; pedicelli stellato-tomentosi, (3-) 4-7 cm. longi; bracteolae 3, prope medium vel infra medium pedicellum intervallis irregularibus dispersae, late ovatae, 1-1.75 mm. longae, ad 1.5 mm. latae, extra prope basin fere lanato-tomentosae, superne brunneae glabrescentes. *Alabastra* matura stellato-tomentosa, ad 1.4 cm. longa. *Calyx* tubo campanulato 4-5 mm. longo, 5 mm. lato, tum in lobos 3 vulgo 1.2 cm. longos fissus; lobi 2 majores late ovati, 8-9.5 mm. lati, tertius elliptico-lanceolatus vel ovato-oblongus, 5.5 mm. latus. *Petala* niveo-alba, reflexa, magna, obovata vel obovato-oblonga, apice rotundata, 2.2 cm. longa, 1.2 cm. lata. *Stamina* circiter 1 cm. longa. *Ovarium* ovoideo-subglobosum, stellato-tomentosum, 3-3.5 mm. longum, circiter 3.5 mm. diametro; stylus 1.2-1.3 cm. longus, triente inferiore conspicue stellato-pubescent, ramis ad 1.5 mm. tantum longis. *Fructus* ovoideo-lageniformis, apice conspicue late obtuse acuminatus, basi rotundatus, 9-12.5 cm. longus, 6-7 cm. diametro, minute tomentellus, pericarpio circiter 4 mm. crasso; semen ovoideum, 7 cm. longum, 4.7 cm. diametro, siccitate brunneum atque costis crebris flavis insigniter reticulatum.

Bartica-Potaro road, in sandy wallaba forests of the Essequibo-Mazaruni Divide: near 14th milepost, fl. August 18th, 1937, Sandwith 1124; near 25th milepost, fl. Sept. 1932, Forest Dept. 2315, 2316 (seedling leaves); near 27th milepost, fr. March 1937, Forest Dept. 2524.

A tree, about 100 ft. high and 1-2 ft. in diameter, the trunk ringed as in the allied species. Flowers numerous in each cluster, very showy, fragrant. Petals snow-white, reflexed, large. Filaments snow-white. T. A. W. Davis notes that the pulp round the seed is very pale yellow, paler than in the seed of *C. fragrans*.

C. fragrans Benth. This species occurs in French Guiana, but—remarkably—has not yet been noted in Surinam. A synonym is *Guenetia macrosperma* Sagot ex Benoist in Bull. Mus. Hist. Nat. Paris, 25, 387 (1919), see Burret in Notizbl. Bot. Gart. Berlin, 9, 868 (1926). Burret's identification is confirmed by *Wachenheim* sine no., ann. 1921, Godebert, distributed recently to Kew from Paris.

ELAEOCARPACEAE.

Sloanea echinocarpa *Uitt.*

Kerimeru Creek, Berbice River, in wallaba bush on white sand, March 21st 1938, *Fanshawe* in *Forest Dept.* 2677: tree 100 ft. high, 24 in. diam., with tall spreading buttresses.

Vernacular name, *Aruadan* (Arawak).

Distr. Surinam, hitherto regarded as endemic.

LINACEAE.

Ochthocosmus Barrae *H. Hallier*, forsan varietas vel species distincta.

Kaieteur Savannah, on rocky bushy ground close to the Falls, c. 1000 ft., Sept. 4th 1937, *Sandwith* 1338. A tree, 30-40 ft. high, with whitish-green petals.

The material, taken from a single tree, does not exactly match any American sheet of *Ochthocosmus* in the Kew Herbarium, but is certainly nearest to the material of *O. Barrae*, from which it differs in the more numerous main lateral nerves (about 10-14 on each side of the midrib) of the leaves, and the greater number of smaller crenae on the margins. No satisfactory distinguishing character has been found in the inflorescence. *O. Roraimae* Bth. has thicker leaves with shorter petioles, fewer crenae, and fewer main lateral nerves which are more arcuate and more steeply ascending, and longer petals. *O. parvifolius* H. Hall. is like a small-leaved edition of *O. Roraimae* with more numerous and straighter lateral nerves. Many more collections of American *Ochthocosmus* are required before the true diagnostic value of leaf-characters can be estimated; and for this reason the writer refrains from describing yet another species from the evidence of a single collection.

LEGUMINOSAE.

Bowdichia racemosa *Hoehne*.

In somewhat open, sandy, forest between the Kaieteur Savannah and the Potaro River, Sept. 6th 1937, *Sandwith* 1393. A small tree, 25-30 ft. high. Leaflets rather thick and resembling leaves of box. Petals cream or very pale creamy-brown, brownish-pink in the lower half.

Distr. Lower Amazonian Brazil, and Matto Grosso.

Compared with *Ducke* 11443 and 24058, which differ in the shorter inflorescences, but intermediates will doubtless be collected. The first record from British Guiana.

Swartzia Davisii *Sandwith*, sp. nov.; juxta *S. latifoliam* Benth. et *S. corrugatam* Benth. ponenda, inflorescentiis longis laxifloris, floribus omnibus partibus multo majoribus, pedicellis longioribus, pistillo omnino glabro primo visu distinguenda; praeterea a *S. latifolia* forma foliorum, nervis lateralibus numerosioribus differt. *Arbor* parva, c. 12 m. alta; ramuli hornotini, petioli, rhachis folii, petioluli pilis plus minusve patulis fulvis vel pullis lanato-

tomentosi. *Folia* imparipinnata, 9-11-foliolata, 17-38.5 cm. longa; petiolus 2-5 cm. longus; rhachis supra canaliculatus, exalatus, internodiis 1.5-4.5 cm. longis; petioluli 1-4.5 mm. longi; foliola ima ovato-elliptica, superiora oblonga vel obovato-oblonga, summa nonnunquam oblanceolata, terminalia elliptica vel obovato-elliptica, apice breviter late acute cuspidato-acuminata, basi cuneata usque rotundata, 2-19 cm. longa, 1.3-8.8 cm. lata, subcoriacea, supra siccitate olivacea nitidula costa vix elevata tomentosa ceterum glabra nervis primariis impressis, subtus siccitate pallidiora (statu vivo glaucescentia) costa nervisque primariis prominentibus fulvolanatis praeterea pagina tota satis dense suberecto-pilosula, nervis primariis utroque costae latere circiter 12 patulo-ascendentibus subrectis marginem versus arcuato-anastomosantibus, rete venularum supra impresso subtus intricato prominulo; stipulae delapsae haud visae. *Inflorescentiae* e trunco infra folia exorientes, arcuato-flexuosae, ad 30 cm. longae, secus totam longitudinem laxiflorae, rhachi subadpresse fulvo-tomentosa, superne siccitate passim fulvo-griseae subnitentes; bracteae facile delapsae, lanceolatae, concavae, 4-5 mm. longae, vix ad 2 mm. latae; pedicelli ascendentes, 1.6-2.3 cm. longi; bracteolae nullae. *Alabastra* ovoideo-subglobosa, apiculata, matura 1 cm. longa, circiter 8 mm. diametro, siccitate pallide fulvo-griseo-sericea plus minusve nitentia. *Calyx* in lobos 4-5 reflexos intus glabros siccitate rubro-brunneos fissus; lobi ovato-lanceolati vel elliptico-lanceolati, 1.2-1.3 cm. longi, 5.5-7 mm. lati. *Petalum* pallide flavum, haud purpureo-venosum, ovato-suborbiculare, basi truncato-rotundatum, circiter 1.8 cm. longum atque latum, margine obscure sinuato-crenulato, extra secus dimidium inferius costae ac unguem dense flavo-pilosum, ceterum glabrum; unguis vix 2.5 mm. longus. *Stamina* filamentis glabris; majora 4-5, antheris 4-4.75 mm. longis. *Ovarium* lineari-oblongum, angustum, saepius curvato-falcatum, glaberrimum, 1-1.4 cm. longum, vix ad 2 mm. latum, in stylum glabrum crassum obtusum brevissimum circiter 1.5 mm. longum transiens; stipes glaber, circiter 9 mm. longus. *Fructus* non visus.

BRITISH GUIANA. Malissa Creek, Berbice River, in mixed forest on sandy clay soil, March 4th 1938, *T. A. W. Davis* in *Forest Dept.* no. 2617 (typus). "Tree of taller undergrowth, 40 ft. high, 3 in. diam. Young shoots, inflorescence, rhachis and principal nerves of leaves with abundance of rusty hairs. Lower surface of leaves glaucous. Cauliflorous. Petal pale yellow, without purple veins. Calyx pale green with faint rusty tomentum on buds." *Ibid.*, in mixed bush on white sand, March 7th 1938, *Fanshawe* in *Forest Dept.* 2669.

This interesting species resembles *S. grandifolia* Bong. ex Bth. and *S. tomentosa* DC. in the facies of its leaves, but these are long-styled species with shorter anthers on the large stamens. The characters of the inflorescence of *S. Davisii* clearly relate it to *S. corrugata* Bth. and *S. latifolia* Bth., and no closer affinity has been

found, although relationship with *S. cardiosperma* Spruce ex Bth., *S. macrocarpa* Spruce ex Bth., *S. obscura* Huber and *S. melanocardia* Ducke may be indicated. This is the twentieth species of *Swartzia* to be recorded from British Guiana.

Heterostemon otophorus Sandwith, sp. nov.; *H. mazarunensi* Sandwith affinis, stipulis maximis auriformibus, folii rhachide infra par foliolorum magnum evolutum alata multo longiore, foliolis pro rata latoribus rete venularum intricatiore, bracteis magis ovatis, floribus brevius pedicellatis differt.

Frutex riparius; ramuli teretes, minute pubescentes. *Folia* paripinnata, foliolis primo visu unijugis sed revera ut in *H. mazarunensi* bijugis jugo inferiore sub internodio rhacheos alato omnino suppresso; petiolus crassus cortice corrugato, 4-6 mm. longus; internodium rhacheos 0.8-1.7 cm. longus, supra alatus atque canaliculatus marginibus alarum revolutis, prope apicem 2.5-4 mm. latus; foliola jugi evoluti maxima petiolulis vulgo circiter 3 mm. longis, elliptico-oblonga vel obovato-oblonga, apice cuspidato-acuminata acumine 0.6-1.5 cm. longo, basi ut in *H. mazarunensi* obliqua, 10-24 cm. longa, 3.9-8.8 cm. lata, glabra, integra, firme chartacea, nervis plus minusve ut in *H. mazarunensi* sed rete venularum supra intricatiore magis manifesto; stipulae maximae, oblongae, erectae, apice rotundato-obtusae, basi conspicue oblique auriculato-cordatae, 2.5-5.5 cm. longae, 1.1-2.3 cm. latae, reticulatione foliolorum. *Racemi* haud dense pubescentes, multiflori, 3-14 cm. longi; bractae ovatae, obtusae, pubescentes atque ciliatae, 3-4 mm. longae, 2-2.5 mm. latae; pedicelli breves vel obscuri, ad 2 mm. longi; bracteolae ut in *H. mazarunensi* prope medium vel supra connatae, pubescentes, 5-6 mm. longae, apicem versus circiter 4 mm. latae. *Calyx* tubo minute pubescente 1-1.2 cm. longo; segmenta 4, extra indumento tubi induta, inaequalia, involuta, marginibus membranaceis glabrescentibus, oblongo-linearia vel fere obovato-oblonga, 1.65-2.2 cm. longa, 3.5-6.75 mm. lata. *Petala* alba, 3 magna obovato-oblonga vel ovato-oblonga, 2.2-3.2 cm. longa, 1.1-1.3 cm. lata, haud unguiculata, dimidio superiore conspicue dense ciliata; petala 2 rudimentaria oblonga, minuta, 2-2.2 mm. longa, 1 mm. lata, apicem versus longe ciliata. *Tubus stamineus* glaber 1.4 cm. longus, filamentis ut in *H. mazarunensi* exorientibus, eis staminum 3 perfectorum prope medium longe pilosis; antherae perfectae 4 mm. longae. *Ovarium* vel suturis pubescentibus ceterum glabrum (in exemplo typico) vel omnino tomentosum (in *Jenman* 7407), stipite brevi pubescente, stylo vel basin versus parvisse pilosulo vel (in *Jenman* 7407) tomentoso 1.4 cm. longo. *Legumen* non visum.

BRITISH GUIANA. Potaro River: Kangaruma, a small shrub with white petals in forest on river-bank, August 31st 1937, Sandwith 1241 (typus); riverside at Pakatuk, Oct. 1898, *Jenman* 7407 (forma ovario basique styli tomentoso).

As in *H. mazarunensis*, the three fertile stamens are found in the highest of the three lateral pairs and in the central terminal stamen at the apex of the sheath. Their filaments are thicker than those of the sterile stamens, and are sparsely long-pilose near the middle, but they are shorter than the filaments of the sterile stamens immediately below them. The shortest filaments are those of the lowest lateral sterile pair. Bentham and Hooker's description of the androecium of *Heterostemon* therefore needs an emendation, which has not yet been given in the Pflanzenfamilien.

The material of the present species, which is very closely allied to *H. mazarunensis*, shows that the morphology of the leaf of the latter was misinterpreted at the time of its description. The minute, extremely short, winged rhachis was inaccurately described as a stipel-like pair of leaflets similar to that occurring in *H. conjugatus* and *H. ellipticus*. The well-developed rhachis of the leaf of *H. otophorus* now reveals the true nature of this winged internode which re-appears in the curious imparipinnate *H. dispar*, and in the multifoliolate *H. mimosoides*.

The Kew material of *Heterostemon* may now be keyed as follows: Leaves paripinnate with numerous pairs of small leaflets; rhachis winged.....*H. mimosoides*

Leaves with 5 or fewer leaflets:

Leaves imparipinnate:

Leaves trifoliolate, the lateral leaflets minute and stipel-like, the terminal elliptic or elliptic-oblong and usually much more than 3 cm. broad.....*H. ellipticus*

Leaves 3-5-foliolate with conspicuously winged rhachis, the lateral leaflets at least 7 mm. long, the terminal oblong or oblong-lanceolate and less than 3 cm. broad.....*H. dispar*

Leaves paripinnate:

Leaves with 2 conspicuous pairs of leaflets separated by a long internode without definite wings.....*H. ingifolius*

Leaves with the lower pair of leaflets either suppressed or extremely reduced and stipel-like; internode very short: Stipel-like lower leaflets usually present. Internode hardly winged. Flowers very large, about 10 cm. long.....*H. conjugatus*

Lower leaflets suppressed (in the material seen). Internode definitely winged. Flowers smaller, much less than 10 cm. long:

Stipules subulate. Internode only 3 mm. long.....*H. mazarunensis*

Stipules very large and ear-like. Internode 0.8-1.7 cm. long.....*H. otophorus*

Pithecellobium Gonggrijpii Kleinh. in Rec. Trav. Bot. Néerl. 22, 414 (1925).

Hurihi, Kara-kara Creek, fr. Feb. 1910, C. W. Anderson in Forest Dept. no. 147. Demerara River, fl. July 1887, *Jenman* 3957,

noted as a small tree. Potaro River, a short distance above the Kaieteur Falls, fl. and fr. Sept. 1937, *Sandwith* 1378: a small tree by stream in high forest; petals pinkish-brown; stamens pure white.

Vernacular name, *Manariballi* (Arawak).

Distr. Surinam.

The material collected by Anderson agrees excellently with *Gonggrijp* and *Stahel* 4211, which is a fruiting collection cited by Kleinhoonte. The other two collections cited above are placed here because they appear to agree in all essential characters of leaves, flowers and fruit. It is believed that they were taken from small examples of a species which is often developed as a large tree. This might account for discrepancies such as the larger number of pinnae (5-8 pairs) and leaflets. It is significant that C. W. Anderson noted that the leaves of a young shoot of his collection were "very much larger than the top leaves of the tree"; in fact his material shows that they bear 7-8 pairs of pinnae with more numerous leaflets than those of the 4-5 pairs of the leaves of old shoots. It is possible, in the light of this evidence, that *P. Pullei* Kleinh., which was described as a small tree 10 m. high and resembles *P. Gonggrijpii* very closely, is not more than a form of the latter species with more numerous pinnae and somewhat more hairy corollas.

ROSACEAE.

Hirtella angustissima *Sandwith*, sp. nov.; *H. racemosae* Lam. speciei polymorphae affinis, ab omnibus ejus formis foliis angustissimis rigidis lanceolatis usque linearibus differt.

Arbor parva riparia, gracilis, pulcherrima; ramuli pilis adpressis vel ascendentibus plus minusve copiose induti; internodia 0.5-2.7 cm. longa. *Folia* pro genere angustissima, disticha, salicina, lanceolata usque linearia, apice longe sensim acuminata vel saltem attenuata, apice ipso obtuso, basin versus attenuata sed basi ipsa vulgo rotundata rarius cuneata, 5.5-18.5 cm. longa, 0.55-2.2 cm. lata, rigide chartacea vel coriacea, nitidula, oculo nudo glabra, sed revera subtus secus costam sparse pilosa, praeterea pagina inferiore pilis minimis e tuberculis exorientibus crebre pubescente, costa utrique prominula, nervis primariis utroque costae latere circiter 10-12 patulo-ascendentibus atque satis longe a margine arcuato-anastomosantibus supra fere planis subtus prominulis, supra nonnunquam cum reticulatione omnino impressis; petiolus pilosus, 2-3.5 mm. longus; stipulae subulatae, 3-4 mm. longae, juventute pilosae. *Racemi* penduli, 8-22 cm. longi, copiose pilosuli atque puberuli, triente vel fere dimidio inferiore nudi sed stipulis bracteisque praediti; pars florifera circiter ad 3 cm. lata; bractae lineari-subulatae, 1-1.5 mm. longae, dense pubescentes; pedicelli 8.5-11 (vulgo 10) mm. longi, indumento rhacheos praediti; bracteolae infra medium pedicellum minutae, ovatae vel oblongae, obtusae, circiter ad 0.6 mm. longae atque latae, nonnunquam minimae

suborbiculares, apice glandula magna sessili terminatae. *Calycis* tubus vix 2.5 mm. longus, 1.5 mm. latus, indumento pedicelli praeditus; lobi ovato-lanceolati vel elliptico-oblongi, 3.5-4 mm. longi, 2 mm. lati, extra pubescentes intus dimidio superiore subsericei. *Petala* amethystino-caerulea, elliptico-oblonga, ad 5.5 mm. longa, fere 3 mm. lata, glabra. *Stamina* 4-5, 1.8-1.9 cm. longa, glabra. *Ovarium* dense pilosum; stylus prope basin sparse pilosus, ceterum glaber, 2 cm. longus. *Fructus* ignotus.

BRITISH GUIANA. Potaro River: Amatuk Falls, on rocky ground, Aug. 31st 1937, *Sandwith* 1246 (typus), *ibid.*, Aug. 1933, *Tutin* 601; below Kaieteur Falls, on rocks and banks in the riverway, Sept.-Oct. 1881, *Jenman* 884, 970. A small tree, 15-20 ft. high, very graceful. Racemes pendent. Petals and filaments *Veronica* or *Echium* blue.

This very beautiful species occurs abundantly along the banks of the Potaro from Tukeit down to Kangaruma, and is so striking and so uniform that it has seemed undesirable to treat it as a mere extreme variety of the polymorphic *H. racemosa*.

MELASTOMACEAE.

Ernestia cataractae *Tutin* in Journ. Bot. **72**, 308 (1934).

Kaieteur Savannah, on open rocky ground near the Resthouse and Falls, Sept. 2nd, 1937, *Sandwith* 1294: leaves grey-green above; petals a delicate pale pinkish-mauve.

Possibly owing to a more favourable season this material is far finer than that of the type collection, presenting a more floriferous inflorescence and larger flowers, the petals and filaments being sometimes up to twice as long as in *Tutin's* description. The anthers of this collection are abortive and therefore much shorter than the healthy anthers of *Tutin's* type. It is interesting to note that this species was collected here long ago by *Jenman*, who, indeed, missed very few of the Kaieteur Savannah plants during his fortnight's stay there. A specimen (without number) has been discovered in the Kew Herbarium, attached to a sheet of *Comolia purpurea*.

Clidemia pycnaster *Tutin* in Journ. Bot. **72**, 306 (1934).

Sandy ground in high forest skirting the Kaieteur Savannah, Sept. 7th 1937, *Sandwith* 1426: shrub with tawny indumentum on branchlets, and strongly toothed leaves; petals dirty white with a longitudinal medium pinkish-mauve line.

Compared with the type collection (*Tutin* 684) which was a small bush growing on the open rocky ground of the Savannah. There seems no doubt that the two collections are conspecific although they represent strikingly distinct ecological forms, *Sandwith* 1426 differing from the type in the larger, ovate-lanceolate, toothed leaves with scattered long simple hairs among the stellate indumentum of the upper surface, and in the larger flowers.

RUBIACEAE.

Sabicea velutina Benth. ; neque Wernham neque Bremekamp.

The holotype of this species, collected by Schomburgk on Mt. Canaupang, was made the holotype of a new species, *S. guianensis* Wernh.—itself a later homonym of *S. guianensis* (Aubl.) Baill.—by Wernham! *S. leucotricha* Krause, described from the same region, is also almost certainly a synonym. The very different and less local plant to which Wernham and Bremekamp applied the name *velutina* is thus left without a specific name, when we examine the synonymy of those authors. The present writer, however, believes that this plant does not differ specifically from *S. glabrescens* Benth., from which it appears to be distinguished only by the addition of an arachnoid tomentum on the branchlets and the lower surface of the leaves. Collections intermediate between the two have been observed, see Britton and Britton 2229 from Trinidad, Martyn 313 from British Guiana, Ule 8336 from the Rio Branco. *S. trinitensis* Standley should also be treated as a synonym of *S. glabrescens*. The plant which has been incorrectly identified with *S. velutina* Bth. may be treated as follows :

Sabicea glabrescens Bth. var. **oblongifolia** (Miq.) Sandwith, comb. nov., descr. emend. ; a typo ramulis foliisque subtus praeter venas pilosas arachnoideo-tomentosis insigniter discedens. —*S. velutina* Bth. var. **oblongifolia** Miq. in Linnaea 18, 615, 735 (1844). *S. velutina* Bth. sec. Wernham, Mon. Sabicea, p. 49 (1914), cum syn. ; sec. Bremekamp in Pulle, Fl. Surinam, 4, 145 (1934), cum syn. ; non Benth.

Distr. British Guiana, Surinam, Venezuela (fide Bremekamp).

Malanea sarmentosa Aubl.

Mazaruni Station, among bushes in sandy burnt bush, Aug. 22nd 1937, Sandwith 1163. A low shrub. Leaves rugose with revolute margins. Corolla creamy-yellow, limb whitish-woolly within.

This agrees excellently with the material from French Guiana, Surinam and Trinidad which has been compared with Aublet's type, and not with other sheets from British Guiana which were named *M. sarmentosa* by Bentham and Schumann but which lack the distinctive indumentum and rugosity of the leaves and perhaps represent a glabrescent variety.

Faramea egregia Sandwith, sp. nov. ; *F. quadricostatae* Brem. affinis atque *F. spathaceae* Müll. Arg. ex Standley subsimilis, ab illa foliis longe petiolatis, floribus aut in axillis penultimis geminis vel solitariis aut apice ramuli ternis, calyce cum ovario multo longiore, ab hac aristis stipularum multo longioribus, petiolis longioribus, floribus haud longipedicellatis, corollis multo majoribus differt.

Frutex vel arbor parva, glabra ; ramuli compressi acute tetragoni lateribus concavis majoribus costato-striatis. *Folia* conspicue petiolata, oblanceolata vel elliptico-oblonga, apice longe ad 2 cm.

angustissime insigniter caudato-acuminata, basi acute cuneata, 12–17.5 cm. longa, 2.5–5.2 cm. lata, chartacea, supra nitidula siccitate viridia, subtus pallidiora siccitate griseo-viridia, costa utrinque prominente, nervis primariis utroque latere costae circiter 11–13 arcuato-ascendentibus et anastomosantibus, rete venularum supra inconspicuo subtus manifesto ; petiolus 1–1.5 cm. longus ; stipularum vagina 1.5–2.5 mm. longa, arista 4–6 mm. longa. *Inflorescentiae* in axillis penultimis apice ramulorum brevium singulorum vel saepius geminorum superpositorum ex internodio singulo pedicelliformi constitutorum sessiles uniflorae, stipulis foliisque valde reductis minutis subulatis bracteoliformibus ita suffultae ut flores singulos vel geminos longipedicellatos axillares simulent, raro apice rami ordinarii annotini terminales ternae ; internodium sub flore pedicelliforme 2.2–4.2 cm. longum ; stipularum aristae sub flore vulgo ad 0.5 mm. (raro 1.5 mm.) longae ; folia reducta bracteoliformia vulgo aristiformia 1.5–2 mm. longa, raro subfoliacea elliptica atque caudato-cuspidata 8 mm. longa 2 mm. lata. *Calyx* cum ovario turbinato-campanulatus, ovario incluso 8–10 mm. longus, ipse fere 6 mm. longus, 5 mm. latus, truncatus, ore integro. *Corolla* hypocrateriformis, alabastro viridescens, sub anthesi cremeo-alba, pro genere magna speciosa ; tubus 2–2.2 cm. longus, apice 4 mm. latus ; lobi expansi valde crassi, recurvo-falcati, 2.5–3 cm. longi, statu plicato basi ad 3 mm. lati. *Stamina* supra medium tubum affixa, filamentis circiter 1.5 mm. longis, antheris 9–9.3 mm. longis. *Discus* annularis, 0.6 mm. altus. *Stylus* glaber, 5.3 mm. longus, lobis circiter 1.6 mm. longis. *Fructus* ignotus.

BRITISH GUIANA. Potaro River : in the deeply wooded gorge about 1 mile below the Kaieteur Falls, September 11th 1937, Sandwith 1498. A small tree, frequent on rich humus in a patch of mora forest. Corolla greenish in bud, whitish-cream when open ; lobes of the limb very thick, recurved-falcate when fully expanded.

This interesting species is remarkable for the morphology of the extremely reduced one-flowered inflorescences which terminate short lateral shoots composed of a pedicelliform internode, the single large flower being supported at the base by bract-like reduced stipules and leaves. These shoots appear at the penultimate nodes of the branch with the new year's growth, the uppermost internode being normally vegetative and terminated by a pair of fully developed leaves. In a single instance the old growth of a branch is terminated by three young shoots ending in an inflorescence. The short lateral inflorescence-bearing shoots are usually superposed in opposite pairs, corresponding to the serial buds known in the *Rubiaceae*. Similar pairs of lateral short shoots can be observed in *F. occidentalis*, in which the lower shoot bears an inflorescence. In *F. spathacea* Müll. Arg. ex Standley the pseudo-axillary flowers are borne on a long true pedicel. It is believed that Bremekamp's key in Pulle's Flora of Suriname, which divides species by the position of the inflorescence at the end either of ordinary shoots or of

short opposite lateral shoots, must be used with considerable caution.

Psychotria racemifera Standl.

Malissa Creek, Berbice River, on clay by creek in morabukea forest and in burnt bush on ironstone hills, abundant, March 7th 1938, *Fanshawe* in *Forest Dept.* 2668: creeping, rooting at nodes; flowers surrounded by pink bracts, white. Itabru Fall, Berbice River, in low bush on clay soil, March 5th, 1938, *Forest Dept.* 2668 A.

Distr. Amazonian Brazil and Peru, Venezuela, Colombia.

Perama scaposa Gleason et Standley.

Kaieteur Savannah, in damp mossy spots among boulders by rivulet, 1200 ft., Sept. 9th 1937, *Sandwith* 1353. Flowers minute, whitish-blue. Near Kaieteur Falls, Aug. 20th 1933, *Tutin* 496. Sand-reef at head of Hooroobe Creek, S.E. of Georgetown, Nov. 1919, *Hitchcock* 16951, det. Bremekamp. Without locality, *Robert Schomburgk* 34 of "last small set."

Distr. Mt. Duida, Venezuela. Schumann's record, in Mart. Fl. Bras., of *P. dichotoma* Poepp. et Endl., as collected by Schomburgk, must presumably be referred here.

COMPOSITAE.

Mikania Sprucei Baker.

Kaieteur Savannah, climbing over small trees on rocky ground near the Falls, c. 1200 ft., Sept. 6th 1937, *Sandwith* 1400.

Distr. Amazonian Venezuela.

This agrees well with the type, much better than with that of *M. roraimensis* Robinson which Robinson contrasted with *M. Sprucei*, admitting the close affinity of the two. Baker's description was inaccurate, the heads of *M. Sprucei* being shortly pedicellate, but the stalks are much shorter than those of *M. roraimensis*, which has the inflorescence and involucreal scales glabrous, whereas those of *M. Sprucei* are conspicuously glandular. Again, Baker's description of the corolla was wholly misleading, his "limb" no doubt representing the campanulate apex, which is slightly shorter (1.5 mm.) than the tube (2 mm.). The achenes vary in length according to development and maturity. *M. roraimensis* may prove to be not more than a variety of *M. Sprucei* which it resembles very closely.

ERICACEAE.

Orthaea pendula Tutin in Journ. Bot. 72, 335 (1934).

Specimens collected at the type locality, Amatuk Portage, Potaro River, on Aug. 31st 1937, by N. Y. Sandwith (no. 1252) show that the characters distinguishing the type from *O. apophysata* (Griseb.) A. C. Smith are not maintained. The corollas of *Sandwith* 1252 are 2.3 cm. long, and the material agrees with that from Trinidad in all other respects except that the petiole is shorter than that of most Trinidad specimens. A. C. Smith, however,

described the petiole of *O. apophysata* as only 3-5 mm. long. The plant is frequent at Amatuk Falls and is a scrambling tree, forming a climber over others, to the height of about 30 ft.

EBENACEAE.

Diospyros ierensis Britton in Bull. Torr. Bot. Club, 48, 336 (1921).

Near Barabara Creek, near 14th milepost of Bartica-Potaro road, Aug. 18th 1937, *Sandwith* 1123 (♂ fls.): a large tree, 1 ft. 6 in. diam., in wallaba forest on white sand; bark blackish, thinly longitudinally many-furrowed; heartwood fairly pale yellow; calyx orange-yellow after fall of corolla; corolla tube greenish-white; lobes of limb reflexed, pale yellow, turning brown.

Kamwatta Creek, Koirimap River, Pomeroon River, July 1918, *Hohenkerk* in *Forest Dept.* no. 109 A (♂ fls. and fr.). Upper Demerara River, Sept. 1887, *Jenman* 4003 (♂ fls. only).

Vernacular name, *Barabara* of wallaba (Arawak).

Distr. Trinidad: forest near summit of Mt. Tocuche, *Britton, Hazen* and *Mendelson* 1243 (fr., type in New York Herb.); *Guanapo, Dannouse* in *Herb. Trin.* 6415; Aripo road, near end of forest, *Broadway* 7593.

The British Guiana material agrees well with that from Trinidad and Britton's rather meagre description may be emended as follows:—Young twigs more or less adpressed-pubescent. *Leaves* 2.5-6.5 cm. wide, often somewhat shining above, when young pubescent on the midrib beneath and with minute scattered hairs on the lower surface, the midrib impressed and canaliculate above, prominent beneath, main lateral nerves about 10 on each side of the midrib, arcuate-ascending and anastomosing, reticulation intricate on both surfaces. *Inflorescence* rusty-tomentose, 1-3-flowered, very short; primary bracts narrowly boat-shaped, up to 4.5 mm. long. *Male* flowers only seen, described from *Sandwith* 1123. *Calyx* rusty brown when dried, densely adpressed-pubescent; tube top-shaped below, abruptly widened at the apex into the lobes, 5-6 mm. long, up to 6 mm. wide in the lower part; lobes 4-5, ovate, with undulating margins and very strongly thickened and raised triangular-lanceolate sericeous midribs within, 5-7 mm. long, 3.5-7 mm. wide. *Corolla* tube urceolate-cylindric, 11-12 mm. long, 5-6 mm. diam., finely sericeous outside; lobes 4-5, spreading and recurved, fleshy, ovate, blunt, 4.8-5.5 mm. long, 4-4.5 mm. wide, glabrescent outside, glabrous within, keeled beneath with a fleshy midrib. *Stamens* 12, inserted at the base of the corolla tube, often geminate; filaments densely pilose, 1.2-2.3 mm. long; anthers glabrous, about 3 mm. long including the long triangular-subulate produced portion of the connective which is 0.5 mm. long. *Ovary* rudiment densely tomentose with pale hairs. *Fruit* (in *Forest Dept.* 109A) globose, about 4.3 cm. diam.; fruiting calyx persistent, 3.3 cm. across, the lobes with conspicuous wrinkles on the outer surface descending for a short distance from the margin.

D. ierensis is apparently a member of the section *Paralea*, and related to *D. Ebenaster* Retz.

Four species of *Diospyros* are now recorded from British Guiana, and may be keyed as follows:—

Leaves narrowly lanceolate, glabrous, dark and veinless above, shining sericeous-tomentose with yellowish-white hairs beneath

D. dichroa Sandwith

Leaves not as above:

Leaves rounded and shallowly cordate at the base. Stamens 4.

D. lissocarpoides Sandwith

Leaves not cordate at the base. Stamens more than 10:

Branchlets, margins and lower surface of leaves with a deciduous rufous-brown tomentum. Filaments glabrous. Fruit

2.5–3 cm. diam.....*D. guianensis* (Aubl.) Gürke

Branchlets and leaves without a deciduous rufous-brown tomentum. Filaments pilose. Fruit 4.3 cm. diam.....

D. ierensis Britton

APOCYNACEAE.

Aspidosperma Vargasii DC., det. Fr. Markgraf.

Kumuparu, Demerara River, on white sand with mixed low bush, Oct. 20th 1937, *Fanshawe in Forest Dept.* 2536: tree 100 ft. high with little latex and no buttresses; buds white; open flowers with a faint mauve flush.

Distr. Venezuela.

Forsteronia Sandwithiana Woodson in Ann. Missouri Bot. Gard. **22**, 209 (1935).

Synonymous with this species are *Thenardia?* *corymbosa* Benth., *Forsteronia Schomburgkii* DC. excl. var., non (Bth.) Müll. Arg., and *Thyrsanthus corymbifer* Miers. Of these the epithet of the first was preoccupied in *Forsteronia*, while the second was an illegitimate name, since de Candolle included under it a variety which was based on the earlier name *Apocynum umbellatum* Aubl. Woodson has made a curious error in placing these three names as synonyms of the taxonomically distinct *F. umbellata* (Aubl.) Woods. The Schomburgk type (no. 277) of *Thenardia corymbosa* Bth., not cited by Woodson, agrees, as might be expected, with the material placed by him under *F. Sandwithiana*. Since the epithet of the third synonym, *Thyrsanthus corymbifer* Miers—a name based on the other two, and on *Schomburgk* 277 (sphalm. 247) as type—is not preoccupied in *Forsteronia*, it must take precedence over the superfluous name *F. Sandwithiana* and the following combination becomes necessary:

Forsteronia corymbifera (Miers) Sandwith, comb. nov.—*Thyrsanthus corymbifer* Miers, Apoc. S. Am. 98 (1878). *Thenardia?* *corymbosa* Bth. *Forsteronia Schomburgkii* DC., excl. var. *F. Sandwithiana* Woodson.

Coutoubea humilis Sandwith, sp. nov.; statura humili, habitu repente radicante, forma foliorum in petiolum manifestum attenuatorum, racemo brevissimo foliis superioribus multo brevior, floribus congestis parvis, corollae lobis obtusis distinctissima.

Herba glabra, riparia, tenera, humilis, 6–20 cm. alta, repens, caulibus saepe inferne decumbentibus atque nodis radicantibus et ramulos novellos sursum emittentibus; caules floriferi tetragoni, ad 2 mm. diametro, crebre vel parce foliati, internodiis 0.4–5.8 cm. longis. *Folia* lanceolato-elliptica usque elliptica, apicem versus attenuata vel acuminata, acuta, basi attenuata acute cuneata et in petiolum distinctum conspicuum circiter ad 10 mm. longum sensim decurrentia, lamina 3–10 cm. longa, 0.6–2.8 cm. lata, chartacea, supra nitidula, nervis supra obscuris planis vel impressis, subtus manifestis prominulis, nervis primariis utroque costae latere 3–4 tantum sursum arcuatis et longe a margine (in foliis majoribus nervo limbali duplici connexis) anastomosantibus, venulis obscuris. *Racemus* terminalis 0.5–2 cm. longus, ad 1.5 cm. latus, fere a basi florifer, foliis superioribus multo brevior, floribus congestis decussatis circiter 5–25; bracteae lanceolatae, parvae sed haud spinuliformes, inferiores ad 2 mm. longae, ceterae circiter 1.2 mm. longae; pedicelli brevissimi crassi, ad 0.75 mm. longi, nonnunquam fere ad 1.5 mm. lati; bracteolae minutae, dimidio inferiore ovatae, superiore subpungenti-subulatae, ad 1 mm. longae. *Flores* 6–7 mm. longi. *Calycis* tubus campanulatus, 1.2 mm. longus, 2.5 mm. latus; lobi lanceolato-ovati, subpungenti-acuminati, 3–3.5 mm. longi, basi 1.75–2 mm. lati. *Corolla* viridescens-alba; tubus 2.75–3.2 mm. longus et 1.75 mm. diametro; lobi ovato-lanceolati, 3–3.2 mm. longi, fere 1.6 mm. lati, apice obtusi. *Stamina* prope tubi apicem inserta, filamentis 2–2.5 mm. longis, antheris circiter ad 1.3 mm. longis e flore expanso exsertis. *Ovarium* anguste ovoideum, 3 mm. longum, 1.5 mm. diametro, in stylum stigmate incluso 3 mm. longum attenuatum; stigmatibus lobi oblongi, 1 mm. longi, 0.5 mm. lati. *Capsula* ovoideo-ellipsoidea, 6–8 mm. longa, 3–3.75 mm. diametro, calycem longe excedens.

BRITISH GUIANA. Potaro River: swampy forest on left bank about 1–2 miles above the Kaieteur Falls, Sept. 6th, 1937, *Sandwith* 1386 (typus); Sheenabowa, Sept.–Oct. 1881, *Jenman* 1288; Waratuk portage, in shade on sandy soil among large stones and boulders, Sept. 12th 1937, *Sandwith* 1509. Essequibo River—Upper Demerara River: Kumuparu Creek, edge of low swamp, Oct. 30th 1937, *Forest Dept.* no. 2547. Trailing herb, usually with procumbent stems rooting at the nodes. Flowers greenish-white.

SOLANACEAE.

Solanum coriaceum Dun. Hist. Solan. 197, t. 14 (1813); Poir. in Lam. Encycl. Suppl. 3, 769 (1813); Dun. in DC. Prodr. 13, part i, 231 (1852).

FRENCH GUIANA. Coll. Poiteau in Herb. Gay., cum fruct., distr. as *S. spicatum* Poit.

BRITISH GUIANA. Near Rockstone, April 1899, *Jenman* 7544. Rockstone, Sept. 1905, *Bartlett* in *Jenman* Herb. 8204. Camaria Road, June 1911, *Kortright* in *Jenman* Herb. 144. Mazaruni Station, in mixed-greenheart forest, fl. and fr. Sept. 25th 1937, *Sandwith* 1591.

This remarkable species is a gigantic bush-rope reaching the forest canopy; the trunk of the rope is prickly, while the branchlets and midrib of the lower leaf-surface are clothed with short recurved prickles. The corolla is amethyst-violet, with yellow anthers. The young fruit is green, turning black when dried in the sun, 1.5–1.8 cm. in diameter.

SCROPHULARIACEAE.

Caconapea sessiliflora (Bth.) Pennell. *Herpestis sessiliflora* Bth.

Mazaruni Station, on bare damp sandy track in burnt bush, Sept. 14th 1937, *Sandwith* 1522. Erect herb. Corolla very pale, whitish with lilac tinge.

Distr. Mexico, Panama, Cuba, Guiana, Brazil. Apparently first record from British Guiana.

PEDALIACEAE.

Sesamum radiatum Schum. in Schum. et Thonn., Beskr. Guin. Fl. 282 (1827).

The whole of the Guiana material at Kew (*Schomburgk* 742 (1322), *Jenman* 1504, *Sandwith* 1038 from Mazaruni Station, *Samuels* 495) is to be referred to the above species rather than to *S. indicum* (*S. orientale*) on account of the shape of the stem leaves, the larger and darker-coloured corollas, the shaggy-haired capsules and the wrinkled seeds. This is of interest since other Surinam material is referred in Pulle's Flora (4, 112) to *S. indicum*, the seeds being correctly described as smooth. The colour of the flowers of *Sandwith* 1038, from grassy places near Mazaruni Station, was a pale, foxglove like, pinkish-purple.

LORANTHACEAE.

Psittacanthus lasianthus *Sandwith*, sp. nov.; in Sect. *Glossidea* juxta *P. biternatus* (Hoffm.) G. Don et *P. glaucocomam* Eichl. ponendus, propter tepala extra permanifeste floccoso-tomentosa distinctissimus.

Frutex parasiticus; ramuli subteretes, cortice longitudinaliter rugoso, papillis conicis dense obtecti; internodia 1.5–3 cm. longa. *Folia* opposita, elliptica, obovato-elliptica vel nonnunquam sub-orbicularia, apice rotundata, basi in petiolum crassum 5–10 mm. longum attenuata vel rotundata, 2.5–5.7 cm. longa, 2.2–4.2 cm. lata, juniora glauca, adulta rigide coriacea, nervis fere semper occultis haud vel vix distinguendis, ubique crebre papillosa.

Inflorescentiae in quaque axilla singulae vel binae, semel dichotome cymosae atque ternationes (rarius binationes) binas gerentes, rarius simplices binationem singulam gerentes, siccitate pruinoso-purpurascetes, dense spinuloso-papillosae; pedunculus 0.5–1.3 cm. longus; rami dichotomiae 0.6–1.1 cm. longi; bractae connatae, patelliformi-cupulares; pedicelli 0.5–1 cm. longi. *Cupula* aperte cyathiformis, calyculi dimidium vel ultra aequans, margine irregulariter sinuato, 2 mm. alta, 4–5 mm. diametro, extra papillis pilisque papillosis dense vestita, siccitate rubra. *Calyculus* campanulatus, 3 mm. altus, 4.5–5 mm. latus, margine patulo pilis papillosis vestitus, ceterum glaber sed sub lente forti ubique minutissime granulatus. *Perigonium* alabastro tubulosum, extra intense scarlatinum, et breviter spinuloso-papillosum et pilis simplicibus sub lente spinuliformibus dense perconspicue floccoso-tomentosum, intus superne aurantiaco-flavum glabrum, infra insertionem filamentorum usque basin papillosum. *Tepala* 6, 4–4.3 cm. longa, circiter 3 mm. lata, alabastro arcte cohaerentia, flore aperto supra medium patula, marginibus conspicue sinuato-crenatis, alternatim obtusa et acuta, apice dorso gibboso-incrassata, intus prope basin (basinque filamentorum) ligula ovata obtusa margine obscure lacerata 2–2.5 mm. longa circiter 2 mm. lata instructa. *Stamina* paullo supra medium perigonium inserta, flava; longiora filamentis liberis glabris 1.35 cm. longis, antheris 5–5.3 mm. longis; breviora filamentis liberis glabris 9 mm. longis, antheris ad 6.75 mm. longis, connectivis apice conspicue fere ad 1.5 mm. productis. *Stylus* 3.8–4 cm. longus, inferne papillosus superne glaber, stigmatibus minute dense granulato. *Fructus* ovoideo-ellipsoideus, apice truncatus, fere ad 1 cm. longus, 6–7 mm. diametro.

BRITISH GUIANA. Kaieteur Savannah, Potaro River, c. 1200 ft., scrambling on trees in a thicket on rocky ground, Sept. 5th, 1937, *Sandwith* 1366 (typus). *Ibid.*, Sept.–Oct. 1881, *Jenman* 1204. Perianth deep scarlet, furry-tomentose on the back, orange-yellow within the spreading upper half of the tepals. Stamens yellow. Younger leaves glaucous.

An outstandingly distinct and very beautiful species, evidently allied to *P. biternatus* and *P. glaucocoma*, and especially to the former which it approaches in the shape of the leaves and the conspicuously papillose branchlets.

EUPHORBIACEAE.

Phyllanthus vacciniifolius (Müll. Arg.) Müll. Arg.

Kaieteur Savannah, in thickets on dry stony ground, c. 1200 ft., Sept. 3rd 1937, *Sandwith* 1315. A small, delicate tree with wavy spreading branchlets. Leaves greyish-green beneath. Tepals and fruit brownish-red.

Hitherto recorded only from Roraima and Duida at about 4000–5500 ft.

BROMELIACEAE.

Navia angustifolia (Bak.) Mez, det. L. B. Smith.

Kaieteur Falls, on the face of cliffs and under boulders at the summit of the precipices near the head of the Falls, Sept. 1st 8th, 1937, *Sandwith* 1285: petals white; anthers yellow; stigmas 3.

Hitherto known only from the type collection, *Appun* 1055, from Marima.

Pitcairnia maidifolia (Morr.) Dcne.

Kaieteur Savannah, in open burnt forest fringing the savannah, close to the Potaro River, Sept. 6th 1937, *Sandwith* 1388. Spike very stiff. Bracts deep scarlet except in the green upper third. Petals greenish-white below, white above.

New to British Guiana and a remarkable extension of the known range, since the nearest locality recorded by Mez (1935) is Caracas.

Guzmania Altsonii L. B. Smith.

Kaieteur Savannah, in wood between the Falls and Resthouse, and elsewhere in thickets (neighbourhood of type locality), c. 1200 ft., Sept. 9th, 1937, *Sandwith* 1447: terrestrial; stem and bracts wholly green; fruit dark olive-green.

The above collection shows that the leaves of this species may reach 6 cm. in breadth, while the apiculate fruiting capsule somewhat exceeds 2 cm. in length.

RAPATEACEAE.

Potarophytum *Sandwith*, gen. nov.; in clavi cl. Pilgeri (vide Engl. et Prantl, *Pflanzenfam.*, 2 Aufl., 15 A, p. 62) prope *Schoenoccephalum* Seub. et *Monotrema* Koern. ponendum, ab ambobus bracteis involucri 4, praeterea ab illa antheris apice poro simplici apertis, ovarii loculis uniovulatis, ab hac bracteis sepalisque pungenti-mucronatis, ovulis angulo centrali affixis statim distinguitur; *Windsorina* Gleason verisimiliter proxima, structura inflorescentiae floribusque paucis longe abhorret.

Herba glabra riparia, typice *Rapateacea*. *Pedunculi* axillares, in quaque axilla ut videtur solitarii (vel nonnunquam bini?). *Inflorescentia* terminalis, caput hemisphaericum formans; involucri bractee 4, liberae, imbricatae, basin capitis arcte amplexantes, breves, horizontaliter patentes, caput vix superantes. *Flores* valde numerosi, densissime congesti, in receptaculo brevi ut videtur subsessiles. *Bractee* florales 6, erectae, imbricatae, subaequales, apice pungenti-acuminatae. *Sepala* 3, libera, bracteis subsimilia sed latiora. *Petala* 3, maturitate spathulata, libera, parva, flava. *Stamina* 6, filamentis liberis planis, antheris quadrilocularibus lineari-lanceolatis exappendiculatis, loculis exterioribus super interioribus elongato-attenuatis et poro simplici terminali obliquo apertis. *Ovarium* subglobosum, conspicue trigonum, triloculare, apice lobis rotundatis trilobatum; ovula in quoque loculo solitaria, angulo centrali affixa. *Capsula* ovoideo-lageniformis, prope medium

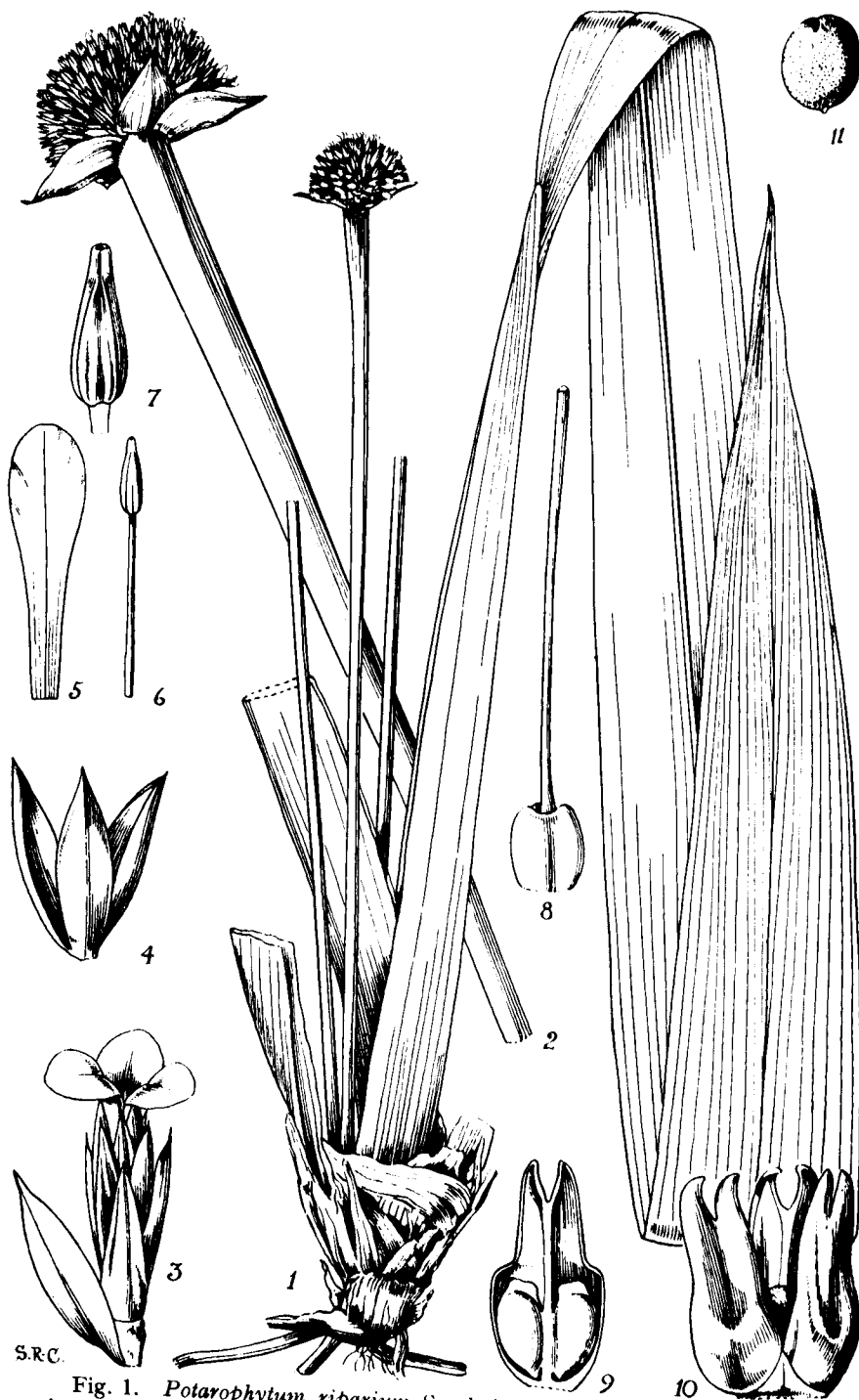
constricta, dimidio superiore trigona lateribus concavis, apice conspicue triloba lobis rigidis corniformibus sinu angusto profunde oblongo sejunctis. *Semina* subglobosa, testa alba dense minute granulosa, apice appendice applanata rostriformi excentrica mox caduca instructa.

Potarophytum riparium *Sandwith*, sp. nov. adhuc unica.

Herba terrestris, acaulescens, circiter 1 m. alta, e vaginis bracteisque involucri gluten mucilaginosum familiae typicum emittens. *Rhizoma* 3 cm. diametro, fibris sulcatis 3 mm. diametro praeditum. *Folia* more familiae compluria, circiter 1 m. longa, supra vaginas conspicue (hic 7-8 mm. lata) constricta, sed statim in laminas transeuntia; vaginae 26-30 cm. longae, 2.2-2.6 cm. latae, costa excentrica; laminae siccitate laete flavo-virides, 4.8-6.3 cm. latae, apicem versus longe anguste attenuatae, firme chartaceae vel subcoriaceae, integrae, inermes, costa subtus valde prominente, nervis longitudinalibus venulisque transversis utrinque prominulis. *Pedunculus* circiter 28-45 cm. longus, basi squamis vaginantibus inaequalibus scariosis ad 7 cm. longis praeditus, apice sub capite ad 7 mm. dilatatus. *Involucri* bractee 4 (an nonnunquam 5?) ovatae, apice breviter obtuse acuminatae, basi rotundatae, inaequales, majores 1-1.8 cm. longae, 0.9-1.2 cm. latae, nervis longitudinalibus circiter 6 reticulatione laxa irregulari connexis. *Caput* hemisphaericum, ad 1.5 cm. altum, 2.3-2.9 cm. diametro, receptaculo circiter 3 mm. tantum alto. *Flores* circiter 9 mm. longi; bractee circa flores adpressae, lanceolatae, concavo-cymbiformes, 6 mm. longae, applanatae 2-2.3 mm. latae, dorso conspicue uninerviae, in apicem incrassatum pungentem per 0.75-1.2 mm. solidum acuminatae. *Sepala* ovata, acuminata, 6.2-6.5 mm. longa, 3.3-3.2 mm. lata, valde concava, pallide viridi-straminea, in apicem pungentem illi bractearum similem sed multo breviora attenuata. *Petala* spathulata, tota 8.75-9.2 mm. longa; unguis 5 mm. longus, 1.8 mm. latus, striis longitudinalibus circiter 10 albis praeditus; lamina flava, obovato-elliptica, apice rotundata, 3.75-4 mm. longa, 2.5-2.75 mm. lata. *Staminum* filamenta fere 6 mm. longa, glabra; antherae 2.5 mm. longae, 0.6 mm. latae. *Ovarium* 1.5 mm. longum atque diametro; stylus 7 mm. longus, stigmate haud distinguendo. *Capsula* 5-6 mm. longa, 3 mm. diametro, sordide alba, nitidula, lobis apicalibus 1 mm. longis. *Semina* ad 1.75 mm. longa, 1.5 mm. diametro; appendix rostriformis facile caduca, alba, minute furfuraceo-puberula, circiter 1 mm. longa.

BRITISH GUIANA. Potaro River: Kaieteur Falls, in deep shade by a stream in forest descending from the savannah to the river, near the head of the Falls, c. 400 m., September 5th 1937, *Sandwith* 1382. Petals small, yellow.

This plant presents a completely new combination of several of the interesting characters distributed among the genera of this family, and it is somewhat difficult to suggest its closest affinity, whether on the grounds of mere facies or of technical features.



S.R.C.

Fig. 1. *Potarophytum riparium* Sandwith. 1, portion of plant, $\frac{1}{2}$ nat. size; 2, an inflorescence, with top of peduncle, nat. size; 3, a flower, with bracts, $\times 4$; 4, sepals, $\times 4$; 5, a petal, $\times 4$; 6, a stamen, $\times 4$; 7, an anther, $\times 8$; 8, gynoecium, $\times 8$; 9, part of immature capsule, showing attachment of ovules, $\times 6$; 10, capsule at dehiscence, $\times 6$; 11, seed, $\times 8$.

Moreover, the Pacaraima Range, on the edge of the escarpment of which it occurs, may be said to be the headquarters and perhaps even the centre of distribution of the *Rapateaceae*. Of the five genera occurring in the Potaro valley or on the Kaieteur Savannah, viz. *Rapatea*, *Stegolepis*, *Saxofridericia*, *Spathanthus* and *Windsorina*, the only two with which a casual glance could associate this plant are *Rapatea* and *Saxofridericia*. Of these *Rapatea* is of course distinguished by its normally 2, erect, spathe-like involucral bracts, the united sepals and petals, and the appendiculate anthers; while *Saxofridericia* differs in its 2 connate, splitting, involucral bracts, the longitudinal clefts by which the anthers open, and the 2-pluriovulate loculi of the ovary. *Windsorina* has strikingly similar anthers, capsules and seeds, and centrally attached solitary ovules (a character not mentioned by Gleason), which perhaps indicate the closest affinity, but this genus differs in the whole structure and facies of the inflorescence which was admirably described by its author (see Bull. Torr. Cl. 50, 147-152 (1923)). The four involucral bracts of *Potarophytum* are to be compared only with those of *Rapatea viscosa* Gleason, from the Kurupung Mountains on the edge of the Pacaraima Range, a very distinct-looking plant with sessile flowers of which the stamens and ovary are undescribed and which is perhaps to be excluded from *Rapatea*; and with the three erect bracts of the new genus *Amphiphyllum* Gleason, from Mount Duida, which has only about ten flowers in the heads, about 20 bracts on each flower, acute or shortly acuminate petals, and two ovules in each loculus.

***Windsorina guianensis* Gleason.**

Potaro River: Amatuk portage; in damp spots in rocky forest by the portage, Sept. 12th 1937, Sandwith 1516. Flowering stems and heads pale yellowish-white. Petals pale yellow.

Discovered by Dr. O. W. Richards, leader of the expedition. Previously unrepresented in British herbaria, and now recorded for the second time in a new locality.

***Stegolepis angustata* Gleason.**

Kaieteur Savannah, in open sandy ground by the Indian trail, sometimes associated with *Brocchinia reducta*, Sept. 4th 1937, Sandwith 1349. Bracts pale yellowish-brown. Petals large, brilliant golden-yellow.

Material of this fine species, known only from this locality, is now distributed to several herbaria.

***Rapatea xiphoides* Sandwith, sp. nov.;** *R. lineari* Gleason et *R. Wettsteinii* Suesseng. ex descriptione tantum cognitis affinis, ab illa praecipue bracteis involucri haud reflexis, forma bractearum floralium fere aequalium apice erectarum, sepalis minoribus, stylo brevior, ab hac receptaculo elongato, bracteis florum fere aequalibus acumine pungente omnium circiter 2 mm. longo statim distinguitur; *R. Spruceana* Koern. laminis foliorum apice obtusis, capitibus parvis

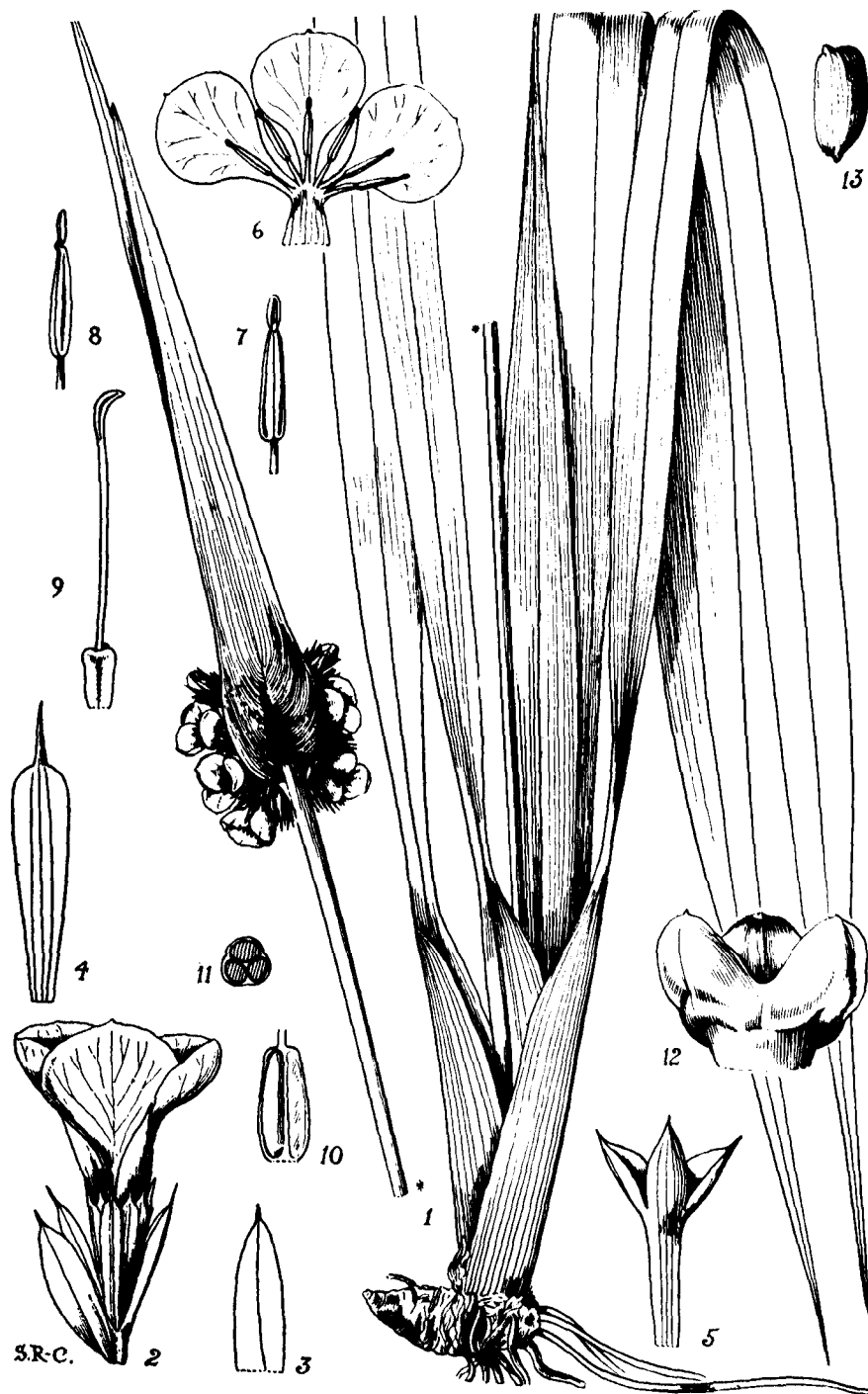


Fig. 2. *Rapatea xiphioides* Sandwith. 1, base of plant, leaves and inflorescence, $\frac{1}{2}$ nat. size; 2, a flower with pedicel and basal bract, $\times 2$; 3, bract at base of pedicel, $\times 2$; 4, floral bract, $\times 4$; 5, calyx, $\times 2$; 6, petals and stamens, $\times 1.5$; 7, an anther, from front, $\times 4$; 8, an anther, from $\frac{1}{2}$ front, $\times 4$; 9, gynoecium, $\times 4$; 10, longitudinal section of ovary, $\times 8$; 11, transverse section of ovary, $\times 8$; 12, capsule after dehiscence, $\times 8$; 13, seed, $\times 4$.

quam bracteis involucri parvis usque duplo tantum brevioribus primo visu abhorret.

Herba terrestris, acaulescens, circiter 80 cm. alta, rhizomate 2 cm. diametro fibris numerosis longissimis pallidis praedito. *Folia* numerosa, 37–80 cm. longa, interpositis nonnullis multo brevioribus, siccitate laete flavo-viridia; vaginae 9–12 cm. longae, 1.2–1.9 cm. latae, margine brunneo-hyalino, in petiolum plus minusve distinctum supra convexum 4–8 cm. longum 3.5–6 mm. minusve distinctum supra convexum 4–8 cm. longum 3.5–6 mm. latum in laminam sensim transeuntem constrictae vel attenuatae; laminae ipsae lineares, 1.3–2.7 cm. latae, glabrae, integrae, longe sensim in apicem acutum attenuatae et per 3–4 cm. ultima angustissimae fere filiformes, costa utrinque prominente sed supra per trientem superiorem evanescente, nervis longitudinalibus utroque costae latere 7–9 praesertim subtus prominulis, venulis transversis haud obviis. *Pedunculus* usque circiter 42 cm. longus, apice sub capite ad 7 mm. diametro. *Involucri* bractaeae 2, anguste lanceolatae, eximie stricte erectae ac arcte parallelae vel rotundatae vel etiam in sensim attenuatae, basi cordatae vel rotundatae vel etiam in pedunculum decurrentes, haud connatae sed apici pedunculi (vel receptaculo) per circiter 2.3 cm. adnatae, aequilatae sed inaequilongae, altera quam altera circiter 3 cm. brevior, 15–23 cm. longae, basi 2–3 cm. latae. *Caput* ambitu ovoideo-sphaericum, lateribus contra bracteas involucri applanatis, 3.5–4 cm. longum, 3 cm. diametro, receptaculo elongato-oblongo ad 1.8 cm. longo et ad 9 mm. diametro. *Flores* valde numerosi, densissime congesti; bracteae basi pedicellorum hyalinae, oblongae, 1 cm. longae, fere 3 mm. latae, in apicem pungentem circiter 1.2 mm. longum attenuatae; pedicelli circiter 2.5 mm. longi; bracteae floris singuli 12–13, fere aequales, anguste spathulato-oblongae, ad basin distincte angustatae, apice incluso 9–10 mm. longae, 1.75–2.5 mm. latae, apice in acumen subulatum rigidum pungens 2 mm. longum abrupte contractae, arcte imbricantes apicibus erectis, aqua tinctae dorso pilis fragilibus obtectae, siccitate parte superiore pilis papillois apice brunneis indutae. *Sepala* tubo circiter 6 mm. longo coalita, tum ovata vel ovato-lanceolata, 6 mm. longa, 2.2–3.2 mm. lata, hyalina, trinervia, in apicem incrassatum pungentem valde acutum angustata, dorso dimidio superiore siccitate brunneo-papillosa. *Petala* tubo 5–6 mm. longo apice piloso coalita; lamina patula, flava, late obovata, plus minusve truncata ac in medio apice triangulari-acutata, ungue incluso ad 12 mm. longa, 9–10 mm. lata. *Stamina* 6.5–7.5 mm. longa, filamentis liberis circiter 2 mm. longis aqua tinctis fragilissime albo-villosis; antherae circiter 2 mm. longae, 3.5 mm. longae, tum lineari-oblongae, siccitate cremeo-albae, 3.5 mm. longae, tum oblongum, plus minusve trigonum, apice rotundato-truncatum, 2–2.5 mm. longum, 1.75 mm. diametro; stylus glaber, 8–9 mm. longus, inferne albo-hyalinus, apice stigmatifero aurantiacus. *Capsula* ellipsoidea, apice triquetra rotundata haud lobata, 4.5 mm. longa,

2.5 mm. diametro. *Semina* obovoideo-oblonga, 3.2 mm. longa, 1.75 mm. diametro, ventraliter subapplanata, dorso rotundata, apice basique lutea, ceterum olivacea longitudinaliter striatula, appendice apicali obtusa lutea vix 0.3 mm. longa instructa.

BRITISH GUIANA. Potaro River; Kaieteur Falls, in a running rivulet descending over rocky bushy ground from the savannah to the Falls, September 4th 1937, *Sandwith* 1337. Heads green, turning brown when old. Involucral bracts turning yellowish with age. Petals yellow.

TRIURIDACEAE.

Sciaphila albescens Bth.

Bartica-Potaro road, 14th milepost, plentiful on floor of greenheart and wallaba forest near the Barabara Creek, August 16th 1937, *Sandwith* 1095: stem pinkish-purple; flowers white.

The material differs from the description given by Giesen in Engl. Pflanzenreich, 4, 18, p. 67 (1938) in the uniformly tetramerous male and female flowers, the two stamens, and the densely papillose apex of the carpels. Examination of Bentham's description, however, shows that he discovered a tetramerous male flower with two stamens on the type material, and he has drawn this on the type sheet of *Spruce* 2833 at Kew. Moreover, some of the carpels of the type (on an individual flower with 6 perianth segments) are clearly papillose at the apex. It is evident that *S. albescens* varies in the degree of papillosity of the carpels and styles, as well as in the number of perianth segments. The papillosity of the styles of *Sandwith* 1095 is much weaker and less evident than in the type and in another collection from British Guiana, viz. *Myers* 3112 from near Mazaruni Head, Pacaraima Range, 1932; the latter collection bears 5-6 perianth segments, and smooth carpels. On present evidence *Sandwith* 1095 cannot be separated as a new species.

III—NICOTIANA LANGSDORFFII. H. S. MARSHALL.

The name *Nicotiana Langsdorffii* was published independently by Roemer and Schultes, by Nees von Esenbeck, and by Schrank. Roemer and Schultes published a diagnosis in their *Systema Vegetabilium* 4, 323, attributing the name *Nicotiana Langsdorffii*, and apparently also the description, to Weinmann.* The probability that Weinmann supplied this botanical description is enhanced by the fact that Schultes, after Roemer's death on January 15th, 1819, wrote to numerous botanists soliciting their help in the continuation of the *Systema Vegetabilium* and among those who promised to be responsible for various parts of it was "Weinmann Hortul. Pawlowsk" (*Syst. Veg.* 5, pp. v-vi: 1819). On the other hand, if Weinmann wrote the description, it is surprising that he should not have appended his name as author

* J. A. Weinmann, head gardener of the Imperial Garden at Pavlovsk, 20 miles south of St. Petersburg. *Vide* *Flora*, 1820, 2: 668-670; *Bot. Zeit.*, 17, 20 (1859).

when he included this species in his *Elenchus* (1824), p. 90. There he included it as *Nicotiana Langsdorffii* Hort. Pawl. This may, however, have been due to modesty on his part. Vol. 4 of the *Syst. Veg.* appeared before May 7th 1820, since it is reviewed in *Flora*, 1820, 1, No. 17, 257, of that date. The date, "1819," given on the title-page of Vol. 4, must be accepted unless it can be proved to be erroneous.—See *Internat. Rules*, ed. 3, Art. 45.

No evidence has been found that Weinmann sent specimens of *Nicotiana Langsdorffii* to Schultes. The latter placed *Nicotiana Langsdorffii* among the species dubiae, which suggests that Weinmann had sent him merely the diagnosis and description. The name should accordingly be cited as *Nicotiana Langsdorffii* J. A. Weinmann apud Roemer et Schultes, *Syst. Veg.* 4, 323 (1819). The species was probably grown in the Imperial Garden at Pavlovsk by Weinmann from seeds received from Langsdorff, who had collected them in Brazil.* The type of the name *Nicotiana Langsdorffii* J. A. Weinmann was presumably one of the plants so grown.

Nees von Esenbeck published the name *Nicotiana Langsdorffii* (spelt with one "f") with a description, in *Horae Physicae Berolinenses*, attributing it to "H[ortus] Berol." This work bears the date 1820, and a notice of the work appears in *Flora* 1820, 2, 477, where the date is also given as 1820. This description was apparently drawn up from a specimen from Herb. Otto and from a plant grown at Berlin.

The name *Nicotiana Langsdorffii* (also spelt with one "f") was published also by Schrank in his *Plantae Rariores Horti Academici Monacensis*, 2, fol. 72, t. 72. Schrank attributed the name to "D. F. Fischer in litt." The "D." presumably represents the word "Dominus," and the "Fischer" concerned was evidently Friedrich Ernst Ludwig von Fischer, who was then Superintendent of the Botanic Garden of Count Razoumoffsky at Gorenki near Moscow.† The figure, however, was prepared from a plant grown at the Munich Botanic Garden, and the description was evidently drawn up from this plant by Schrank himself. Fol. 72 of Schrank, *Pl. Rar. Hort. Acad. Monac.* 2, containing Schrank's description, appeared in Heft 7 of the work (see *Flora*, 1819, 2, 697, Nov. 28th, 1819, where it is stated that each Heft consists of 10 leaves with the same number of plates). W. T. Stearn, in his paper on this work (*Journ. Soc. Bibl. Nat. Hist.* 1, 151: 1938), has shown that Heft 7 was published in Jan.-June 1821, and a notice of Heft 7 appeared in *Wikström, Jahresber. K. Schwed. Akad. Wiss. Bot.* . . . in den Jahren 1821, etc., 145 (1838), where the date of publication is also given as 1821.

It appears that seeds of the species concerned were rapidly distributed to several gardens under the name *Nicotiana Langsdorffii* (presumably without any authority appended), and that

* *Vide* Urban, *Vitae Itineraque Collectorum Botanicorum*, etc., in Martius, *Flora Brasiliensis*, 1, pars 1, 38 (1906).

† *Vide* Curtis's *Bot. Mag. Ded.* p. 39 (1931).

Weinmann, Schrank, and Nees based their respective descriptions on different material. The binary combinations *Nicotiana Langsdorffii* Weinmann apud Roemer et Schultes, *N. Langsdorffii* Hort. Berol. ex Nees, and *N. Langsdorffii* F. E. L. Fischer ex Schrank, are therefore not nomenclatural synonyms since they were based on different types. They have always, however, been treated as taxonomic synonyms.

The names *N. Langsdorffii* Hort. Berol. ex Nees and *Nicotiana Langsdorffii* Fisch. ex Schrank are accordingly later homonyms of *Nicotiana Langsdorffii* Weinm. apud Roemer et Schultes (Internat. Rules, ed. 3, Art. 61). The fact that the three species have always been treated as identical is immaterial in this connexion, being a matter of taxonomic opinion.

The name of the collector was spelt with one "f" by Pritzel* and in Cat. Libr. Brit. Mus. (Nat. Hist.) 3, 1057 (1910), with two by Wittstein† and Urban‡. As the correct form of the name appears to be doubtful, the original spelling with "ff" is retained. The relevant synonymy of the species is as follows:—

Nicotiana Langsdorffii Weinm. apud Roem. et Schult., Syst. Veg. 4, 323 (1819).

N. Langsdorffii Hort. Berol. ex Nees, Horae Phys. Berol., 52 (1820).

N. Langsdorffii F. E. L. Fisch. ex Schrank, Pl. Rar. Hort. Acad. Monac. 2, 72 (1821).

This investigation was undertaken at the request of Prof. T. H. Goodspeed, who supplied some of the data.

IV—TWO NEW FERNS FROM OCEANIA.

CARL CHRISTENSEN.

***Blechnum (Lomaria) phanerophlebium* (Baker) C. Chr., sp. nov.**

Lomaria phanerophlebia Baker in sched. Herb. Kew. *Lomaria adnata* Bl. sec. Baker in Journ. Linn. Soc. 17, 295 (1879), non Bl.

Rhizomate erecto vel decumbente, paleis castaneis vel fuscis crassiusculis lanceolato-acuminatis integris vestito, foliis fasciculatis. *Stipite folii sterilis* 15–20 cm. longo, stramineo, ut totum folium glaberrimo. *Lamina* late ovato-lanceolata, c. 25–30 cm. longa 15–20 cm. lata, papyracea, pinnata; pinnis c. 10-jugis, suboppositis, sursum alternis, 3–2 cm. inter se remotis, maximis 10–12 cm. longis 1–1.2 cm. latis (basalibus paulo brevioribus), acuminatis, integris vel marginibus subrepandulis, inferioribus sessilibus vel antice ad rhachin breviter adnatis, basin versus paulo angustatis, medialibus basi vix dilatata utrinque adnatis, supremis 3–4-jugis sat abrupte abbreviatis, confluentibus, apice pinnis medialibus persimili; venis distinctis, subtus subprominulis, simplicibus vel furcatis.

* Pritzel, Thes. Lit. Bot., ed. 2, 176 (1872).

† Wittstein, Etymol.-bot. Handwörterb., 498 (1856).

‡ Urban in Martius, Flora Brasiliensis, 1, pars 1, 38 (1840–1906).

Folio fertili magnitudine subaequali, pinnis 3 mm. latis 8–10 cm. longis, inferioribus petiolatis, indusiis atro-brunneis, crenatis.

FIJI. Viti Levu, sources of the Wai ni malu, 1877–78, *Horne* 939 (type); on rocky or stony steep slopes on a branch of the Navua River, Namosi, at 1000 feet, in wet places, *Horne* 812.

Baker did not describe this species because he later on identified the specimens with *L. adnata* Bl., which is *Plagiogyria adnata* (Bl.) Bedd. No species of *Plagiogyria* is known from Polynesia, and Copeland suggested therefore (Bishop Mus. Bull. 59: 58, 1929) that Baker's identification was wrong, which it is. The species is a genuine *Lomaria*, quite different from all Polynesian species known to me. The possibility remained that it might be *B. Milnei* (Carr.) C. Chr. a Fijian species very incompletely described by Carruthers, but his description fits badly the specimens at hand.

Later note: I have now seen the type-specimen of *Lomaria Milnei* Carr. in the British Museum (Natural History). It is a bad one, very different from *B. phanerophlebium* and in my opinion one of the many forms of *B. procerum* (Forst.) Sw.

***Polypodium (Pleuridium) squamisorum* C. Chr., sp. nov.**

Rhizomate late repente, 3 mm. diam., glauco, paleis rufo-brunneis ovato-acuminatis integris subadpressis vestito. *Foliis* dimorphis, coriaceis: *folii sterilis* petiolo 1 cm. longo, lamina lanceolata, 7 cm. longa, 2 cm. lata, basi rotundata, apice obtusa (?), marginibus incrassatis integerrimis, venis principalibus subtus elevatis, ceteris occultis. *Folii fertili* petiolo 1.5 cm. longo, lamina 7 cm. longa, 1 cm. lata, basi cuneata et paulum decurrente, marginibus (in sicco) undulato-sinuatis; sori utrinque uniseriatis, magnis, superficiem inter nervum medianum et marginem implentibus, subimmersis, ovalibus (5×4 mm.) vel subrotundis, primum dense paleaceis, paleis e receptaculo ortis quam sporangia longioribus, rufo-brunneis, e basi tenui ovata in acumen longum leviter dentatum sat abrupte acuminatis, aetate deciduis.

PAPUA: Musgrave Range, 9200 feet, June 5th, 1889, *Sir. W. Macgregor* 15.

This remarkable species is a new addition to the many peculiar ferns found in later years in the high mountains of Papua. In general aspect it is not very different from several others with dimorphous fronds, but the paleaceous sori are very strange. In young sori the scales appear as a dense tuft overtopping and nearly hiding the sporangia. They are totally different from the clathrate, peltate scales found in the sori of *Lepisorus*.

V—ADDITIONS TO THE FLORA OF BORNEO AND OTHER MALAY ISLANDS. XI.* Two UNRECORDED GENTIAN. H. N. RIDLEY.

Dr. C. A. Backer, of Heemstede, Holland, has recently sent to Kew material of an interesting small Gentian collected in Java by

* Continued from K.B. 1938, 285.

Dr. L. van der Pijl, with the request that it might be described if found to be a new species. Sumatran material collected by Mr. J. A. Lörzing was also forwarded for comparison.

The Javan specimen proves to be *G. cephalodes* Edgeworth, and Dr. Backer's description of the plant in English is appended.

The Sumatran specimens, however, represent an undescribed species, which has been named after its discoverer, Mr. J. A. Lörzing, at Dr. Backer's request. Mr. Lörzing is a keen and able botanist who, from 1915 until his retirement from public service in 1924, held the post of conservator of the botanical establishment (closed down in 1924) of Sibolangit, near Medan, N. Sumatra.

***Gentiana cephalodes* Edgeworth ex Thoms. et Bacon** in Hook. Lond. Journ. Bot. **4**, 637 (Dec. 1845); Edgew. in Trans. Linn. Soc. **20**, 84 (1846).

Stemless, glabrous. Leaves 4-8 in a radical rosette, broadly elliptic, acute or obtuse, 6-18 mm. long, 4-12 mm. wide. Flowers in 1-3 shortly stalked or subsessile 3-flowered cymes, 5-merous; pedicels very short; calyx 7-9 mm. long, divided less than halfway down; segments distant, very narrowly triangular, very acute, keeled; tube strongly ribbed, with 5 nerveless fields alternating with the calyx-segments. Corolla 10-12 mm. long, blue; corolla tubular, widened upwards; segments at the base united by inwardly folded shortly bifid *not* fimbriate membranes, acute, not caudate. Fruit borne on a thick stalk, exerted from the corolla, very narrowly bialate at the apex; seeds numerous, very small, $\frac{1}{4}$ - $\frac{1}{2}$ mm. long, reticulate, not winged.

JAVA. Slope of Gunung Tambak (Mount Idjen), on ashy soil covered by tall grasses, June 1929, *Van der Pijl* 141 (Herb. Hort. Bogor.; dupl. in Herb. Kew).

This species is usually described as a variety of the much larger *G. capitata* Ham., but it is a dwarf plant only two or three inches in height. *G. cephalodes* Edgew., exactly agreeing with the Javanese plant, is found in the Himalayas, Mussoori, Chakrata, Simla, Naini Tal, Kumaon and Sikkim.

***Gentiana Loerzingii* Ridley**, sp. nov.; a *G. kumaonensis* Biswas, cui affinis, foliis marginibus minutissime denticulatis, sepalis angustioribus acutis, corollae lobis angustis acuminatis, stylo bifido lobis recurvis differt.

Herba minima, simplex, 1-1.5 cm. alta. *Folia* in apice congesta, carnosa, obovata, acuta, basi angustata, margine pallida, minutissime denticulata, 5-7 mm. longa, 3-4 mm. lata, nervis invisibilibus. *Flores* 5 vel 6 in apice congesti. *Pedicelli* 2 mm. longi, crassi. *Bracteae* anguste lanceolatae, acuminatae, marginibus denticulatis. *Sepala* 5, lanceolata, acuminata, angusta, 4 mm. longa, denticulata. *Corolla* caerulea, tubo cylindrico 2 mm. longo, lobis 5 lanceolatis acuminatis acutis angustis 5 mm. longis basibus 1 mm. latis, plicis 5 minutis acutis triangularibus. *Stamina* 5, filamentis

gracilibus ad basin corollae tubi adnatis paullo dilatatis, antheris oblongis obtusis. *Ovarium* cylindricum, 2 mm. longum, stylo brevi crasso lobis crassis recurvis.

SUMATRA: Sibolangit. Raja (Karo-plateau), sunny grassy localities (deserted fields), amongst low grass, scattered, ± 1300 m., 24 Jan. 1920, *Lörzing* 7075 (typus; dupl. in Herb. Kew.); "Earlier (13.3.1917) a single specimen found in this region (No. 4092) [not seen]; several specimens now discovered in another similar locality on a surface of a few square meters. Flowers a fine blue, open during the hottest part of the day only." Between Mount Piso-piso and Lake Toba near Tongging, steep grassy slope, rare, ± 1200 m., 21 Nov. 1920, *Lörzing* 8103: "Tiny herb; only fruiting specimens found." Karo-plateau, near Brastagi, sunny locality, amongst short grass, many specimens in a limited area, ± 1300 m., 26 May 1921, *Lörzing* 8416: "Flowers blue." (Omnia in Herb. Hort. Bogor.)

This tiny inconspicuous species resembles *G. kumaonensis* Biswas, of Kumaon, India, especially in its fleshy leaves, which are, however, minutely denticulate on the cartilaginous edge and narrowed to the base, and in the narrow acuminate sepals and petals, and the bilobed style.

VI—MISCELLANEOUS NOTES.

New Year Honours.—We have much pleasure in recording the conferment of the following Honours:—

K.C.M.G.—SIR ALGERNON EDWARD ASPINALL, C.M.G., C.B.E., Secretary to the Imperial College of Tropical Agriculture, lately Secretary to the West India Committee; Knight Bachelor—REGINALD GEORGE STAPLEDON, Esq., C.B.E., M.A., Professor of Agricultural Botany, University College of Wales, and Director of the Welsh Plant Breeding Station, Aberystwyth; C.M.G.—JOHN NINIAN OLIPHANT, Esq., Director of the Imperial Forestry Institute, Oxford; C.I.E.—WILLIAM BURNS, Esq., D.Sc., Agricultural Expert to the Government of India in the Imperial Council of Agricultural Research Department.

Mr. Ernest Harrison.—Mr. E. Harrison, C.M.G., B.Sc., who has just retired from the Colonial Agricultural Service, has had an interesting career. Educated at Holmes Chapel (Cheshire), Edinburgh University and the State College of Agriculture at Ames, Iowa, U.S.A., he went out to South Africa in 1910, serving on the staff of the Grootfontein Agricultural College (Cape Province). In 1913 he became the Principal of the School of Agriculture at Cedara in Natal. He joined the Colonial Agricultural Service in 1921 and was Deputy Director of Agriculture in Kenya for nine years. He was then promoted to Tanganyika Territory as Director. He proved a successful administrator and raised the Department

in Tanganyika to a high state of efficiency. His outlook on agricultural matters was essentially wide, and his methods for dealing with such matters as closer settlement and soil erosion problems were on a definitely sound basis. He has now accepted the Chair in Agriculture at the Imperial College of Tropical Agriculture, Trinidad, which has fallen vacant on the retirement of Professor R. Cecil Wood, and his wide experience and previous knowledge of teaching should prove invaluable to him in his new post.

G. EVANS.

Dr. R. Lloyd Praeger.—We record with pleasure the conferment of the Honorary Degree of Doctor of Science by the University of Dublin (Trinity College) on Dr. R. Lloyd Praeger, D.Sc.

Mr. Morley Thomas Dawe.—Mr. M. T. Dawe, O.B.E., who retired from the Colonial Agricultural Service on 22nd November 1938, has had a very varied and interesting career. After the completion of his training at Kew, he was posted to Uganda in 1902 and became head of what was then known by the cumbersome title of the Botanical Forestry and Scientific Department. This was the ancestor of the present highly developed Department of Agriculture, and undoubtedly the work of Dawe and his colleagues did much to pave the way to these modern developments. He left the Colonial service for a period in 1910 and served in Mozambique as Director of Agriculture and in Colombia as Agricultural Adviser to the Government of that Republic, with headquarters at Bogota. When the war ended he was sent by the Colonial Office to report on the Gambia in 1919 and as a result of his visit an Agricultural Department was formed. He afterwards worked in Angola for three years in the employ of the Fomento Geral de Angola and was then appointed Commissioner of Lands and Forests in Sierra Leone. In 1928 he was made Director of Agriculture in Cyprus where he stayed until he was promoted to his last post of Director of Agriculture and Forests in Palestine.

Although in recent years he has devoted most of his time and attention to administrative matters, yet his interest in botanical matters has always been maintained, and throughout his career he has been on the look-out for new plants and species, particularly if they had possibilities of economic use. He has continued to keep in close touch with Kew, and past and present members of the Kew staff will all wish him long life and a pleasant time in retirement.

JOHN WILLIAM BEWS.—It is with deep regret that we record the death on November 10th of Dr. John William Bews, M.A., Principal and Professor of Botany of Natal University College, Maritzburg, Natal. He had been ill for some months.

Professor Bews was born at Kirkwall, in the Orkney Islands,

in 1884. From the local school he entered the University of Edinburgh as Earl of Zetland Bursar in 1902, and after graduating was appointed lecturer in economic botany at the University of Manchester. In 1908 he returned to Edinburgh as Lecturer in Plant Physiology and Assistant Professor of Botany under the late Sir Isaac Bailey Balfour.

In 1910 Bews was appointed Professor of Botany in Natal University College, and has held that post ever since except for a short period (1925–1927), when he occupied the chair of botany at Durham. In addition, since 1930, he has been Principal of the Natal College, and was responsible for organising the recent rapid developments in university work which have taken place in Natal, and which, it is hoped, will lay the foundations for a future University of Natal. He also worked hard to establish a faculty of Agriculture at the College.

Besides being a botanist of great repute, especially as an ecologist, Bews was a philosopher, and since 1935 he has published two books, "Human Ecology", and "Life as a Whole". In 1925 he produced a book on "Plant Forms", and soon afterwards "The Ecological Evolution of Angiosperms". In the sphere of taxonomic botany Bews was also well known. In 1921 he brought up to date J. Medley Wood's "Flora of Natal and Zululand" in a much improved form, and in 1929 he published a compendium on the "World's Grasses," this being largely a compilation from other works.

Not only did Bews write many other important papers, but he also built up a strong department of botany at the Natal University College. He was a very successful teacher and an able director of students' research. Several of his past pupils have achieved success and hold important posts in the botanical world.

In 1931 Bews was President of the South African Association for the Advancement of Science, and in 1932 the Association awarded him the South African Gold Medal in recognition of his distinguished services in the science of botany.

J. HUTCHINSON.

HENRY ALFRED CUMMINS.—We record with regret the death of Emeritus Professor Major H. A. Cummins, R.A.M.C., C.M.G., M.D., on January 1st, 1939, in his 74th year.

He was a native of Cork and after graduating at the Royal University of Ireland he served in the Sikkim Expedition, the Ashanti Expedition—on which he published an account of the Botany (K.B. 1898, 65)—in Bermuda, where he collected some Fungi (K.B. 1898, 133), and in the South African War, when he was mentioned in despatches, was awarded the C.M.G., and was appointed by Lord Roberts a member of his staff.

On his retirement from the army he joined the Kew staff and acted as Assistant for India during the absence of Mr. J. F. Duthie

in 1906 and was subsequently (1909) elected Professor of Botany at University College, Cork. On his retirement from the Chair at Cork he was granted the title of Emeritus Professor and then resided at Chelsea, where he died. He was elected a Fellow of the Linnean Society in 1893.

Choice between Epithets of the Same Date.—The genus *Monospora* Hochst. (Flora, 24, 660: 1841) included two species, *M. rotundifolia* Hochst. and *M. grandifolia* Hochst., descriptions of which were published on page 661. The description of the former species is a good one, but that of *M. grandifolia* is poor, being merely a comparison of that species with *M. rotundifolia*, of which Hochstetter thought it might prove to be a variety. It is clear, therefore, that *M. rotundifolia* is the type of the generic name *Monospora* Hochst.

In 1893 Warburg (Engl. & Prantl, Pflanzenfam. 3, 6A, 37) transferred *M. grandifolia* to the genus *Trimeria* Harv., as *T. grandifolia* (Hochst.) Warb. He gave illustrations of the plant and made no reference to *M. rotundifolia*. In 1921, Gilg (Engl. Pflanzenw. Afr. 3, 2, 582) transferred *M. rotundifolia* to *Trimeria* Harv., as *T. rotundifolia* (Hochst.) Gilg, citing exactly the same illustrations as those used by Warburg for *T. grandifolia*, so that although he did not explicitly cite *M. grandifolia* as a synonym there can be no doubt that he considered the two species conspecific and deliberately adopted the epithet *rotundifolia* in place of *grandifolia*.

Gilg appears to be the first botanist to treat these two names as synonymous, and, according to Article 56 of the International Rules of Botanical Nomenclature, the epithet chosen by him, namely *rotundifolia*, must be adopted for the species.

It might conceivably be argued that *T. rotundifolia* (Hochst.) Gilg was superfluous when published and therefore illegitimate under Article 60, there already being a valid name, *T. grandifolia* (Hochst.) Warb., for the group to which it was applied. The wording of Article 60 (1), as amended at Amsterdam in 1935, is as follows: "A name is illegitimate . . . if it was nomenclaturally superfluous when published, i.e. if the group to which it was applied, as circumscribed by its author, included the type of a name which the author ought to have adopted under one or more of the Rules." But Gilg was under no obligation to adopt the name *T. grandifolia*, which was consequently not valid (i.e. correct) for the aggregate species although it was a legitimate name. When an author treats as synonymous two specific names published at the same time, he has the right to choose whichever epithet he wishes for the aggregate species, and, in this case, Gilg wisely chose the epithet belonging to the type-species of *Monospora*, namely *rotundifolia*. *Trimeria rotundifolia* (Hochst.) Gilg is accordingly the correct name for the aggregate species. The fact that the combination *Trimeria*

grandifolia (Hochs.) Warb. had already been published did not make the combination *T. rotundifolia* nomenclaturally superfluous under Art. 60, as amended.

E. MILNE-REDHEAD.

Preservation of the Flora of St. Helena.—We note with interest that His Excellency the Governor-in-Council has issued an order [Forest Reserve (Indigenous Flora) Order 1938] whereby the following lands are constituted as Forest Reserve:—

1. The lands within 300 feet of the summit of the Central Ridge between Diana's Peak, Mount Actaeon, and Cuckholds Point.

2. The lands within 150 feet of the summit of High Peak.

3. The lands within 200 feet of the summit of Old Joan Point situated on Man and Horse.

This order should be of great value in preserving the vegetation on the higher slopes of the Island's mountains where some of the interesting indigenous plants may still be found.

Ocotea viridis.—The name of a Kenya tree, *Ocotea Gardneri* Hutch. et M. B. Moss in Kew Bull. 1930, 70 cum ic., has been changed to *Ocotea viridis* Kosterm. in Bull. Jard. Bot. Brux. 15, 83 (1938), because it is antedated by *Ocotea Gardneri* (Meissn.) Mez in Jahrb. Bot. Gart. Berlin, 5, 338 (1889), the name of a Brazilian tree.

Botanical Magazine.—Part 3 of Volume 161 was published on November 28th and contains the following plant portraits:—

Tulipa Schmidtii Fomin (t.9535), a distinct species from Talysch in Trans-caucasia; *Vaccinium glauco-album* Hook. f. ex C. B. Clarke (t.9536), a purple-fruited species, discovered as long ago as 1838 by Griffith in Bhutan; *Viola allchariensis* G. Beck var. *Herzogii* W. Becker (t.9537), an interesting *Viola* with linear leaves from North Macedonia; *Rhododendron cerasinum* Tagg (t.9538), a species which shows considerable variation in the colour of the flowers from uniform crimson to a pale-pink tube with pinkish-crimson lobes, native of North Burma, Assam and Tibet; *Coelogyne speciosa* (Bl.) Lindl. var. *alba* Hort. (t.9539), a variety known only from cultivated specimens, but probably native in western Malaya; *Ceanothus foliosus* Parry (t.9540) a native of California; *Fritillaria liliacea* Lindl. (t.9541), a species with greenish-white flowers found in western North America; *Columnea hirta* Klotzsch et Hanst. ex Hanst. (t.9542), a handsome species from Central America extending from Nicaragua to Panama; *Picea Breweriana* S. Wats. (t. 9543), a weeping Spruce found only in a few localities about Mt. Shasta, on the borders of Oregon and California; *Moraea Carsoni* Baker (t.9544), from Tropical Africa, and *Jasminum polyanthum* Franchet (t.9545), a beautiful pinkish-white-flowered Jasmine with the

tube of the corolla crimson on the outside, a native of Yunnan, Kweichow, and the southern part of Szechwan—a species hardy in the south-west of England and very beautiful in gardens on the Riviera.

Ornamental Flowering Trees and Shrubs.* The Royal Horticultural Society cannot be accused of being premature in holding its first Conference on Ornamental Flowering Trees and Shrubs in April last. Within the last fifty years two conferences have been held on conifers, a much less important group from the gardener's point of view, especially at the present time. It also reflects one of the changes in public taste, for with the exception perhaps of Alpine and Rock Garden plants to which, indeed, shrubs contribute no unimportant a section no branch of horticulture is more popular in these days.

As was pointed out during the conference, this is largely due to the enormous additions made to cultivated trees and shrubs during the present century by plant collectors like Wilson, Forrest, Kingdon Ward and Comber. They have not only added many species to old and well known genera, but have brought many quite new types into cultivation. It has also been influenced by the fact that once the initial outlay in the preparation of the ground and obtaining the plants has been met, no branch of ornamental gardening, considering the returns we get in beauty of leaf, flower, fruit and autumn colour, is less costly.

The programme planned by the Committee was on the whole a comprehensive one, but a great many beautiful trees and shrubs got little or no notice. It would have been a useful thing, after allotting the great groups, if some one had been deputed to deal with the "left overs" and oddments, many of which play a very important part in gardens. It is true that Mr. Besant of Glasnevin gave a paper on "Other flowering Trees and Shrubs," but he confined his notes to some nine or ten genera. The consequence is (judging by the excellent index) that an outstanding genus like *Erica* gets scant notice, the lovely *Enkianthus* none at all; nor do *Stewartia*, *Styrax*, *Ribes*, *Yucca*, *Robinia*, *Catalpa*, *Amelanchier*, *Sophora* and others, get more than barest mention if any at all.

At the opening meeting on April 26th, after the ordinary preliminaries had been disposed of, Dr. F. Stoker gave a very charming paper under the comprehensive title of "The use of flowering Trees and Shrubs." That part of it dealing with shrubs for rock gardens is especially interesting and valuable. No one has a greater knowledge of these plants than the author. He has published a little book on the subject and grows an astonishing

number of rare species in his own rock garden. In the discussion that followed, the question of the identity of *Mahonia nervosa* and *M. repens* was raised. They are perfectly distinct, and the former has twice as many leaflets to a leaf as the latter. The plant figured on Plate 4 as *M. repens* is almost certainly *M. nervosa*.

It was fortunate that the help of Mr. Collingwood Ingram could be obtained to deal with cherries and crabs. Of the cherries he has a more comprehensive acquaintance than any one else in this country, and as regards those commonly grouped as "Japanese" he is our leading authority. He not only grows a collection of them in his garden at Benenden, more nearly complete than any other in the British Isles, but he has studied them *in situ* in Japan.

The conference was fortunate also in having represented there four of the most famous gardens in Britain, namely Nymans, Exbury, Bodnant and Highdown. Mr. Comber, the talented gardener at Nymans, contributed a useful paper on "The Broom and Cistus Families." This could only have been a pleasant and comparatively easy task for him. Very different was the work undertaken by Mr. Lionel de Rothschild, who had *Berberis*, *Cotoneaster* and *Viburnum* allotted to him, three of the most difficult genera amongst shrubs. The magnitude of the collections at Exbury no doubt contributed to the very successful results embodied in this essay. They also enabled the author to give lists of the best kinds in each genus, which is extremely useful information for a beginner to have available.

Lord Aberconway contributed papers on *Magnolia* and *Camellia*, two of the pleasantest genera with which a gardener can have to deal. It owes its excellence very much to the fact that the author has evidently a close personal acquaintance with his subjects. In the *magnolia* section it is gratifying to note that he considers *M. Campbellii* and *M. mollicomata* "markedly different." One difference is particularly valuable: the latter flowered at Bodnant in twelve years from seed, whereas seedlings of *M. Campbellii*, as is well known, will take twice or thrice as long.

Major Stern's paper was on "Trees and Shrubs for various climates and soils." His garden at Highdown is situated on the seaward slope of the South Downs and is unmitigatedly chalky. A considerable part of it, in fact, is on the site of a disused chalk pit. Major Stern is an enthusiastic experimenter and has tried practically every tree and shrub worth trying. We have, in consequence, come to regard him as our highest authority on the matter of lime-loving and lime-hating subjects. To those whose gardens are on calcareous soil this paper may be recommended as one of the highest value.

Two papers were given on purely practical, as apart from the ornamental aspects of gardening, one on pruning by Mr. W. Dallimore, the other on propagation by Mr. F. P. Knight. Both authors are alumni of Kew and to the experience gained there may be largely attributed not only the excellence but the comprehensive quality of

* Report on the Conference held by the Royal Horticultural Society, April 26-29, 1938, edited by F. J. Chittenden, F.L.S., V.M.H. London, R.H.S. Offices, Vincent Square, S.W.1. Pp. 271, 80 plates. Price, to Fellows 7s. 6d., to others 10s. 6d.

their essays. A discourse by Mr. R. M. Wallace on arrangement is likely to be valuable to many beginners in giving a comprehensive enumeration of, and comment on, the very cream of flowering trees and shrubs.

In conclusion may be mentioned papers on "The Lilac in Canada" by Mesdames Davis and Preston; on "Syringa, Philadelphus, Deutzia, Diervilla, Escallonia and Hibiscus" by Mr. H. G. Hillier; and one on "Sorbus, Cydonia and Crataegus" by Mr. W. J. Bean. They will all, no doubt, prove useful for purposes of reference.

Australian Essential Oil Plants.—During the last ten or twelve years a good deal of investigation has been carried out on essential oil plants in Australia (chiefly species of *Eucalyptus*), by Mr. A. R. Penfold of the Technological Museum, Sydney, and his collaborators. Although this work has been primarily of a chemical nature, interesting facts from a botanical point of view have been brought to light.*

One of the first species to receive close attention was *Eucalyptus dives* Schauer, the common "Broad Leaf Peppermint," which has long been of economic value for its essential oil, an oil normally high in piperitone (usually 45–50%) and important as a commercial product. This species is widely distributed, and in most areas where it occurs the high piperitone content of the oil is fairly constant, but trees have been found in certain districts which persistently yield oil with only 5% to 15% of this constituent, while other components are present which seriously affect the market value of the oil. When the leaves of such trees happen to have been commercially distilled in the past the inferior nature of the oil has sometimes led to heated disputes between buyer and seller and to accusations of adulteration.

A closer study of the species and its distribution showed that some trees existed with a piperitone content intermediate between the figures shown above. Morphologically there was no difference at all between these forms and the normal one, both experienced botanists and bushmen failing to distinguish them. It was found, however, that the desirable form (with high piperitone), could be differentiated from the others in the field, by those experienced in the various odours of *Eucalyptus* oil constituents, by simply crushing the leaves in the hand.

Seedlings were raised from seed of the normal and the three physiological forms of *Eucalyptus dives*. In each case they developed true to type. The young seedlings were morphologically identical, yet "when tiny fragments of the leaves, even from plants only 1½ inches in height, were rubbed between the fingers, the characteristic odour of each particular kind was readily detected. The

seedlings could be mixed, and yet readily sorted out again by means of the test described." About five years later when these seedlings had matured they still showed no morphological differences and the constituents of their oil agreed closely with those of the original parent trees.

The discovery of the existence of these inferior physiological forms of *E. dives*, and the fact that they are recognisable in the field by those with the necessary skill or experience, proved to be of value to the oil industry itself in that certain proposed new areas could be assessed before distillation commenced.

Since the above work on *Eucalyptus dives* was carried out, the existence of similar physiological forms in other oil-yielding species of *Eucalyptus* in Australia (e.g., *E. australiana* Baker & Smith, *E. haemastroma* Sm., *E. micrantha* DC., *E. piperita* Sm. and *E. radiata* Sieb.), has been demonstrated by the same investigators and it is thought that yet further species, so far uninvestigated, will in time be found to vary in the same manner.

Eucalyptus radiata Sieb., commonly known as "River White Gum," generally yields an oil of remarkably uniform composition with a high proportion of phellandine and not more than 5% piperitone. Investigation in certain areas, however, established the presence of a form of *E. radiata* with as much as 50% piperitone and of another with 20% to 30%. The first mentioned of these "would be of considerable economic importance if a stand or area of the trees, comparatively free of the type, could be located." Seed of the normal form or type of *E. radiata* and the form with high piperitone content (50%) were sown, and the oil from the young trees obtained was examined some years later. In this connexion it is now stated "The results obtained confirm the constancy of the several forms or varieties, but a remarkable observation was made with a tree planted from seed of the form called Variety A. In this particular instance two stems grew from the one root system. The leaves and terminal branchlets from each stem were separately distilled, when the essential oils were found to differ from one another in chemical composition. One yielded an oil containing 50% piperitone, identical with Variety A, and the other yielded an oil containing only 18% piperitone with a considerable quantity of piperitol and, consequently, it bore a very close resemblance to what we prefer to regard as the type." F. N. HOWES.

The World was my Garden.*—This book is the autobiography of David Fairchild, one of the foremost American agricultural botanists. He was in charge of the Division of Foreign Plant Exploration and Introduction of the U.S. Department of Agriculture for over twenty years, and retired in 1935.

* "The World was my Garden." Travels of a Plant Explorer, by David Fairchild, assisted by Elizabeth and Alfred Kay. Charles Scribner's Sons, Ltd., 23, Bedford Square, London, W.C.1. Pp. xiv + 494, many illustrations. Price 18s.

* Published from time to time in the Journal and Proceedings of the Royal Society of New South Wales.

During the course of his career, Fairchild travelled most extensively and visited practically every country under the sun. His experiences have been many and varied and an account of them is given in this volume. So extensive were his journeyings that it is somewhat difficult to grasp salient facts, so quickly does the scene change, and one hopes that the opportunity will arise for another volume to be published in which a more detailed account of some of the more important of his introductions will be set forth. As it is, limitations of space have obviously made it impossible to do more than make passing references to introductions of great economic value.

The book is obviously written for the layman, and the magnificent photographs—mostly taken by the author himself—that illustrate the volume add greatly to its attractiveness.

Fairchild worked in the golden age of the plant-explorer. In the latter part of last century large areas were still practically unknown botanically and agriculturally, and he was one of the pioneers in the introduction or exchange of new and valuable species of plants from one country to another. One reads of a vast series of economic plants and varieties such as Tung Oil (*Aleurites* spp.) from China, Avocados from the Argentine, Egyptian Cotton, Red Gemesh Hops from Germany, Dates from Iraq, Bamboos, and many others. These have all been introduced into the United States, and are now being grown there in their original state over considerable areas, or have been used in plant-breeding to the great economic benefit of the country.

The book is written in a friendly, conversational style and is enlightened throughout with accounts of personal experiences combined with a sense of humour. The account of the American expedition that set out to take possession of an "Adamless" Island in the South Pacific, inhabited only by most beautiful native women, is an example. As is perhaps natural in a treatise covering such extensive ground, slight inaccuracies seem to have crept in here and there, as for example, the account of the first discovery of seedling canes in Barbados in 1898. It must be remembered, however, that most of the volume was recorded from memory, as we are reminded in the preface by the collaborators, Mr. and Mrs. Kay.

The book is a long one and is so full of events that it cannot be read hurriedly, but it should prove a valuable record of the date and origin of many valuable plant introductions.

G. EVANS.

The Vegetation of Albany and Bathurst, South Africa.*—The area dealt with by Dr. Dyer is a portion of South Africa where at least three quite distinctive floras meet. It contains small patches of (1) the real Cape or South Western flora, (2) a considerable

*The Vegetation of the Divisions of Albany and Bathurst, by R. A. Dyer, D.Sc. (South Africa), pp. 138, with 4 maps, 4 diagrams and 42 photographs (Botanical Survey of South Africa, Memoir No. 17).

quantity of the Karoo flora of the Addo Bush type, and (3) the Subtropical or Natal flora, the last mentioned being the most extensive.

The foundation of Dyer's work was laid during his period of service from 1925 to 1930, when as Government Botanist he had charge of the excellent herbarium at Grahamstown. This was followed by some years' intensive taxonomic study of the flora in the Kew herbarium, an ideal procedure which if followed by other students of vegetation would bring about a vast improvement in their results.

The paper begins with an interesting history of early botanical exploration in the area, which was visited in turn by such famous travellers as Sparrman, Paterson, and Burchell, and more purely botanical collectors such as Ecklon, Zeyher, and Drège.

Following this are notes on the history and development of the Albany Museum herbarium, which contains a fine set of Ecklon and Zeyher's duplicates.

Chapter 2, on the topography and geology, is contributed by Professor E. D. Mountain, of Rhodes University College, and includes two maps; and chapter 3, dealing with climatic and some biotic factors, carries the reader as far as p. 55, leaving only some seventy odd pages for the account of the vegetation.

This is described under several headings such as, (1) Lagoon, (2) Vlei, Marsh and Stream, (3) Strand, (4) Coastal Lithosere, (5) Psammophilous Macchia and Littoral Scrub.

Chapter 5 is devoted to Fynbos, the survivors of the southwestern flora, which we learn are decreasing rapidly owing to present-day methods of stocking and veld management. Other sections of the paper deal with Karoid Scrub and Grassland, a bibliography mainly of works on ecology, and at the end there are a number of interesting photographs.

It seems a pity that the author has arranged the families of Dicotyledons alphabetically and not systematically, for to a taxonomist it is a trifle disconcerting to encounter first of all the family *Anacardiaceae*, succeeded by *Araliaceae* and then *Asclepiadaceae*, etc. In the reviewer's opinion this detracts somewhat from the high scientific standard of this valuable contribution to our knowledge of South African vegetation.

J. HUTCHINSON.

St. Helena Lilies.—The history of these beautiful lilies, which have been the subject of admiration to so many visitors to the Royal Botanic Gardens, Kew, during the last few months, has been outlined by Toms in the Royal Horticultural Society's Lily Year Book, 1937, p. 110, and a summary of the facts may be of interest to readers of the Bulletin. So long as St. Helena was a naval station and an important coaling centre, agriculture, which is the only industry, was more or less prosperous, as the farmers had a ready market for their produce. With the abandonment of the

naval station and the decline in the number of ships calling at the port, due to a large extent to the substitution of oil fuels for coal, the agricultural industry rapidly declined as the home market for produce became negligible. The problem was to try and introduce some crop which could bear the long distance of transport to the commercial markets of the world and which would also bring in returns commensurate with the costs of production and marketing. The post-war period was a particularly difficult time for the St. Helena farmer as most of the agricultural products that the Island is capable of producing were already being produced in abundance in other countries which possessed special advantages, especially in such matters as cheaper freight rates and better transport facilities.

In August 1929 the Governor of St. Helena pointed out the difficulties of the situation in a despatch to the Secretary of State for the Colonies, which covered a report by the Curator of the Gardens, who at that time was Mr. Bruins-Lich. The agricultural situation of the Island was fully discussed and certain suggestions made for the bettering of the agricultural and horticultural conditions. One of these was the possibility of growing lilies. A parallel to Bermuda was drawn and it was pointed out that the growing of lilies (*L. longiflorum*) for the New York market had become an important industry in that Island.

The Governor's despatch was forwarded by the Secretary of State to the Director of Kew for favour of consideration and the latter in his reply made the suggestion that the cultivation of bulbs of both the Bermuda Lily (*L. longiflorum*) and the Madonna Lily (*L. candidum*) for export to the United Kingdom should be given a thorough trial. Following up this suggestion, Mr. Bruins-Lich collected about 4000 bulbs of *L. longiflorum* from various small-holders and planted them on the Scotland Estate which the Government of St. Helena had purchased as an agricultural and horticultural experimental station. These bulbs had presumably been introduced as garden plants on various occasions over a period of years.

The result of these experiments was to prove definitely that the lilies flourished under St. Helena conditions, and in the spring of 1935 a consignment of bulbs was brought to Kew where they were planted, some in pots in a cold house, and some in the open, and blossomed from September to December, the display attracting considerable attention. The Director was thus in a position to recommend that an attempt should be made to establish an export trade in lily bulbs from St. Helena to the United Kingdom.

Further consignments of bulbs arrived in the following year and were equally successful, an exhibit of St. Helena lilies being sent to the Autumn Show of the Royal Horticultural Society, where it attracted much favourable attention.

The attention of the Colonial Office was drawn to the success of these trials by the Director, who urged that every effort should be made to establish the industry in St. Helena on a firm basis.

It was pointed out that the St. Helena bulbs came into flower in England in the autumn at a time when it is difficult to find this lily in blossom unless the bulbs have been retarded or specially treated; the St. Helena lilies, therefore, fill a very definite gap.

The fact was also emphasized that there was a strong demand for lily bulbs in this country and that the monopoly was largely held by Japan. The decision to develop the industry was taken and in 1936 the first commercial consignment of 2000 bulbs was sent to England. Since then the demand has increased and a display of lilies grown at Kew was staged in the St. Helena section of the Colonial Hall at the Empire Exhibition at Glasgow in 1938. This led to a number of enquiries from the general public and from commercial seedsmen and florists, and two prominent Glasgow firms have decided to stock the bulbs. This industry, if carefully fostered, should help the growers in St. Helena to more prosperous times.

It may be mentioned here that in 1931 seed of 21 different kinds of lilies were sent from Kew to St. Helena, and, later, some bulbs of Roman Hyacinths, in the hope that they might be successfully grown in the Island.

The Characteristic Vegetation of recent Volcanic Islands in the Pacific.

During the autumn of 1925 the writer had the opportunity of landing at several islands of volcanic origin in the Vitiaz Straits. These Straits separate the large island of New Britain from the mainland of New Guinea and consist of a wide waste of water studded with reefs and islands. On one island called Aröp (or Long) Island a stay of over three days was made as the weather was very stormy at the time and our tiny craft had to run in for shelter and anchor as close to the beach as possible in order to gain protection. Aröp is in many ways typical of the islands in this archipelago and is situated at about 5°S. lat. and 147°E. longitude. It is about thirteen or fourteen miles long and three or four miles across at the broadest point. In the middle is a peak of perhaps 1000 feet in height. The formation is entirely volcanic and consists of lava boulders on the slopes of the mountain whilst the peniplane is composed of a loose porous ash soil. The beach sand is pitch black in colour and provides a violent contrast to the dazzling white strands found on the coral reefs that so commonly occur in other parts of this region. The vegetation is quite peculiar and ecologically most interesting. Although the rainfall is probably at least 70 inches per annum, judging by the fact that these islands lie in a wet belt, yet owing to the porous nature of the soil, combined probably with the desiccating effect of the constant trade winds,

there is very little undergrowth and a marked absence of epiphytes, tree ferns and similar undergrowth. The low plain at the north-east end of the island was covered with a growth of trees all approximately of the same age and probably between thirty or forty years old. There was so little undergrowth that one could walk about quite freely between the trees, whereas, of course, in tropical forests in similar latitudes it is usually necessary to hack one's way through with a cutlass.

There was a marked absence of coconuts and possibly the volcanic ash soils, which are apparently very acid, do not suit this species. The commonest forest tree was *Barringtonia speciosa*, which was everywhere abundant. Another common tree was the false almond (*Terminalia Catappa*). The seeds of both these species float readily and the beach was in fact covered with their characteristic fruits. Other common trees, which possibly also originated from water-borne seeds, were *Cassia* sp. (possibly *fistula*), *Thespesia populnea* and, in one spot only, a small group of *Pandanus*. This was particularly interesting as our party was short of water at the time. There is no surface water on the island owing to the porosity of the soil, but on my recommendation potable water was found on digging at this spot, as *Pandanus* is a pretty good indication of the presence of fresh or only slightly-brackish water at no great depth under the surface.

In addition to these trees which had evidently arrived by water, were certain species that had probably originated from seed conveyed by birds. These included *Ficus*, *Eugenia* and *Canarium*. The island so far as we could judge was uninhabited but it teemed with large purple fruit pigeons, responsible no doubt for the introduction of these species. There were also a few Megapodes (mound-building scrub turkeys) and how they had arrived on the island has always been a puzzle, as they prefer running to flying and do not appear to be strong on the wing or capable of sustained flight.

G. EVANS.

The Forests of Sweden.*—Sweden, with 56·5 per cent. of her area under forests, is one of the most heavily wooded countries in Europe, being surpassed in this respect only by Finland. Her position in the northern Coniferous zone with highly industrialised countries for neighbours, and her numerous rivers taking a south-easterly course, gradually thawing in the spring from mouth to source to provide a ready transport system for lumber, combine to make her forest industries the most important in the country. The resultant flourishing and active condition of Forestry in Sweden is clearly evident from a perusal of this booklet.

A brief account of the natural forest regions and a short history of forestry in the country make a background against which the

* By Th. Streyffert. New Sweden Tercentenary Publications. Alb. Bonniers Boktryckeri, Stockholm, 1938. Pp. 72. Price \$1.00.

development of the great lumber and wood-pulp industries can be seen in true perspective. The location of the larger sawmills and pulp-mills at the river mouths is shown very clearly by maps marked by circles proportional in size to the numbers of workers employed. The heavy demands of the lumber and pulp industries on the forests are balanced, as in few other countries, by the annual increment of growth. This happy state of affairs is due largely to compulsory provision for reproduction after felling which has been enforced by law since 1903. An active Forest Experiment Station, working in close union with the College of Forestry at Stockholm, is of great value in carrying the application of modern scientific research into the forests. The ownership of the forests, the scope and organisation of silvicultural work in the country and the importance of forestry as a source of employment are other topics dealt with in this interesting survey of Forestry in Sweden. The book is illustrated by maps and photographs.

Wild Flowers of Attica.*—This volume is intended as a memorial to the late Shirley Clifford Atchley, to whose great knowledge of Greece and the plants of Greece so many botanists and horticulturists are deeply indebted. When Atchley died in 1936 he left manuscript notes prepared by himself and a series of paintings of Greek plants made, under his direction, by Mr. W. O. Everett of Athens. Atchley's daughter, Mrs. Dixon, held the full copyright of the paintings and arranged with the Clarendon Press for the publication of the manuscript notes and a selection of the paintings. Dr. Turrill, acting as honorary editor, prepared the manuscript, selected the paintings, and saw the work through the press, besides providing letterpress for those paintings not referred to in the original manuscript notes. All concerned with the publication may be congratulated on the appearance of an interesting and useful work. A foreword by Sir Sydney Waterlow, British Minister at Athens, shows clearly how Atchley's life and work for both Great Britain and Greece were appreciated by his colleagues and the affection they felt for him. Sir Arthur Hill gives an interesting outline of Atchley's life and indicates briefly his great services to botany and to Kew in particular.

The body of the book consists of short descriptions and field notes of many of the more conspicuous or more interesting species of the flora of Attica. Since these notes represent the observations of a keen observer and field botanist they have considerable botanical value. Some of them are very typical of their writer's whimsicality and sly but never unkind humour. Not all of the species referred to in the text are represented on the plates, since it was thought advisable to publish all of the manuscript notes. Seventy-nine species are represented by coloured figures, some two, but mostly

* By the late Shirley Clifford Atchley, C.M.G., O.B.E., prepared for publication by W. B. Turrill, D.Sc., F.L.S. Oxford, at the Clarendon Press, 1938. Pp. xix + 60, xxi plates and frontispiece in colour. Price 25s.

four to a plate, though on the frontispiece *Mandragora autumnalis* occupies the whole plate. These figures are not all of equal merit and some suffer from the reduction to which they had to be subjected. On the whole, however, they are very satisfactory and their reproduction is excellent. The text is clear and, as one would expect from the Clarendon Press, exceptionally well produced. Those who understand good fount have pronounced that used throughout the volume to be very beautiful.

The text and the figures together form a useful introduction to the Attic flora. Had the author lived to produce a similar second volume, as his preface says it was intended to do if a first volume met with favour, most of the flowering plants likely to be seen by visitors to Attica would have been represented. Even with this one volume the traveller will have a valuable guide to the flora, and it may be hoped that many who visit Greece will be stimulated by this work to study the plants of a country whose history is that of the beginnings of modern civilization and whose natural beauty is not even yet destroyed by man and his domestic animals.

An Introductory Text-book of Botany.*—If the demand for a continuous flow of new text-books be a sign of vitality in a science, one must conclude that botany in Britain is in a vigorous condition. Every teacher complains that the ideal text-book has yet to be written, unless, of course, he has published one himself, but at present he has many to classify into groups better or worse than the mode. The book noticed here is, however, largely written from fresh view-points and, mainly as an introduction to laboratory work, should fulfil a useful purpose. While it covers the first year's course in botany in the University of Leeds it would also suffice for the corresponding course in the University of London, and no doubt in other universities, so far as the gross morphology, anatomy, and physiology of Angiosperms are concerned. It is, however, inadequate in the treatment of ecology and taxonomy. This is unfortunate, since both subjects are basic to a proper understanding of the science and, moreover, the student who is not made familiar with their principles and given opportunity to apply them early in his studies is at a decided disadvantage at all later stages of his career.

For the actual contents of the book there can be little but praise. It is full of suggestions for the use of a wide range of material which is often neglected by teachers and students. The drawings, diagrams, and photographs are new, clear, and adequate, and properly illustrate the text, which is decidedly "readable." A full index is provided.

W. B. TURRILL.

* "An Introduction to Botany, with Special Reference to the Structure of the Flowering Plant," by J. H. Priestley and L. I. Scott, Longmans, 1938. Pp. x + 615. Illustrated. Price 17s. 6d.

Humus.*—Nowadays the view is widely held that the use of mineral fertilizers alone does not necessarily ensure that the grower will obtain the best possible crops from his land. Consequently there has been an intensive study of the importance in plant nutrition of those partially decomposed plant remains which are collectively known as humus. Very varying claims concerning the significance of humus in plant nutrition have been made by various authors, and it is therefore useful to have the different views on the subject and recent researches summarized in a single volume.

The second edition of Professor Waksman's work on humus will be greatly appreciated by soil experts and more general readers alike. When reading this book one cannot fail to be impressed by the uncertainty and controversial position of the study of many aspects of this important subject. In the author's view, humus is of admitted value in plant nutrition, but chiefly because of its effects on the physical and chemical properties of the soil, and because it provides a suitable medium for microbial activities. It is improbable that the constituent complexes can be directly assimilated by the plant. References are given to no less than 1608 articles on the subject, and the book ends with author and subject indexes. It is rather curious to find on page 17 members of the fern genus *Adiantum* referred to as "forest shrubs," but this is only a small blemish in a book which will be found useful by all who are interested in the scientific study of the soil.

C. R. METCALFE.

Plant Physiology.†—A few years ago, English-speaking students could justly complain of the lack of a modern textbook on plant physiology. Since then, however, several reliable textbooks on this subject have been published, one of the most recent of which is by Professor Seifriz of the University of Pennsylvania. The author states in the preface that he has tried to avoid making dogmatic statements, and that he has illustrated his points wherever possible by reference to well known facts which can be observed every day. Another important aim has been to make the student think for himself. The subject matter is wide in scope, and includes something about all the important branches of plant physiology, and a limited number of references are given to books and other literature suitable for further study. The author has, in some instances, sought the aid of specialists who have helped to compile those sections of the book which deal with their respective fields. For instance, Dr. P. W. Zimmerman has assisted with the chapter on hormones and growth-promoting substances. On the whole the book is written in a clear and lucid style, and the illustrations

* "Humus: Origin, Chemical Composition, and Importance in Nature." By Selman A. Waksman. London, Baillière, Tindall and Cox, 2nd edition, 1938. Pp. xiv + 526. Price £1 10s.

† "The Physiology of Plants," by William Seifriz. New York, John Wiley and Sons Inc.; London, Chapman and Hall Ltd. 1938. Pp. vi + 315, 95 figs. Price 17s. 6d. net.

are simple and carefully selected. Chapter 21 includes a brief account of the modern methods of growing plants in chemical solutions. This, together with the picture on p. 247 of some *Gladioli* flourishing in a culture solution, should arouse the interest of students far more than the rows of rather anaemic looking plants in glass jars which are a familiar feature of the older textbooks. This type of improvement is characteristic of the whole book, which should prove to be a useful introduction to plant physiology.

C. R. METCALFE.

British Guiana Papers.*—This considerable volume represents the first instalment of results of the Oxford Expedition to British Guiana in 1929. The preface and list of members are followed by a reprint of an account of the Expedition which was read to the Royal Geographical Society by its leader, Major R. W. G. Hingston. The rest of the volume is devoted to reprints of numerous papers. These include almost the whole of the botanical results, both ecological and taxonomic, and the impression gained is that really valuable work was accomplished from both standpoints by means of a successful collaboration. Rarely before can a small piece of tropical forest have been studied so scientifically and in such detail, and even more rarely has the identification of so many of the trees mentioned been fixed. There are also valuable papers on the ornithology and entomology of the area, including a complete revision by Dr. O. W. Richards (a member of the Expedition) of the American species of *Trypoxylon*, a large genus of wasps. Owing to the immense size of the entomological collections and the great difficulties attending taxonomy in this branch of science—systematic botanists do not sufficiently realise how happily they are placed in comparison with their entomological fellow workers—it is evident that very many years must pass before the entomological results are even nearly concluded. Nowadays, many much advertised and lavishly equipped expeditions seem to end in a radio talk, a lantern lecture, a travel book and, perhaps, the partial incorporation into museums of the collections obtained; the Oxford Exploration Club is therefore to be congratulated on this scientific justification of its first tropical venture, which cost only £1,171 for about eleven men. If one examines the reasons for this success they are clearly to be traced to the choice of a single small area for study, to the blending of untrained undergraduates with enthusiastic specialists under a tried and capable leader, and to the constant help and guidance of a most able Department of Forestry. We look forward with interest to the completion of the work and hope that any further tropical expeditions of the Oxford Exploration Club may furnish equally valuable results.

* "British Guiana Papers," Scientific Results of the Oxford University Expedition to British Guiana in 1929. Published for the Oxford University Exploration Club by the Oxford University Press, London, 1938.

BULLETIN OF MISCELLANEOUS INFORMATION No. 2 1939 ROYAL BOTANIC GARDENS, KEW

VII—AMARYLLIS AND HIPPEASTRUM. J. R. SEALY.

I. INTRODUCTION.

In the first edition of his "Species Plantarum" (1, 292–293: 1753) Linnaeus placed nine species in the genus *Amaryllis* L., and these nine species belong to as many different genera according to our modern concepts of the genera of *Amaryllidaceae*. As a result of this original wide concept of the limits of *Amaryllis*, still further diverse elements were included within it during the years that followed the publication of Linnaeus's work, and by the beginning of the nineteenth century it had come to include about fifty species representing at least a dozen different genera. Some of the original nine species of *Amaryllis* were referable to certain genera (*Brunsvigia* Heister, *Sprekelia* Heister, *Imhofia* Heister, *Atamasco* Adanson, and *Sternbergia* Waldst. & Kit.) that had been proposed during the period between 1753 and 1805, but these genera either remained unknown to students of the family or were not recognized by them, and the genus *Amaryllis* was generally accepted as being very polymorphic.

The task of sorting the diverse elements that constituted this *Amaryllis*, *sensu latiore*, into homogeneous groups and defining them as distinct genera was first attempted in 1819 by Herbert (Bot. Mag. sub t. 2113). Two years later he dealt with the problem in more detail, correcting his previous work in certain respects, and extending it to include all the genera of *Amaryllidaceae*, and this work, published under the title "An Appendix" (actually to vol. 6 of the Botanical Register), forms the basis of all the succeeding taxonomy of the family. In the "Appendix" Herbert restricted the name *Amaryllis* to the Cape plant now so well-known to botanists and gardeners alike as *Amaryllis Belladonna*, and distributed the other diverse elements of *Amaryllis* among other genera, some of which he established for their reception.

For some years students of the *Amaryllidaceae* have known that the Cape plant to which Herbert applied the name *Amaryllis Belladonna* was not, apparently, the plant that Linnaeus meant when he first gave that name to one of the species of *Amaryllis* in the first edition of his *Species Plantarum* (1753). Under the name *Amaryllis Belladonna* Linnaeus cited certain synonyms, which evidently all refer to the American plant now known as

Hippeastrum equestre (Linn. fil.) Herb.,* and not to the Cape Belladonna at all; in fact Linnaeus gave the habitat of his species as "in Caribaeis, Barbados, Surinama." The matter was mentioned by the late Dr. Stapf in a footnote on page 3 of his article on *× Crinodonna Corsii* in the Botanical Magazine, t. 9162 (1929), but nothing was published about the problem until last year, when an article by Dr. Uphof appeared in "Herbertia" (1938, pp. 100-109, tt. 107-109). Uphof comes to the conclusion that *Amaryllis Belladonna* L. is the correct name for *Hippeastrum equestre* (Linn. fil.) Herbert, that the genus *Hippeastrum* Herbert must be renamed *Amaryllis* L., and that the Cape Belladonna must receive the name *Callicore rosea* Link. These conclusions seemed reasonable at first sight, but on closer examination it appeared that the complexities of the case had not been fully appreciated by Uphof, and that it would be necessary to reconsider it in more detail and from a different angle before one could judge whether or not his conclusions were correct.

The case was accordingly fully re-investigated and the results are given below. The problems concerned are much more involved than would appear from Uphof's account, and form another example of the difficulties so often experienced when attempts are made to identify and typify Linnaean genera and species, and illustrate the necessity for caution in dealing with such problems.

Whilst taking entire responsibility for the views expressed in this paper, I gratefully acknowledge the help given to me, by way of advice and discussion, by Messrs. J. Ardagh and J. E. Dandy of the British Museum (Natural History) and by Mr. Spencer Savage of the Linnean Society. Dr. T. A. Sprague has been kind enough to go over the MS. in detail with me, and I am greatly indebted to him for the many suggestions he has made and the advice he has given.

II. THE IDENTITY AND TYPIFICATION OF AMARYLLIS BELLADONNA L.

The name dates from Linnaeus, *Species Plantarum*, 1, 292 (1753), where the species is defined as "*Amaryllis spatha multiflora, corollis campanulatis aequalibus, genitalibus declinatis*" and a reference is given to Linnaeus, *Hortus Cliffortianus*, 135 (1737) where that phrase is used for the first time. In addition Linnaeus cites certain synonyms, with references to earlier authors, and gives the habitat of the species as "in Caribaeis, Barbados, Surinama." The references, synonyms, and habitat apply, as stated above, to the American plant we know as *Hippeastrum equestre*, and therefore at first sight it seems clear that *Amaryllis Belladonna* L. was actually

* This name was based on *Amaryllis equestris* Linn. fil. ex Aiton, Hort. Kew. 1, 417 (1789), which, however, is antedated by *Amaryllis puniceus* Lamarck, Encycl. Méthod. 1, 122 (1783). The correct name for the species under *Hippeastrum* is accordingly *H. puniceum* (Lam.) Urban, Symb. Antill. 4, 151 (1903), but for the purposes of this paper the better-known name *H. equestre* is retained.

Hippeastrum equestre (Linn. f.) Herb. Three points, however, suggest caution in accepting this conclusion: (1) three authors of Linnaeus's own time, Philip Miller, John Miller, and the younger Linnaeus, actually applied the name *Amaryllis Belladonna* to the Cape plant known under that name to-day; (2) we know from contemporary literature* that the Cape Belladonna was a well-known garden-plant in Linnaeus's day, and it seems incredible that Linnaeus would not have known of it, and if he knew the plant, it is only reasonable to suppose that he would have included it in his "Species Plantarum"; (3) as already mentioned, Linnaeus diagnosed his *A. Belladonna* with a phrase taken from his "Hortus Cliffortianus," a work which deals with the identification and classification of plants grown in the garden of Georg Clifford at Hartecamp, Holland, and of specimens in Clifford's herbarium, so that we can say that Linnaeus must have seen either a dried specimen or living plants (or both) of his *Amaryllis Belladonna*, and that this species was not based merely on the synonyms he quotes. This fact was apparently unnoticed by Uphof, but it at once raises the question, was that specimen or plant really the American *Hippeastrum equestre*, or could it have been the Cape Belladonna?

Further investigation has brought to light the evidence detailed below:—

(1) In the "Viridarium Cliffortianum," Linnaeus gave a list of all the living plants in the Clifford garden during the years 1735, 1736 and 1737, and among them is the "*Amaryllis spatha multiflora, corollis campanulatis aequalibus, genitalibus declinatis*," the plant which he subsequently named *Amaryllis Belladonna*. Linnaeus therefore certainly knew a living plant of this species.

(2) In the Clifford herbarium,† now at the British Museum (Natural History), London, there is a specimen immediately recognizable as the *Cape Belladonna*. The specimen bears no name or identification, and therefore there is no ground for stating either that it is the basis of *Amaryllis Belladonna*, or that it is the plant which Linnaeus knew in the Clifford garden, for the specimen may have been added to the herbarium after Linnaeus had left Holland. On the other hand, the absence of data on the sheet suggests that this specimen was grown in Clifford's garden, and there is a possibility that the species was growing there, or that the specimen was in Clifford's herbarium, when Linnaeus was writing the "Hortus Cliffortianus," and it is therefore possible that the specimen represents one of the species described in that work. It is obviously referable to the genus *Amaryllis* and can be referred

* For example, Miller, Gard. Dict. ed. 1 (1731). Actually the Cape Belladonna was in cultivation in Italy as early as 1633, *fide* Ferrari, De Florum Cultura, 116-118, c.c. (1633). In the Italian version of that work (Flora overo Cultura di Fiori, 118: 1638) the common name is given as "Donna bella."

† An excellent account of it was given by the late Dr. A. B. Rendle in his Presidential Address to the Linnean Society in 1924, see Proc. Linn. Soc. 1923-24, 38-42 (1924).

only to the second species, the one which in 1753 Linnaeus named *Amaryllis Belladonna*.

(3) The Cape Belladonna and the American *Hippeastrum equestre* are markedly dissimilar plants, and if Linnaeus had known the latter in cultivation and had based his diagnosis of *Amaryllis Belladonna* upon it, one would expect the fact to be evident from his diagnosis. The latter reads: "*Amaryllis spatha multiflora, corollis campanulatis aequalibus, genitalibus declinatis*" and there are two points in it which are not in keeping with *Hippeastrum equestre*. The first is "*spatha multiflora*," which is scarcely descriptive of a plant 2-4 flowers, even if used as a contrast to species "*spatha uniflora*." Had Linnaeus been describing *Hippeastrum equestre*, it is surely more likely that he would have written "*spatha pauciflora*," and it should be noticed that all the other species of *Amaryllis** described as "*multiflora*" in the "Species Plantarum," ed. 1, really are many-flowered. On the other hand, in the second edition of the "Species Plantarum," Linnaeus accepted Miller's description of *A. Reginae* as "*multiflora*," though this species is generally 2-4-flowered. It might therefore be said that "*multiflora*" should be taken as meaning "more than one-flowered" in contrast to the "*uniflora*" of other species. It should be remembered, however, that in the case of *A. Reginae* Linnaeus was merely recording Miller's work, whereas for *A. Belladonna* the diagnosis was original and written by Linnaeus himself.

The second point concerns the "*corollis campanulatis*." No one who knew living plants (and it must not be forgotten that Linnaeus knew his *Amaryllis spatha multiflora* . . . etc. in life) or even good figures of *Hippeastrum equestre*, could describe the flowers as campanulate. The flower has a most characteristic shape, as shown in figure 1 (actually taken from one of the works cited by Linnaeus), and I suggest that it is exceedingly unlikely that Linnaeus would have described it as "*corollis campanulatis*." On the other hand, both the "*spatha multiflora*" and the "*corollis campanulatis*" are understandable if Linnaeus was dealing with the Cape Belladonna, for in that plant the stem bears 10 or 12 flowers, which, as shown in figure 2, would be accepted as campanulate as that term was used by Linnaeus.

(4) In the "Hortus Cliffortianus," under *Amaryllis*, Linnaeus wrote:—"Lilio narcissus vocabulum est consarcinatum, quod rejicio. Flores hujus generis eximii sunt, nescio num 2-da parem habeat, hinc Bellae donnae dictae plures; Bella donna virgilii, Amaryllis dicta, nomine transiit in proverbium de omni grato, et de secunda specie apud Hortulanos quosdam, quae cum et radice amara sit, pro Amarella Amaryllis dicatur."

This may be translated:—"Lilio-narcissus is a patched-together designation which I reject. The flowers of this genus are very

* *A. sarniensis* (Nerine), *A. zeylanica* (Crinum), *A. longifolia* (usually placed in *Ammodorus*), *A. orientalis* (Brunsvigia), and *A. guttata* (Boophone).



S.R.C.

1. *Hippeastrum equestre* Herbert (copied from Merian, *Metamorph. Insect. Surinam*, t. 22: 1705). 2. *Amaryllis Belladonna* L. emend. L'Hérit. (copied from John Miller, *Illustr. Syst. Sex. Linn.* t. 18: 1770 on plate, 1771 on title page); both figures two-thirds natural size.

beautiful—I do not know that the second species has an equal—hence many are called Belladonna. The Belladonna of Virgil was called Amaryllis and this name has passed into proverb for any beautiful thing, and has been used among certain gardeners for the second species, which although it has a bitter root, is called Amaryllis in place of Amarella.”

The “second species” to which Linnaeus referred in this note is the one he named *A. Belladonna* in 1753, and two points stand out at once. First that the species had such beautiful flowers that Linnaeus doubted if it had an equal, and second that the species was at least fairly well-known in cultivation since it had already received the name *Amaryllis* in gardens. Both remarks apply to the Cape Belladonna—no one would dispute that its flowers are exceedingly beautiful, and it was certainly well-known in gardens in Linnaeus’s time (see next paragraph)—but one could scarcely claim that *Hippeastrum equestre* had no equal in beauty of flowers, and it was certainly *not* well-known in cultivation in Linnaeus’s day, in fact it was very rare.

(5) The Cape Belladonna was in cultivation in Italy in 1633. It was included by Morison in his “Plantarum Historiae” (1680), and by Miller in his “Gardeners’ Dictionary” from the first edition (1731) onwards; it was apparently introduced into this country at an early date and became well-known. *Hippeastrum equestre* may also have been in cultivation in England in Miller’s time, for his *Lilio-Narcissus* no. 3, the West Indian Red Lily (Gard. Dict. Ed. 1–4: 1731–43), stated to be very rare in England, may have been that species. It should be noted, however, that the West Indian Red Lily of Ed. 6 and Ed. 7 (1752–59) was another species, *H. Reginae* and that this had been introduced in 1728. The Cape Belladonna was growing at Leyden in 1681–1686 and is included in Hermann’s “Catalogus” (1687), where, incidentally, it is called *Lilium africanum* . . . etc. It was at Leyden when Boerhave prepared his “Index Alter” (1720), and in that work there is also a reference to the American *Hippeastrum equestre*. Only one species is mentioned, however, by Royen in his account of the Leyden garden (1740) and that species was recorded under the Linnaean phrase-name* for *Amaryllis Belladonna*, with synonyms belonging to the American plant. It is scarcely likely that two such different plants as the Cape Belladonna and the American *Hippeastrum* would be identified with one another in a garden, and hence it is most likely that one or the other had disappeared from the Leyden garden by 1740. Of the two, the American plant, which has to be grown under glass and requires careful treatment, is more likely to have disappeared than the hardy Cape plant. It is therefore much more likely that the plant recorded by Royen was the Cape Belladonna. All the

available evidence, in fact, points to the Cape Belladonna being well known in gardens in Linnaeus’s day, whereas the American *Hippeastrum equestre* was rare.

(6) Philip Miller, in his “Figures of Plants” (1755) figured the Cape Belladonna under the name *Amaryllis spatha multiflora* . . . etc. of the “Hortus Cliffortianus,” and in the second edition of the “Species Plantarum,” Linnaeus cited Miller’s figure as an illustration of his *Amaryllis Belladonna*. Miller stated that the plant was well known in gardens as the Belladonna lily, and that it had been identified by Sir Hans Sloane with a plant which he had obtained in Barbados and which he had called *Lilio-narcissus polyanthos, flore incarnato, fundo ex luteo albescente* (Sloane, Cat. 115, Hist. I. 244). Miller goes on to say, however, that from all he can learn there are two species of “lily” in the West Indies, one white-flowered and evidently a *Pancratium*, the other red-flowered and certainly *not* the Belladonna lily. In the next plate of his “Figures,” Miller gives an illustration of the plant known in English gardens as the “Mexican Lily,” which, he says, had been named *Lilium Reginae* by Dr. James Douglass, “because it was in full Beauty on the First of March, which was the late Queen’s Birth-day.” This plant is the one known to-day as *Hippeastrum Reginae*. With it Miller identified the *Lilium Americanum puniceo flore, Belladonna dictum* described and figured by Hermann in his “Paradisus Batavus” 194 (1698), but he adds “Doctor Herman says it came from the *Caribbee Islands*; but all the Roots which I have received from those Islands, by the Title of *Red Lily*, are of a different sort from this.” In this statement Miller was perfectly correct, for the Red Lily of the West Indies is *H. equestre*. The mistake that Miller made was in identifying Hermann’s plant with *H. Reginae*, for Hermann’s plant is unmistakably *H. equestre*. Now Linnaeus included Miller’s “Mexican Lily” as a new species of *Amaryllis* in the second edition of his “Species Plantarum” and named it *A. Reginae*, quoting, as a synonym, the Hermann reference already mentioned. This means that under *A. Reginae* his synonym referred to another plant, *Hippeastrum equestre*, whilst the references in the same work under *A. Belladonna* likewise belonged to *H. equestre*. It may be noted that in one of the works in the synonymy of *A. Belladonna*, namely, Merian’s “Metamorphosis,” the plant described and figured is identified with the Hermann plant, and also that in the “Hortus Cliffortianus” Linnaeus had actually included the Hermann reference in the synonymy of the plant he afterwards named *A. Belladonna*. The conclusion seems to be that Linnaeus did not critically examine the literature, and that he had no clear idea of the identity of the plants described and figured in the works cited. In fact, it is most likely that the synonyms cited by Linnaeus in the “Hortus Cliffortianus” represent “book-work” hastily compiled owing to the great pressure under which that work was written.

* Royen was assisted by Linnaeus in his re-arrangement of the Leyden garden—see Daydon Jackson, “Linnaeus,” 163 (1923).

In the second edition of the "Species Plantarum" Linnaeus emended his diagnosis of *Amaryllis Belladonna* by adding "*ungue reflexis*" to the original "*corollis campanulatis aequalibus*." This was evidently put in the better to distinguish it from *A. Reginae*, for under the latter he says it differs from *A. Belladonna* by the petals being undulate at the margin and *not recurved into a claw* ("*nec ad ungues recurvatis*"). Now Linnaeus did not get this additional character from Miller, for the latter does not mention it, nor is it shown in his plate, and we must therefore conclude that Linnaeus derived it from a plant or specimen which he accepted as his own *Amaryllis Belladonna*. This recurving of the apex of the outer perianth-segments in the shape of a claw is characteristic of the Cape Belladonna, but does not occur, so far as I am aware, in *Hippeastrum equestre*. In the latter the apices may be shortly apiculate or minutely cucullate but can scarcely be described as "recurved in a claw." The claw-like apices are very clearly shown in John Miller's excellent figure of the Cape Belladonna in his "Illustration of the Sexual System of Linnaeus," t. 18, part of which is reproduced in figure 2. This work was known to Linnaeus, who formed a high opinion of it, but the plate of *Amaryllis Belladonna* did not appear until 1770 (date on plate), that is, long after the second edition of the "Species Plantarum." It would seem that some time between 1753 and 1762 Linnaeus became acquainted with Miller's "Figures of Plants," and that before accepting Miller's "Mexican Lily" as a new species of *Amaryllis*, he examined a plant or specimen of his own *A. Belladonna* to see how the new species differed from it, and that he noted the claw-like apex of the outer segments. This would mean that Linnaeus was perfectly aware of the identity of his *A. Belladonna*, and that that species was the Cape plant. It may be of interest to add that in his own copy of the "Species Plantarum," ed. 2, Linnaeus has written in a short description for *A. Belladonna*, which reads as follows: "*Corolla regularis campanulata statura Hemerocallidis, incarnata, fundo viridi albicante. Petala 3 exteriora apice ungue intus retro spectante. Petala 3 superiora basi ciliata. Stamina declinata rubra. Antheris albidis. Pistillum rubrum apice albo. Caulis teres, parum compressus. Bulbis viridis.*" This evidently applies to the Cape Belladonna, and together with the work published in ed. 2 of the "Species Plantarum," shows conclusively that Linnaeus *did* accept the Cape plant as his *A. Belladonna* some time between 1753 and 1762; but it does not necessarily mean that he based the species on the Cape plant when he first described it in 1737. The fact that Linnaeus did accept the Cape plant as *A. Belladonna*, however, in conjunction with the fact that the 1737 description and reference to the outstanding beauty of the flowers both apply to the Cape plant, seems to justify the conclusion that the species was based on the Cape plant. It may be mentioned that Trew (Hort. Amoen. Fl. Imag. Ed. Seligmann, 1, p. N2. verso, t. 12) also described the

Cape plant under the phrase that Linnaeus used in 1737, and figured it as "*Belladonna*." The title-page of volume I is dated 1750, and if the work had been written prior to that date, it would mean that even before 1753 the Cape plant had been recognized as the species described by Linnaeus in 1737. However, on the page of Trew cited is a reference to another work the date of which is given as 1766, so that Trew's work must have appeared during or after that year.

(7) In 1775 a thesis, prepared under Linnaeus's direction by one of his pupils, Jacobus Alm, was published under the title "*Plantae Surinamenses*."* This thesis deals with the identification of a collection of Surinam plants and among them is an *Amaryllis* which is dealt with thus:—"39. *Amaryllis* 98. dubia. *Mer. surin. t. 22. Corolla basi laciniarum barbata.*" That is to say, that no. 98 was an *Amaryllis* whose specific identification was doubtful but which was the plant figured by Merian. The latter, of course, is the American *Hippeastrum equestre*, and, since Merian's work was actually cited by Linnaeus under *Amaryllis Belladonna* in the "Species Plantarum," one would normally have expected that Alm would have given this name for the *Amaryllis* no. 98 of the collection. That he did not do so seems to imply that either he or Linnaeus had become aware that the American plant was *not A. Belladonna*.

(8) The younger Linnaeus prepared a MS. on certain plants, including a number of *Amaryllidaceae*, which remained unpublished and is now in the possession of the Linnean Society of London. This MS. recently formed the subject of an article by Mr. Spencer Savage in *Herbertia*, 1937, 92-99, in which he showed that the MS. was written about 1781-83, and that it formed the source of the diagnoses of various plants which were published in Aiton's "*Hortus Kewensis*" (1789) and there attributed to "Linn. fil.," the diagnoses concerned having been sent to Aiton by Linnaeus fil. himself (see Aiton's Preface, p. vi). Among the plants dealt with are those with which we are concerned, and it is instructive to notice that the younger Linnaeus completely clears up the confusion which surrounds *Amaryllis Belladonna* and *A. Reginae*. He does this by restricting the name *A. Belladonna* to the Cape Belladonna (as may be easily demonstrated from the references he gives), by restricting the name *A. Reginae* to the plant figured by Miller, and by establishing a new species, *A. equestris*, to cover the American plant which Linnaeus had placed in the synonymy of *A. Belladonna* (by citing the works of Sloane, Seba and Merian under that species), and which Miller had misidentified with *A. Reginae* (when he cited Hermann, *Par. Bot.* 194 as a synonym of the latter). Incidentally, the habitat of *A. Belladonna* was not given in Aiton's "*Hortus Kewensis*," but it is evident from Savage's account (p. 99) that the younger

* Reprinted in Linné, *Amoen. Acad. Ed. Schreberus*, VIII. pp. 249-267 (1785).

Linnaeus knew that it came from the Cape, and wrote in the MS. "Habitat in Africa Australi: Cap: Bona Spei." The name *Amaryllis Belladonna* was also restricted to the Cape plant by L'Héritier in his *Sertum Anglicum*, 11-13 (1788). Moreover, L'Héritier quoted much of the earlier literature concerning the plant, and gave its home as the "Cape of Good Hope," a piece of information which may have been derived from one of the works he cited, namely, Petiver, *Gazophylacii Nat. Art.* 9, t. 85, fig. 5, et *Cat. Class. Sec. Vol.* p. 4, no. 497 (1764). The Sloane, Seba and Merian references, which Linnaeus senior had placed under *Amaryllis Belladonna*, were transferred by L'Héritier to *A. Reginae*. L'Héritier obviously recognized that these references were to the same plant as the one figured and described by Hermann, but he apparently did not realize that they all represented a species distinct from *A. Reginae*.

The evidence from the foregoing discussion may be conveniently summarized thus:—

- (a) Linnaeus knew a living plant of his *Amaryllis Belladonna* in Clifford's garden;
- (b) The Cape Belladonna was a well-known garden plant in Linnaeus's day; it is most unlikely that it was unknown to Linnaeus, and if he knew the plant he would certainly have accounted for it in his "Species Plantarum"; *Hippeastrum equestre* was rare in cultivation;
- (c) There is a specimen of the Cape Belladonna in the Clifford Herbarium, but no specimen of *Hippeastrum equestre*;
- (d) Linnaeus especially mentions his *Amaryllis Belladonna* as an *outstandingly* beautiful species; it was apparently reasonably well-known in cultivation, since Linnaeus mentions the name given to it in gardens: these remarks are applicable to the Cape plant, but scarcely to *Hippeastrum equestre*.
- (e) Linnaeus's original diagnosis of his *Amaryllis Belladonna* fits the Cape plant better in two respects ("spatha multiflora" and "corollis campanulatis") than it does *Hippeastrum equestre*.
- (f) In the second edition of his "Species Plantarum," Linnaeus cited a figure of the Cape plant as an illustration of *Amaryllis Belladonna*, and added to the diagnosis a character ("corollis . . . ungues recurvatis") present in the Cape Belladonna but not in *Hippeastrum equestre*. Moreover, Linnaeus must have seen this character in a specimen or living plant, for it is not mentioned in the literature, nor shown in any of the illustrations cited by him. Furthermore, Linnaeus wrote a description of his *Amaryllis Belladonna* in his own copy of "Species Plantarum" ed. 2, and that description is of the Cape Belladonna. This all shows that Linnaeus himself accepted the Cape plant as his *A. Belladonna*.
- (g) Under *A. Reginae* Linnaeus, following Miller, erroneously cited as a synonym the *Lilium Americanum* . . . etc. of Hermann,

which he himself had cited under *A. Belladonna* in 1737, and which is the same plant (*Hippeastrum equestre*) to which his synonyms under *A. Belladonna* belong. This indicates that Linnaeus had not examined the literature carefully.

- (h) In 1775 the Merian reference, given in the synonymy of *A. Belladonna* by Linnaeus in 1737 and 1753, was cited in a thesis prepared under Linnaeus's direction, as an *Amaryllis* whose identity was doubtful.
- (i) Three botanists of Linnaeus's own times, Philip Miller, L'Héritier, and the younger Linnaeus, all agree in identifying *Amaryllis Belladonna* L. as the Cape plant, and excluding from it the American *Hippeastrum equestre*.

Taken as a whole, this evidence indicates that Linnaeus knew the Cape Belladonna, that he almost certainly based his *Amaryllis Belladonna* upon it, but confused with it the literature relating to *Hippeastrum equestre*.

If this view is rejected, we are left with the alternative that the name *Amaryllis Belladonna* was based only on the American plant *Hippeastrum equestre*, known to Linnaeus in cultivation and from the literature. The difficulties that arise when one attempts to reconcile this alternative with the evidence detailed above, will be readily discernible.

Now regarding the identification of *Amaryllis Belladonna* L., it seems that the four following views are possible:—

- (1) We can reject entirely the suggestion that the Cape Belladonna formed part of *Amaryllis Belladonna* L. in 1753, and say that only *Hippeastrum equestre* is concerned. This is Uphof's conclusion.
- (2) We may consider that Linnaeus based *Amaryllis Belladonna* on the literature he cited, i.e., on *Hippeastrum equestre*, that he misidentified with it the Cape Belladonna known to him as a garden plant, and took the characters for the diagnosis, at least in part, from the garden plant.
- (3) We can consider that Linnaeus based *Amaryllis Belladonna* on the Cape Belladonna known to him as a garden plant, and misidentified with it the literature belonging to *Hippeastrum equestre*.
- (4) We may agree that Linnaeus confused the Cape Belladonna and the literature concerning *Hippeastrum equestre* under *Amaryllis Belladonna* but consider that there is not sufficient evidence to show that either species has a better claim than the other to the name *Amaryllis Belladonna* L.

With regard to these four possibilities I would remark as follows:—

- (1) In my opinion the evidence as a whole, and particularly that under (b), (d), and (e), and to a less extent that under (c), (f) and (h) makes this view so improbable that it must be rejected.

- (2) and (3) These being alternatives may be considered together. It seems much more likely that Linnaeus would have had chiefly in mind the garden plant from which he took his diagnosis, and would have misidentified with it the literature connected with another species, rather than *vice-versa*. The diagnosis is so incompatible with the species represented by the literature, that there is no justification for giving the literature precedence as the basis for the name *Amaryllis Belladonna*. Consequently I think that (3) is the more reasonable view. As to the type of the name *A. Belladonna*, this will be the plant from which Linnaeus took his diagnosis, or specimen thereof if one exists. The specimen of the Cape Belladonna in the Clifford Herbarium may actually be the type, but unfortunately this cannot be proved. However, in the absence of evidence to the contrary this specimen may be accepted as the working type.
- (4) In my opinion the evidence points to view (3) being preferable to this, and consequently I accept (3) and reject (4). However, this view might be accepted by other workers, in which case a lectotype of the name *A. Belladonna* would have to be chosen. As the "Regulations for determining types," mentioned in the International Rules of Botanical Nomenclature ed. 3 (1935), have not yet appeared, the choice of a lectotype should be governed by the general principles upon which the Rules are based. The first essential point in nomenclature is to aim at fixity of names (Art. 4), and in the absence of a relevant rule established custom must be followed (Art. 5). The first author to restrict the name *A. Belladonna* to one of its two elements and definitely to exclude the other, was L'Héritier, who in 1788 restricted the name *A. Belladonna* to the Cape Belladonna, excluding the literature. The same treatment was adopted independently by the younger Linnaeus in MS. 1781-83, though his work was not published until 1789. This treatment has been accepted without question for the past hundred years. We may therefore say that the name *A. Belladonna* should be retained for the Cape Belladonna, and the specimen in the Clifford Herbarium may well be accepted as the lectotype.

III. THE TYPIFICATION OF THE GENERIC NAME AMARYLLIS L.

Linnaeus included nine species in *Amaryllis* in the first edition of his "Species Plantarum," and these nine species belong to as many different genera according to modern concepts.

No one species has a better claim than the others to be regarded as the type of the generic name, and in fact Linnaeus indicated the wide limits of his concept of the genus when he stated (in his "Genera Plantarum," Ed. 5, p. 142: 1754) "Inflexia petalorum, staminum, and pistilli in hoc genere admodum diversa est."

In the absence of rules for typification, the choice of one of the original species as the type of *Amaryllis* is governed by the general

principles underlying the rules. It has been the general practice from 1821 to the present day to retain the name *Amaryllis* for *A. Belladonna* L. (the Cape Belladonna), and accordingly that species "the only one of the nine original species now retained in the genus," was suggested as the standard-species for *Amaryllis* by Hitchcock and Green (Internat. Bot. Congr. 1930, Nomencl. Prop. Brit. Bot. 145: 1929). In 1935 the Sixth International Botanical Congress recommended "that the standard-species (species lectotypicae) of Linnaean generic names printed in International Rules, ed. 3, pp. 139-143, be adopted by botanists unless there is clear reason for rejecting any species in favour of another."

We have therefore to trace the history of *Amaryllis* from 1753 onwards in order to discover whether or not any clear reason exists for rejecting *A. Belladonna* as the lectotype.

Between the time of the publication of "Species Plantarum" in 1753, and the year 1819, five new genera of *Amaryllidaceae* were established, to each of which one of the original *Amaryllis* species is referable. These genera are:—

<i>Brunsvigia</i> Heister	to which is referable	<i>A. orientalis</i> L.
<i>Imhofia</i> Heister	" " " "	<i>A. sarniensis</i> L.
<i>Sprekelia</i> Heister	" " " "	<i>A. formosissima</i> L.
<i>Atamasco</i> Adanson	" " " "	<i>A. Atamasco</i> L.
<i>Sternbergia</i> Waldst. & Kit.	" " " "	<i>A. lutea</i> L.

In no case, however, was the establishment of a new genus accompanied by a revision of the limits of *Amaryllis*.

The first effort to distinguish the various elements that Linnaeus had included within *Amaryllis* was made by Herbert in 1819, in the Botanical Magazine, sub t. 2113, who distributed the elements of *Amaryllis* L. Sp. Pl. (1753) thus:—

A. zeylanica was placed in *Crinum* L.
A. sarniensis was referred (along with other species) to a new genus, *Galatea* Herbert.

A. orientalis (under the name *A. multiflora*) and *A. Belladonna* (the Cape Belladonna) were placed with other species in a new genus *Coburgia* Herbert.

A. longifolia (under the name *A. falcata*) was tentatively referred to *Brunsvigia* Heister.

A. formosissima and *A. Atamasco* were left in *Amaryllis*, the latter species being doubtfully included.

A. lutea and *A. guttata* were not accounted for, though the latter may have been included in the *A. ciliaris* which was doubtfully referred to *Coburgia*.

Incidentally it may be noted that Herbert regarded *A. Belladonna* as the Cape plant, and recognized *A. equestris* Linn. fil. as a distinct species which he retained in *Amaryllis*. Under *A. equestris* the younger Linnaeus had cited Merian's figure which was one of the original elements of *Amaryllis* L. (1753), having been cited by Linnaeus under *A. Belladonna*. Hence Herbert actually retained in

Amaryllis three of the original elements of that genus, namely, *A. formosissima*, Merian's figure (now referred to *A. equestris*), and *A. Atamasco*. Of these, *A. Atamasco* was included with a query and the remark that it might have to be separated as a distinct genus; for purposes of typification it may therefore be excluded, and the two other elements alone have to be taken into account. Herbert did not indicate either of them as type, and therefore we may say that he did not choose a lectotype of the generic name *Amaryllis*, either explicitly by specific mention, or implicitly by including only one of the original elements in the genus. For purposes of typification, therefore, his treatment of *Amaryllis* in 1819 need not be taken into account.

It should be mentioned, however, that Herbert gave a description of *Amaryllis* in 1819 and that this description does not cover *A. formosissima* since that species differs in one very important particular. Herbert says "Tube of the corolla outwardly a funnel-shaped continuation of the limb" but the corolla of *A. formosissima* has no tube, the perianth-segments being free right to the ovary, and, moreover, they spread apart at the base and do not connive there to form a false tube. The description given by Herbert covers, and was evidently taken from, the other eight species which he placed without question in *Amaryllis*, so that the genus as defined by him contained

- (1) *A. formosissima* L., one of the original species of the genus, but which does not agree with Herbert's generic description;
- (2) 8 other species (including *A. equestris*), to which Herbert's generic description applies.

Actually (2) represents a genus distinct from (1), a fact which Herbert recognized two years later when he proposed a new genus, *Hippeastrum*, for it, and treated *A. formosissima* as the sole species of another genus, *Sprekelia* Heister.

That Herbert's conception of *Amaryllis* in 1819 was based primarily on the *Hippeastrum* species, is clear from his remark on p. 144 of his *Amaryllidaceae* (1837), where, under *Hippeastrum*, he says "Many years ago, when . . . I first distinguished this genus from the plants with which it had been confounded, I retained for it the name *Amaryllis*" In 1819, however, Herbert was evidently unaware that *A. formosissima* was generically distinct from the other species he had placed with it in *Amaryllis*, and that it did not agree with his generic description. It might be argued that Herbert had implicitly typified *Amaryllis* by supplying a revised generic description which is now known to fit only one of the original elements of *Amaryllis*. Such an argument, however, shows confusion of thought between a type-species of a generic name and a typical species of a genus. If the type-species should happen to be a morphologically aberrant species, as compared with the rest of its congeners, it will obviously not agree with a description drawn up from the more typical species. Consequently we cannot

argue in this case that, because *A. equestris* was a typical species of *Amaryllis* as that genus was defined by Herbert in 1819, it was therefore implicitly chosen by him as the lectotype of the generic name.

Two years after the publication of his work in 1819, Herbert produced the famous "Appendix," in which he corrected and altered his earlier work in several respects. In the "Appendix" the original species of *Amaryllis* were distributed as follows:—

Linnaean name.	Genus to which Herbert referred the species.	Name under which the species appeared in Herbert's Appendix.
<i>A. Belladonna</i> L. pars typica (the Cape Belladonna)	<i>Amaryllis</i> ...	<i>A. Belladonna</i> Bot. Mag. 733.
<i>A. Belladonna</i> L. quoad literat.	<i>Hippeastrum</i> ...	<i>H. equestre</i> Bot. Mag. 305.
<i>A. orientalis</i> L. ...	<i>Brunsvigia</i> ...	<i>B. multiflora</i> Bot. Mag. 1619.
<i>A. sarniensis</i> L. ...	<i>Nerine</i> ...	<i>N. sarniensis</i> alias <i>Venusta</i> , var. 3. Bot. Mag. 294.
<i>A. zeylanicum</i> L. ...	<i>Crinum</i> ...	<i>C. zeylanicum</i> Bot. Mag. 1171.
<i>A. formosissima</i> L. ...	<i>Sprekelia</i> ...	<i>S. formosissima</i> Bot. Mag. 47.
<i>A. Atamasco</i> L. ...	<i>Zephyranthes</i> ...	<i>Z. Atamasco</i> Bot. Mag. 239.
<i>A. lutea</i> L. ...	<i>Oporanthus</i> ...	<i>O. luteus</i> Bot. Mag. 290.
<i>A. longifolia</i> L. ...	<i>Ammocharis</i> ...	<i>A. falcata</i> Bot. Mag. 1443.
<i>A. guttata</i> L. ...	<i>Boophone</i> ...	<i>B. ciliaris</i> quoad "Specimen in herb. Banks."*

It will be seen at once that this arrangement disposes of all the original elements of *Amaryllis* L. (1753) and retains only *A. Belladonna* (the Cape Belladonna) in the genus. This, therefore, was the first choice of a lectotype for the generic name *Amaryllis*.

In the 1821 arrangement, it will be observed, *A. formosissima* was placed in *Sprekelia*, most of the other species of *Amaryllis* L. emend. Herbert (1819) were included in a new genus *Hippeastrum*, and the name *Amaryllis* was retained for *A. Belladonna*, a species which in 1819 had been referred with four others to a new genus *Coburgia* Herbert.

The reason for this *volte-face* was given by Herbert some years later in *Amaryllidaceae*, 144-145 (1837). The passage is too long to quote, but it should be observed that parts of it are inaccurate.† It shows, however, that Herbert's change of mind came about through the construction which he placed on the observation which Linnaeus made in *Hortus Cliffortianus*, 135, and which is reproduced in full on p. 52 of this article. From Herbert's remarks it is clear that he interpreted this as showing that when Linnaeus proposed

* In *Amaryllidaceae*, 240 (1837) Herbert refers this specimen to *Boophom guttata* and maintains that species as a species distinct from *B. ciliaris*.

† As for example when Herbert states that *Coburgia* was established in *Trans. Hort. Soc.*, whereas it was first proposed in the *Bot. Mag.* sub t. 2113.

the name *Amaryllis* to replace *Lilio-narcissus* of Tournefort, he had primarily in mind the well-known Belladonna of gardens (that is, the Cape plant), and Herbert goes on to say: "It was the exquisite blending of pink and white in that flower, as in the female complexion, that suggested the common name in Italy, and to those lovely tints Linnaeus referred, when he assigned to it the name of a beautiful woman. To suppose he would have alluded to a bright orange flower would be perfectly absurd. It is therefore quite indisputable that Belladonna is the type of the Linnaean genus *Amaryllis*, and it would be an idle insult to the memory of Linnaeus to remove it without any cause."

Strangely enough, Herbert says that *Amaryllis Belladonna* (that is, the Cape Plant) was not one of the species defined in the "Hortus Cliffortianus," and he seems to have been unaware that the second species in that work was precisely the one that Linnaeus named *A. Belladonna* in his *Species Plantarum*. Herbert says that at the time he first revised the genus *Amaryllis* and referred *A. Belladonna* to *Coburgia*, he did not know of Linnaeus's note in the "Hortus Cliffortianus," but that as soon as he learnt of this note he felt that the name *Amaryllis* ought to have been retained for *A. Belladonna*, and consequently he transferred the name to that species in his "Appendix."

It is clear that during the years 1819 to 1821 Herbert was working to bring order out of the chaos which enveloped the genera of the *Amaryllidaceae*, and it was not until 1821 that he himself reached reasonably satisfactory conclusions regarding the genera of the family. These conclusions were embodied in his "Appendix," and succeeding workers have naturally followed the arrangement in that publication, and ignored the earlier and less complete work. Actually the "Appendix" forms the basis upon which all succeeding taxonomy and nomenclature of the family rests, and this has already received recognition by the conservation of *Zephyranthes* Herbert (1821) against *Atamasco* Adanson (1763), and *Nerine* Herbert (1820) against *Imhofia* Heister (1753 and 1755).

It appears that no reason exists for rejecting Hitchcock and Green's choice of *A. Belladonna* as the standard-species (lectotype) of *Amaryllis* and it should therefore be accepted.

IV. THE CORRECT NAME FOR HIPPEASTRUM.

The generic name *Hippeastrum* Herbert dates from Herbert's "Appendix," published December (?) 1821, where it was proposed for a number of plants previously included in *Amaryllis* L.

Two years previously (Bot. Mag. t. 2113) Herbert had retained a number of these plants in *Amaryllis* along with a generically distinct plant *A. formosissima*. As shown in section III of this paper, however, the name *Amaryllis* must be retained for *A. Belladonna* and cannot be applied to *A. formosissima* or to the other species.

In the Bot. Mag. article already mentioned, Herbert proposed a new genus *Coburgia* to which he referred five species, enumerated

thus: 1. *C. blanda* Bot. Mag. 1253*; 2. *C. Belladonna* Bot. Mag. 733; 3. *C. pudica* Ker; 4. *C. reticulata*; 5. *C. multiflora* Bot. Mag. 1619. These belong to three different genera as now understood, nos. 1-3 to *Amaryllis* (the Cape plant), no. 4 to *Hippeastrum* and no. 5 to *Brunsvigia*. In addition Herbert mentioned a number of other species which might also be referred to the genus. In a footnote Herbert said that *C. reticulata* might, in certain circumstances, have to be made a distinct genus, for which he suggested the name *Leopoldia*. The latter is, however, clearly a *nomen provisorium* and has no standing whatsoever at this date (Dec. 1st 1819, date on plate). Moreover, in a later article in the same volume of the Botanical Magazine, sub t. 2124, p. 2 (Jan. 1st 1820, date on plate) Herbert has a footnote "*Reticulata* may decidedly rank as COBURGIA," which cancelled his earlier note. A little later in the same year Herbert apparently changed his mind about *reticulata*, for in a letter to the Secretary of the Horticultural Society, dated March 20, 1820, and which was read to the Society on April 4th, 1820, and subsequently published in the Transactions, 4, 176-184, Herbert says:—"Leopoldia reticulata and striatifolia, § [§ *Amaryllis reticulata* Bot. Mag. 657. And var. *striatifolia* Bot. Mag. 2113, and Bot. Reg. 352. Leopoldia reticulata and striatifolia Bot. Mag. 2113, p. 5.] which are two distinct species of a separate genus, approaching to Coburgia in the seed, and to Amaryllis in the flower, require the stove, and will not thrive with much of the bulb above ground." The part in square brackets appeared in the original as a footnote. It is clear that in this place Herbert definitely proposes the genus *Leopoldia*, with *L. reticulata* and *L. striatifolia* as the only species. The only question that arises is whether or not the generic name was validly published. Herbert's remarks concerning *Coburgia* and *Amaryllis* obviously mean (1) that *Leopoldia* has fleshy seeds like *Coburgia* (which it has) and differs in this respect from *Amaryllis*, which Herbert described in Bot. Mag. t. 2113, p. 3 as having "Seeds flat, shining black, winged," and (2) that *Leopoldia* had flowers like *Amaryllis* and not like *Coburgia*, the effective differences, as defined by Herbert in Bot. Mag. sub t. 2113, being that in the latter the stamens were alternately longer and shorter, whereas in the former they were not. In this respect *Leopoldia* agrees with *Amaryllis*. Herbert's statement, however, is by itself scarcely sufficient to rank as a "description" of the genus. Herbert also gave a direct reference to *Leopoldia* in Bot. Mag. t. 2113, p. 5, where he had said "If *reticulata* be really a native of Brasil. . . . I conjecture that it will be found to form by itself a genus distinguishable from Coburgia by a complete union of the outer laciniae to the tube, and non-alternation of the filaments: in which case I should separate it from Coburgia under the name of *Leopoldia reticulata*, and consider the white-lined sort as a separate species,

* This is obviously an error; t. 1253 is *Amaryllis ornata* Linn. fil. sec. Ker Gawl. (i.e. *Crinum distichum* Herb., fide Baker). *A. blanda* appears in the Bot. Mag. t. 1450.

viz., *striatifolia*. I am unable to state whether the filaments of *reticulata* are alternate or not, which would at once decide whether it be a *Coburgia* or distinct genus." The fact that Herbert definitely accepted it as a distinct genus in the Transactions seems to show that he had discovered that the filaments were not alternate (they are not) and that he considered the distinctions mentioned in the Bot. Mag. were correct and that *Leopoldia* was distinguished from *Coburgia* by the characters mentioned.

Article 42 of the Rules reads: "A name of a genus is not validly published unless it is accompanied (1) by a description of the genus, or (2) by the citation of a previously and effectively published description of the genus under another name; or (3) by a reference to a previously and effectively published description of the genus as a subgenus, section, or other subdivision of a genus," and it is clear that the publication of *Leopoldia* does not conform either to the first or to the third alternative, and does not strictly come under the second. Herbert's reference to Bot. Mag. 2113, p. 5 is certainly to a previous and effectively published description of the genus, but it is not under another name, being, in fact, under the same name, *Leopoldia*, which appeared as a *nomen provisorium* in the Bot. Mag. It is evident, however, that the essential part of article 42 (2) is the citation of a previous and effectively published description, and the possibility of that description having appeared *under the same name*, published as a *nomen provisorium*, was overlooked. Having regard to the obvious intention of article 42, the citation of p. 5 of Bot. Mag. t. 2113 by Herbert may be regarded as validating the name *Leopoldia*.

Thanks to the researches of Mr. W. T. Stearn of the Lindley Library, it is possible to give the date of publication of *Leopoldia* as January 29th or the early days of February 1821, for although the title-page of the volume bears the date 1822, the volume was issued in parts, and Herbert's letter is in part 2, which, Mr. Stearn states (in litt.), appeared Jan. 29-Feb. 1821.

Later in the same year Herbert issued the "Appendix," which Mr. Stearn states (in litt.) was probably published in December, and certainly after May 1st, for in it are references (p. 24) to Bot. Mag. t. 2231 and (p. 23) to Bot. Reg. t. 546, both of which are dated May 1st, 1821. In the "Appendix" Herbert continued to treat *reticulata* and *striatifolia* as a distinct genus—for which, however, he used the name *Coburgia* instead of *Leopoldia*—whilst he established a new genus, *Hippeastrum*, for certain other species.

As mentioned above, the genus *Coburgia* Herbert was first proposed in 1819 with five species. No nomenclatural type was indicated by Herbert, nor is there anything in the original place of publication to show that any one species has claims to be regarded as the type. *C. reticulata*, however, may be excluded from consideration, since it was assigned to the genus with some doubt, and this limits the choice of lectotype to the other four original

species.* Consequently the name *Coburgia* should not be applied to *reticulata* and *striatifolia* as was done in the "Appendix." Herbert evidently argued that since he had referred four of the original species of *Coburgia* to other genera (*C. blanda*, *C. pudica* and *C. Belladonna* to *Amaryllis* and *C. multiflora* to *Brunsvigia*), he was at liberty to use the name *Coburgia* for *C. reticulata*.

Three years after the publication of the "Appendix," Herbert became convinced that *reticulata* and *striatifolia* could not be maintained as generically distinct from *Hippeastrum*, whereupon, in Bot. Mag. sub t. 2475 (date on plate April 1, 1824), he united them with that genus under the name *Hippeastrum*. Now the use of *Hippeastrum* for the resulting genus was wrong, for the generic name *Leopoldia* Herbert (Jan. 29-Feb. 1821), which had been proposed for *reticulata* and *striatifolia*, antedates *Hippeastrum* Herbert (Dec. 1821). Accordingly, when *reticulata* and *striatifolia* were united with *Hippeastrum* in 1824, the name *Leopoldia* should have been adopted for the resulting genus. Consequently the correct name for *Hippeastrum* Herbert, under the Rules, is *Leopoldia* Herbert.

The substitution of *Leopoldia* for *Hippeastrum* to-day, however, would necessitate the making of new combinations for all the species of *Hippeastrum* except *H. reticulatum*, changes which would cause great inconvenience and loss of time to all concerned. It was precisely with such cases in view that the conservation of particular generic names was authorized under the International Rules, Art. 21, and the generic name *Hippeastrum* is therefore proposed for conservation. The grounds for this proposal are as follows:—

- (1) The genus consists of about seventy species, many of which are well known in cultivation.
- (2) The name *Hippeastrum* has been in general use for the genus for over a hundred years (1821–1938). During that period it has been adopted in nearly all monographs and floristic works, among which the following may be mentioned:—

Herbert, Appendix (1821); Herbert, Amaryllidaceae (1837); Kunth, Enum. V. (1850); Baker in Journ. Bot. XVI (1878); Hemsley, Biol. Centr.-Amer. Bot. III (1882–86); Bentham & Hooker f., Gen. Pl. III (1883); Nicholson, Illustr. Dict. Gard. (1884–88); Baker, Handb. Amaryll. (1888); Engler & Prantl, Nat. Pflanzenfam. (1888); Donnell Smith, Enum. Pl. Guatemal.

* Of these, *C. blanda*, *C. pudica* and *C. Belladonna* are generally regarded as conspecific and take the oldest epithet *Belladonna*, so that the choice for the lectotype actually lies between *C. Belladonna* and *C. multiflora*. There is, however, evidence that *C. Belladonna* (sens. ampl.) was actually the type of the generic name, for in his Amaryllidaceae, p. 144, Herbert says "Many years ago, when . . . I first distinguished this genus [*Hippeastrum*] . . . I retained for it the name *Amaryllis*, and proposed that of *Coburgia* for *Belladonna* and *Blanda*," and, referring to the fact that Sweet had proposed *Belladonna* as a generic name for *A. Belladonna* and *A. blanda*, and had proposed a new specific epithet for the former, Herbert says "This was doubly wrong, for with his view he ought to have adopted the proposed name *Coburgia*." It seems clear that Herbert regarded *Coburgia* as founded upon *A. blanda* and *A. Belladonna*.

(1889-1907); Philippi, Pl. Nuevas Chil. (1896); Dyer, Fl. Trop. Afr. (1898); Dalla Torre & Harms, Gen. Siphonog. (1901); Urban, Symb. Antill. (1903-1921); Rendle, Classif. Flow. Pl. (1904); Ascherson & Graebner, Synopsis III (1906); Pulle, Enum. Vasc. Pl. Surinam (1906); Boldingh, Fl. Dutch West Ind. Isl. (1909-14) et Fl. Nederl. West Ind. Eil. (1913); Bailey, Stand. Cycl. Hort. (1915); Haumann & Vanderv. Cat. Phanerog. Argent. (1917); Britton, Fl. Bermuda (1918); Standardized Pl. Names (1923); Bailey, Man. Cult. Pl. (1924); Rendle, Classif. Flow. Pl. ed. 2 (1930); Small, Man. Southeast Fl. (1933); Hutchinson, Fam. Flow. Pl. II (1934); Macbride, Fl. Peru (1936); Standley, Fl. Costa Rica (1937).

The name *Hippeastrum* has, in fact, been used in practically all botanical and horticultural literature since 1837, and nearly all illustrations of the genus that have appeared since that year will be found under that name.

V. CONCLUSIONS.

As a result of a fresh investigation into the identity of *Amaryllis Belladonna* L., it has been shown that this species was not based exclusively on the American plant now known as *Hippeastrum equestre*, as Uphof has stated, but was actually based on a plant of the Cape Belladonna (currently known as *Amaryllis Belladonna*) with which was confused the literature relating to the American plant; consequently the name *Amaryllis Belladonna* cannot be used for the American plant.

With regard to Uphof's conclusions that the genus *Hippeastrum* Herbert should be renamed *Amaryllis* L., and that the Cape Belladonna must be renamed *Callicore rosea* Link, it has been demonstrated that the name *Amaryllis* must be retained for *A. Belladonna* (the Cape plant), and that under the Rules the correct name for *Hippeastrum* is *Leopoldia* Herbert. However, since the adoption of the latter name would cause considerable inconvenience to botanists and horticulturists alike, it has been proposed that *Hippeastrum* Herbert should be placed on the list of *Nomina Generica Conservanda*.

VIII—NOTES ON STREPTOCARPUS. B. L. BURTT.

The genus *Streptocarpus* has attracted a good deal of attention in recent years; it has been studied from the standpoint of its seedlings* and has been in use for some time in genetical and biochemical investigations at the John Innes Horticultural Institution, Merton. During this time a taxonomic study of the genus has been made at Kew and the more important points that have come to light are referred to in the following notes. I am greatly indebted to Mr. W. J. C. Lawrence, who is in charge of the

work on *Streptocarpus* at Merton, for his help in considering the affinities of certain species and for supplying living material of many of them. Miss I. C. Verdoorn of the Division of Plant Industry, Pretoria, visited Kew early in 1938 and the opportunity was taken to discuss a number of the problems affecting the South African species; since her return to Pretoria she has kindly sent over a number of interesting specimens for examination and also seed of several species, which it is hoped will flower at Kew next year. I must also thank Mr. P. J. Greenway of Amani for the benefit of his first hand knowledge of the East African species. In Germany Dr. F. Oehlkers of Freiburg has been working on problems of cytoplasmic inheritance in *Streptocarpus** and a new species, proposed by Dr. Mansfeld of Berlin, was published in his paper. We are indebted to Dr. Oehlkers for sending to Kew a living plant of this species, *S. Comptonii* Mansfeld.

No attempt is made in the present paper to reclassify the genus as a whole, but one or two observations on its primary classification may be made. The arrangement of the genus now in general use is into three equivalent sections, *Unifoliati*, *Rosulati* and *Caulescentes*. This was first proposed by Fritsch in 1893† and was adopted by C. B. Clarke in the Flora Capensis‡ and by Clarke and J. G. Baker in the Flora of Tropical Africa.§ By 1904, however Fritsch|| had recognised the deeper gulf separating *Caulescentes* from the other two sections and had therefore raised it to the rank of a subgenus, which he called *Streptocarpella*: the sections *Unifoliati* and *Rosulati* were combined to form another subgenus, *Eustreptocarpus*. There can be little doubt that Fritsch's later classification gives a much truer representation of the affinities of these groups. The break between *Streptocarpella* and *Eustreptocarpus* is a very real one, unbridged by any species yet known and it is further emphasized by complete sterility between species not of the same subgenus. There is also a difference in the chromosome numbers, which have been determined at Merton: in *Streptocarpella* $2n=30$, in *Eustreptocarpus* $2n=32$.

On the other hand there does not seem to be a hard and fast line between *Unifoliati* and *Rosulati*. For instance in some states *S. rhodesianus* and *S. Pole-Evansii* look like unifoliate species, though other specimens of the former and Miss Verdoorn's observations on living plants of the latter show that they are really rosulate-leaved. It is not certain, however, that their growth morphology is fully equivalent to that of the *S. Rexii* group which is distinguished

* F. Oehlkers, Bastardierungsversuche in der Gattung *Streptocarpus* Lindl. 1. Plasmatische Vererbung und die Geschlechtsbestimmung von Zwitterpflanzen. Zeitschrift für Botanik, **32**, 305 (1938). This paper includes an interesting account of the characteristic *Streptocarpus* inflorescence.

† K. Fritsch, Gesneriaceae in Engler & Prantl, Natürl. Pflanzenfam. **4**, 3B, 151 (1893).

‡ Dyer, Flora Capensis **4**, sect. 2, 438 (1904).

§ Dyer, Flora of Tropical Africa **4**, sect. 2, 504 (1906).

|| K. Fritsch, Die Keimpflanzen der Gesneriaceen, 158 (1904).

* A. W. Hill, The monocotylous seedlings of certain dicotyledons with special reference to the Gesneriaceae. Ann. Bot. New Series, **2**, 127 (1938).

by its more numerous leaves and few-flowered inflorescences. Further investigation may well show that a more satisfactory subdivision of *Eustreptocarpus* can be made if the character of unifoliate or rosulate habit is relegated to a position of secondary importance.

In the following notes the species are arranged alphabetically under the two subgenera.

SUBGENUS EUSTREPTOCARPUS.

S. Bolusi C. B. Clarke in Dyer, Fl. Cap. 4, sect. 2, 445 (1904).

TEMBULAND. Engcobo Mts., 1350 m., 17 Jan. 1896, H. Bolus; 16 Jan. 1896, Flanagan 2749.

GRIQUALAND EAST. Rocky places near Maclear, 1350 m., 29 Jan. 1896, H. Bolus.

Clarke placed this species in section *Rosulati*, apparently because one of Bolus's specimens has two leaves, but his other specimen and that collected by Flanagan (not seen by Clarke), are unifoliate. Perhaps the second leaf on Bolus's Maclear specimen is the second cotyledon which is known to enlarge occasionally (cf. A. W. Hill in *Ann. Bot.* n.s. 2, 129, fig. 5: 1938). In any case *S. Bolusi* does not produce a real rosette of leaves as does *S. Rexii* and other members of the section *Rosulati*, and there is no doubt that it is better referred to *Unifoliati*.

S. breviflos C. B. Clarke—see below under *S. Saundersii*.

S. Comptonii Mansfeld in Zeitschrift für Botanik, 32, 327 (1938), et in Fedde, Repert. Spec. Nov. 45, 64 (1938).

A living plant of this species was kindly sent us by Dr. F. Oehlkers and proved to be the same as an unidentified plant in cultivation at Kew. In both cases the seed had been collected by Dr. E. E. Galpin at Dullstroom in the Transvaal and sent by Dr. R. H. Compton from Kirstenbosch.

S. Comptonii is closely allied to *S. gracilis* B. L. Burt (Kew Bull. 1937, 514) and these two species form a small natural alliance with *S. polyanthus* Hook. and *S. Haygarthii* N. E. Br. Mansfeld mentions four species, which he thinks are allied to *S. Comptonii*; none of these, however, shows the sharply curved corolla tube with laterally compressed mouth which is characteristic of the *S. polyanthus* group.

S. Comptonii shows a distinct tendency towards cleistogamy, a phenomenon which occurs in some wild caulescent species of *Streptocarpus* and in a cultivated form of *S. grandis* (see below), but it is not yet known to occur in the wild in species of *Eustreptocarpus*. The chief differences between *S. Comptonii* and *S. gracilis* are the smaller, paler flowers and shorter inflorescence of the former.

S. cyaneus S. Moore—see below under *S. Rexii*.

S. Gardeni Hook.—see below under *S. Rexii*.

S. Goetzei Engl. in Engl. Bot. Jahrb. 30, 406 (1901). *S. rungweensis* Engl. in Engl. Bot. Jahrb. 57, 217 (1921).

TANGANYIKA TERRITORY. Tukuyu District: outer S. slope of crater wall of Wentzel-Heckmann Lake, 2160–2350 m., 7 March 1932, St. Clair-Thompson 663. Rungwe, 19 Dec. 1911, Stolz 1040; 17 Feb. 1912, Stolz 1121.

NYASALAND. 1891, Buchanan 108, 882, 1088. Shiré Highlands, Buchanan 99.

The species of *Streptocarpus* to be found in the mountains around and near Lake Nyasa are not yet sufficiently well known to permit of a satisfactory classification. *S. Goetzei* and *S. rungweensis* are scarcely separable from a study of herbarium specimens and are best united under the former name. Both have shortish (2.5–3 mm.) calyx-segments, and in this they differ from *S. Mahoni* Hook. f. in which the calyx-segments are 6 mm. long. *S. Mahoni* is still only known from the type material grown at Kew in 1900. There appears to be at least one other species in Nyasaland, represented in the Kew herbarium by a fragmentary specimen from Namasi: further material is necessary before it can be identified.

S. grandis N. E. Br. in Bot. Mag. t. 8042 (1905).

This fine species has been in continuous cultivation since its original introduction, though no further specimens collected in the wild have reached Kew.

Two white-flowered forms of this species are known. One has normal chasmogamous flowers and may be an albino of wild origin. The other is a stunted plant, which often bears malformed inflorescences and cleistogamous flowers. It has been grown under the name *S. Saundersii*, but it is certainly only an abnormal form of *S. grandis*.

S. Haygarthii N. E. Br. ex C. B. Clarke in Dyer, Fl. Cap. 4, sect. 2, 440 (1904).

The description of this species in Flora Capensis has caused confusion by the mention of the leaf "the herbarium fragment 26 in. wide." This refers not to *S. Haygarthii* but to *S. grandis*, as has been already pointed out by N. E. Brown (Bot. Mag. t. 8042).

The flowers have been described by collectors as "pale blue" or "lilac," but a form grown at Merton had deep cobalt-violet flowers. In all other respects it agreed with the wild specimens of *S. Haygarthii*. As a horticultural subject it is disappointing, for though a plant may remain in flower for a long time, there are seldom more than one or two flowers expanded together.

S. hirtinervis C. B. Clarke in Dyer, Fl. Cap. 4, sect. 2, 446 (1904), quoad descr., et in Dyer, Fl. Trop. Afr. 4, sect. 2, 507 (1906).

NYASALAND. Mt. Mlanji, 2100–2700 m., Dec. 1900, Purves 91 (type). Mt. Malosa, 1200–1800 m., Nov.–Dec. 1896, Whyte.

Although the species was first published in Flora Capensis, Clarke there states that the description was taken chiefly from the Nyasaland specimens and he has definitely labelled Purves 91 as the type. He associated with this species a specimen collected by H.

Bolus at Chwenka in Griqualand East, but this unfortunately was an error of judgment. Bolus's specimen lacks both the densely silky-villous indumentum and the saccate corolla-base that are characteristic of true *S. hirtinervis*; the saccate corolla-base, which is its most interesting feature, was not even mentioned by Clarke either in Flora Capensis or in the Flora of Tropical Africa. *S. hirtinervis* is, then, a species endemic in Nyasaland and the record of its occurrence in South Africa must be erased. Bolus's Chwenka specimen, it may be mentioned, is probably a very small specimen of *S. polyanthus* Hook.

S. Junodii Beauverd. This is a synonym of *S. cyanus*: see under *S. Rexii*.

S. luteus C. B. Clarke—see under *S. parviflorus*.

S. Michelmoriei B. L. Burtt; species nova *S. grandis* N. E. Br. affinis, floribus pluribus saturatus caeruleis fauce luteis, corollae lobis majoribus distinguenda. *S. Mahoni* Hook. f. etiam accedit sed inflorescentiis altioribus, corollis fauce luteo-notatis, filamentis eglandulosis, fructibus longioribus facile distinguitur.

Herba acaulis, unifoliata. *Folium* ultra 30 cm. longum attingens, apice mox emarcidum, usque 30 cm. latum, ovatum, basi subcordatum, margine obtuse crenulato-serrulatum, utrinque breviter pubescens, nervis lateralibus c. 20 ut costa subtus prominentibus carnosus. *Inflorescentiae* usque 30 cm. altae, serie acropetala productae, multiramosae. *Flores* numerosi subpenduli per paria cymose dispositi, saturate caerulei, circum fauce purpurei et in fauce luteo-notati. *Pedicelli* usque 2.5 cm. longi, pubescentes. *Calyx* ad basin 5-partitus, lobis linearibus 5 mm. longis, pubescens. *Corolla* 3 cm. longa, tubo levissime arcuato, ore obliquo aperto c. 8 mm. diametro, lobo anteriore 6 mm. longo et 7 mm. lato, antero-lateralibus et postero-lateralibus 4 mm. longis et 7 mm. latis, omnibus rotundatis, extra breviter pubescens. *Stamina* fertilia 2, 1 cm. supra basin corollae affixa; filamenta crassa, arcuata, glabra; antherae reniformes 3 mm. latae, inter se cohaerentes. *Staminodia* 2, 2 mm. longa, clavata. *Discus* annularis, 0.3 mm. altus. *Pistillum* 2.2 cm. longum, dense et brevissime pubescens, stigmatibus capitato. *Fructus* pubescens, usque 12 cm. longus, spiraliter tortus.

S. RHODESIA. Chipetzana headwaters, 1200 m., Sanyuerton 1889 (herb. mus. brit.). Melssetter, 1929, *Earthy* 4 (herb. nat. pretor.). Inyamadzi River, near Mt. Selinda, Melssetter, on steep shaded bank of stream, flowers blue, of numerous plants only one in flower, 4 July 1934, *Michelmorie* 299—cult. in hort. reg. bot. kew. flor. Mar. 1938 (typus).

Streptocarpus Michelmoriei made a fine display when in flower at Kew this spring; in fact so fine were the plants in comparison with the wild specimen that some doubt as to its origin was entertained and the plant was tentatively determined as a variety of

S. grandis. Further investigation, however, and comparison with a wild herbarium specimen sent on loan from Pretoria (*Earthy* 4 from Melssetter) have placed the matter beyond doubt and the plant has to be recognised as a fine new species allied to *S. grandis* N. E. Brown, which comes from Natal, but differing in a number of well-marked characteristics (see diagnosis above).

The discovery of *S. Michelmoriei* is of considerable interest for it serves to link *S. grandis* geographically and morphologically to *S. Mahoni*, a Nyasaland species. As far as the shape of the corolla is concerned *S. Wilmsii* probably belongs to the same group, but it differs from the other species in having a corolla with spotted markings.

S. Muddii C. B. Clarke—see below under *S. Wilmsii*.

S. parviflorus Hook. f. in Bot. Mag. t. 6636 (1882). *S. luteus* C. B. Clarke in DC. Monogr. Phan. 5, pt. 1, 153 (1883).

The confusion which has long existed between these species has never been satisfactorily resolved and a complete re-investigation of the problem has therefore been made.

The first mention of the name *Streptocarpus parviflorus* is in Drège, Zwei Pflanzengeographischen Documenten, where it appeared as a *nomen nudum*, and so it remained until Sir Joseph Hooker figured a plant under this name for the Botanical Magazine (t. 6636: 1882). This, therefore, was the first valid publication of the name and it is necessary to decide what is to be considered its type. Hooker mentioned three herbarium species which he thought, at that date, were conspecific with the living plant he was illustrating, but he found out later that they were distinct (cf. Bot. Mag. t. 7036: 1889). These herbarium specimens are the plant which is generally accepted as the one referred to by Meyer's name *S. parviflorus*, though we have already seen that it is Hooker's description and illustration which constitute the first valid publication of that name. Comparison of Hooker's description with his illustration and the herbarium specimens quoted shows conclusively that the description was based on the living plant with the exception that one character, "Capsule one and a half inch long" (given in the English description only), was very probably taken from Bolus's herbarium specimen as no fruits of the living plant were figured. For the rest there are a number of points in the description, the shape and posture of the leaves and the colour of the flower, which definitely exclude the herbarium specimens, while the character of the fruit mentioned above is not diagnostic of either group. We cannot escape the conclusion therefore that the type of *Streptocarpus parviflorus* is the living plant which Hooker figured.

This article was followed in the next year by C. B. Clarke's account of the genus (DC. Monogr. Phan. 5, pt. 1, 153: 1883), which was in manuscript when Hooker wrote. Clarke took up the name *S. parviflorus* E. Mey. and provided a description based on the herbarium specimens. Hooker's article in the Botanical Magazine,

however, was published first and it is his plant that must be regarded as the type of *S. parviflorus*. Clarke's species, which we may cite as *S. parviflorus* E. Mey. ex C. B. Clarke—non Hook. f., therefore requires a new name and *S. Meyeri* B. L. Burtt is proposed. This name will be validated by the reference to Clarke's description and one of the specimens quoted by him, *Bolus* 389 collected at Graaf Reinet in 1873, is its type.*

The second illustration in the Botanical Magazine under the name *S. parviflorus* was published in 1889 (t. 7036) and the article was also by Sir Joseph Hooker. The plant figured here was raised from seed brought from near Grahamstown and it is the "*S. parviflorus* E. Mey." of Clarke's Monograph and, later, of Flora Capensis. Although the use of the name "*parviflorus*" by Hooker shows that both he and Clarke regarded the plant intended by Meyer as the "type" of the species, Hooker's original description under this name renders such an interpretation impossible under the Rules of Nomenclature.

The next question which arises concerns the status of *S. parviflorus* Hook. f. Hooker himself said (Bot. Mag. sub t. 7036), that it was *S. luteus* C. B. Clarke, but in Flora Capensis Clarke quotes it under his *S. parviflorus* (= *S. Meyeri* above).

S. luteus was based on two specimens, one collected by Nelson near Houtbosch (Woodbush) in the Pietersburg district of the Transvaal, the other collected by Gerrard at a cascade on the Tugela River, Natal. Since Clarke wrote, the species has been recollected in the Houtbosch district but nowhere else and Gerrard's Natal specimen remains its only representative outside that area. Enough is now known of the type of distribution found in *Streptocarpus* to say that such a discontinuous range is highly improbable. On the other hand Gerrard's specimen is not good enough to permit one to say with certainty that it and Nelson's Houtbosch plant represent two distinct species. It seems possible that the Natal plant has a narrower corolla-tube and calyx-lobes tending to be recurved at the tips, but the matter cannot yet be settled. It is to be hoped that Gerrard's plant from the Tugela River will be introduced into cultivation, meanwhile as a precautionary measure it is proposed to designate Nelson 378 as the lectotype of *S. luteus*.

Having settled the application of the names *S. parviflorus* and *S. luteus* we must now consider whether they represent distinct species. It has already been mentioned that Clarke quoted *S. parviflorus* Hook. f. under the species we have just renamed *S. Meyeri*, whereas Hooker considered his *S. parviflorus* equal to Clarke's *S. luteus*. A careful comparison of Hooker's illustration and description of *S. parviflorus* and Clarke's specimens of *S. luteus* fails to show any important difference. Unfortunately indisputable *S. luteus* has not

yet been introduced into cultivation and dried specimens in this genus can be very misleading, but in this case there seems to be little doubt that *S. parviflorus* and *S. luteus* are one and the same species. The former name has priority by eighteen months.

Although only published by E. Meyer as a *nomen nudum* "*S. parviflorus*" has been generally attributed to that author and is a good instance of the danger attached to this practice. Had care been taken to discover who published the first valid description the changes in nomenclature now found necessary could have been made long since.

The two species are thus:—

S. parviflorus Hook. f. in Bot. Mag. t. 6636 (1882). *S. luteus* C. B. Clarke in DC. Monogr. Phan. 5, pt. 1, 153 (1883), in Dyer, Fl. Cap. 4, sect. 2, 445 (1904).

TRANSVAAL. Pietersburg Div.: Houtbosch Berg, on tree-trunk in dense jungle, a lovely gloxinia-like little white flower with yellow throat, rare, Nelson 378 (type). Houtbosch, *Rehmann* 5974, 5975, 5976. Debegeni, Woodbush, flowers white, sometimes 2 or 4 dark lines in throat, very occasionally blooms have a faint bluish tinge, 14 Jan. 1938, v. d. Merwe 1621.

S. Meyeri B. L. Burtt, nom. nov. *S. parviflorus* E. Mey. ex C. B. Clarke in DC. Mon. Phan. 5, pt. 1, 152 (1883); Hook. f. in Bot. Mag. t. 7036 (1889); C. B. Clarke in Dyer, Fl. Cap. 4, sect. 2, 445 (1904)—non Hook. f.

EASTERN CAPE PROVINCE. Albany Div. to Graaf Reinet, Graaf Reinet, in lateribus meridionalibus montium, 1050 m., 1873, *H. Bolus* 389 (type).

S. paucispiralis Engl.—see below under *S. rhodesianus*.

S. Pole-Evansii Verdoorn in Fl. Pl. S. Afr. t. 678 (1937).

TRANSVAAL. Crocodile Poort, Barberton District, flowered at Irene, Pretoria District, Feb. 1937, *Pole-Evans* 3977. Barberton, under rocks, Jan. 1909, *Thorncroft* (Transvaal Dept. Agric. 2780).

The discovery of Thorncroft's specimen amongst undetermined sheets in the Kew herbarium enables Miss Verdoorn's description to be completed as follows: "*Fruit* 1 cm. long, densely pubescent, the valves twisted through only 3 turns of the spiral."

One of the most interesting characteristics of *S. Pole-Evansii* lies in its production of external granules of a red pigment on the leaves, inflorescences and flowers. The only other species in which this is known to occur is *S. Dunnii*, a point which naturally raises the question whether these two species are not rather closely allied to one another.* The leaf of *S. Pole-Evansii* is not unlike that of

*The pigment of *S. Dunnii* is under investigation at Merton and has been the subject of a letter to "Nature" by J. R. Price and R. Robinson ("A new natural colouring matter of the naphthalene group," *Nature*, 142, 147, July 23, 1938), who have named it *dunnione*. The pigment of *S. Pole-Evansii* is not yet available in sufficient quantity for investigation.

* The Drège specimen originally named *S. parviflorus* by E. Meyer cannot be taken as the type of the name *S. Meyeri* as it was not amongst those described by C. B. Clarke.

S. Dunnii: it is much smaller, but has the same silvery indumentum and conspicuous venation. In both species the fruit is short, but that of *S. Dunnii* is very much stouter than that of *S. Pole-Evansii*, or indeed of any other species. In corolla-shape, however, the two species are very different, *S. Pole-Evansii* having a strongly bilabiate corolla with a long trilobed lower lip and the upper lobes reflexed; in *S. Dunnii* it is but very slightly bilabiate and all the lobes are spreading and subequal.

Should *S. Dunnii* and *S. Pole-Evansii* be found to be closely related, as a result of further examination of the living plants and their crossing, it will indicate that the form of the corolla may not be an altogether reliable guide to the affinities of the species of *Streptocarpus*.

S. Rexii (Hook.) Lindl. in Bot. Reg. t. 1173 (1828).

S. Gardeni Hook. in Bot. Mag. t. 4862 (1855).

S. cyaneus S. Moore in Journ. of Bot. 55, 172 (1905).

It is convenient to consider these three species together as they were all included under the one name, *S. Rexii*, by C. B. Clarke in Flora Capensis. They are very closely related to one another and form an alliance of species which may be to some extent vicarious, but are not entirely so. They need critical studies in the field before their detailed inter-relationships can be worked out, and the following notes are in many respects tentative.

S. Rexii first became known from specimens and seeds sent home from the Cape by Bowie, the Kew collector, in 1818. It was described in 1827 by Sir W. J. Hooker, who placed it in the Indian genus *Didymocarpus*. *Streptocarpus* was not founded as a distinct genus until the plant was figured by Lindley for the Botanical Register, in the following year. The original specimens were collected in George and Knysna divisions of Cape Province, but further exploration has shown that these are the westernmost localities of a rather wide range which extends through the eastern Cape to Natal and northwards as far as Barberton in the eastern Transvaal.

S. Gardeni was described from a cultivated specimen and a number of differences between it and *S. Rexii* were given. In his treatment of the family for De Candolle's Monographiae Phanerogamarum C. B. Clarke retained *S. Gardeni* as a distinct species, but in Flora Capensis changed his view and reduced it to *S. Rexii*, remarking "I suppose *S. Gardeni* Hook., which I know only from the picture in Bot. Mag. t. 4862, to be a fine garden variety of *S. Rexii*." Recently, however, plants exactly agreeing with Hooker's original illustration of *S. Gardeni* have been rediscovered, and it is found that his recognition of *S. Gardeni* as a species distinct from *S. Rexii* is perfectly justified.

Hooker said of *S. Gardeni* "The leaves are longer and handsomer, more ovate in form, more rugose and more wrinkled, and cordate

at the base. The scapes are almost invariably two-flowered, the calyx has the segments patent at their apices. The corolla, though of nearly the same size, is different in form and colour; uniform pale-blue in *S. Rexii*, here the tube is green or greenish white, and the limb lilac; moreover the tube is much broader (not suddenly contracted in the lower half), slightly curved downwards; and the limb, instead of spreading into five nearly equally spreading lobes, is more decidedly two-lipped, the two lobes of the upper lip moderately patent, and the three composing the lower lip porrected or standing forward: the lines on the lower lip, instead of being blue and continuous, are sanguineous, and interrupted in dots or short streaks: the stigma too is different."

Mr. W. J. C. Lawrence has grown *Gardeni* and *Rexii* side by side for two or three years and is convinced that they are distinct species, the differences he recognises being substantially the same as those given by Hooker. His breeding experiments show that *Gardeni* and *Rexii* give different results when crossed with the same species, and that certain characters of *Gardeni*, for instance the more ovate, wrinkled leaves, are nearly always detectable in crosses in which it is concerned. He also tells me that *S. Gardeni* has two lines on its upper petals which are inherited as a dominant character in the species-crosses he has made.

Miss I. C. Verdoorn, working with living plants at Pretoria, had also come to the conclusion that there was a second smaller species allied to *S. Rexii* which she knew from specimens collected near Estcourt, Natal. Until a recent visit to Kew she was unaware that this species was Hooker's *S. Gardeni*, but examination of the Botanical Magazine plate convinced her of their identity.

Lastly a careful examination of the herbarium material has showed that several specimens which can be recognised as *S. Gardeni* by the discontinuous markings on the corolla, were included by Clarke under *S. Rexii*. These species are not easy to separate in dried material but it is very often possible and probably only very imperfect material will be found indeterminable.

The following specimens are referable to *S. Gardeni* Hook. :—
NATAL. Without locality, *Sutherland*, *Gerrard* 763. Umhloti, flowers lilac, February, *Wood* 796. Roxburgh, 1200 m., *Armstrong*. Estcourt, Cathkin Peak, Drakensberg, in wooded kloofs, on rocks and epiphytic, flowers pale mauve, 1200–1500 m., 28 Jan. 1932, *Galpin* 11763.

ORANGE FREE STATE. Without locality, 1862, *Cooper* 1031.
S. cyaneus S. Moore, the third species in this group, is known from the Eastern Transvaal and Swaziland and is a most perplexing form. Clarke saw a specimen collected by Galpin which he referred to *S. Rexii* with the remark "I suppose it to be a high level form." The salient features of this species are the short corolla tube and the pinkish mauve colour of the corolla. It has been figured in the Botanical Magazine (t. 8521) and in the Flowering

Plants of South Africa (t. 666 as *S. Rexii*). If it is accepted as a distinct species from *S. Rexii* (and Dr. E. P. Phillips of Pretoria does not consider it is so) it is difficult to delimit satisfactorily, for the corolla varies considerably in length, even if always shorter than in *Rexii*, and there may be 1 to 5 flowers on a peduncle. No useful purpose can be served by trying to reach a definite decision at present and the problem is mentioned here chiefly to draw attention to the need of careful studies in the field. It is essential that the relative frequency and variation of the species in the field should be known and that the various forms should be introduced into cultivation for careful study.

S. cyaneus was published in 1905 and thus antedates *S. Junodii* Beauverd (Bull. Herb. Boiss. Sér. II, 7, 699: 1907) which proves to be conspecific. *S. Junodii* was described from a cultivated plant raised from seed sent by Junod from Mt. Mamotsuri in the Transvaal (see Bull. Herb. Boiss. Sér. II, 7, 1013: 1907). The type specimens of *S. Junodii* have kindly been sent to Kew on loan from the Boissier herbarium and there is no doubt as to its identity with *S. cyaneus*.

There is one other plant of this alliance of which only dried specimens have been seen, but it appears to have a narrower corolla tube than in *S. Rexii* and the flowers are more numerous (3-6 in an inflorescence). The corolla tube has a yellow throat, which also serves to distinguish it sharply from *S. Rexii*, but not from *S. cyaneus* which also shows this character, though whether constant in that species is uncertain. Specimens of this plant have been seen from Graskop (Reynolds 2659), Sabie (Koeleman s.n.) and Tzaneen (v. d. Merwe 1179) but they are not sufficient for description and the species is only mentioned here to call attention to the need for further specimens.

S. rhodesianus *S. Moore* in Journ. of Bot. 49, 188 (1911). *S. paucispiralis* Engl. in Engl. Bot. Jahrb. 57, 217 (1921).

N.W. RHODESIA. Katonina Hills, between rocks on hill, 27 Dec. 1907, Kassner 2162.

ANGOLA. Moxico Province, Lusavo Falls, in shade of overhanging rocks on hillside in very shallow peaty soil. Leaves flannelly, tips dying against the rock, soft with white hairs; stems reddish; calyx whitish, corolla tube dull wine red, lobes white, hairs of throat white, tube inside white spotted with wine red. Jan. 1, 1938, Milne-Redhead 4056.

Kassner 2162 is the type number of both *S. rhodesianus* and *S. paucispiralis*.

S. rungwensis Engl.—see above under *S. Goetzei*.

S. Saundersii Hook. in Bot. Mag. t. 5251 (1861); C. B. Clarke in DC. Mon. Phan. 5, pars 1, 150 (1883) et in Dyer, Fl. Cap. 4, sect. 2, 443 (1904). *S. Saundersii* Hook. var. *breviflos* C. B. Clarke in DC. Mon. Phan. 5, pars 1, 150 (1883). *S. breviflos* C. B. Clarke in

Dyer, Fl. Cap. 4, sect. 2, 443 (1904). *S. tubiflos* C. B. Clarke in Dyer, Fl. Cap. 4, sect. 2, 441 (1904) p.p.—quoad specimen Woodianum.

Our knowledge of *S. breviflos* is based on a single, very poor, herbarium specimen and a note by N. E. Brown in the Gardeners' Chronicle (III. 375: 1875). Brown said the plant had been grown by Mr. Saunders of Reigate and that it was "A very distinct variety, having more numerous and smaller drooping flowers, of a delicate waxy white colour, faintly tinged and spotted with lilac, and proved to be really a very charming variety of the parent plant." Unfortunately no herbarium specimens of this plant have been preserved. The specimen quoted by Clarke was collected by Cooper in the Orange Free State; it is a very poor one and I cannot see why it should be separated specifically from *S. Saundersii*: the corollas present look like some young ones on the sheets of true *S. Saundersii*. Unfortunately both typical *S. Saundersii* and the form noted by N. E. Brown have been lost to cultivation: it may be that the latter will prove distinct from the specimen described by Clarke as *S. breviflos*, but we must await its rediscovery.

Another of the species proposed by Clarke in Flora Capensis which fails to withstand critical investigation is *S. tubiflos*. This was based on two specimens: Wood 572 was originally determined by Clarke as *S. Saundersii* and I have failed to discover why he should have altered this decision; the specimen is a good match of others included in *S. Saundersii* and should be referred to that species. The other specimen, Gerrard 191, is a fairly good match of the type of *S. Cooperi* C. B. Clarke and undoubtedly belongs to that species.

Clarke referred some Nyasaland plants to *S. tubiflos* in the Flora of Tropical Africa. These do not agree with either of his type specimens but are probably referable to *S. Goetzei* and have already been discussed (p. 70).

A plant which has been passing as *S. Saundersii* in Botanic Gardens is really an abnormal form of *S. grandis* and has been mentioned under that species (p. 71).

S. tubiflos C. B. Clarke—see above under *S. Saundersii*. *S. tubiflos* was based on a mixture of *S. Saundersii* and *S. Cooperi*. For notes on tropical African plants referred to *S. tubiflos* (Baker and Clarke in Fl. Trop. Afr. 4, sect. 2, 506: 1906) see under *S. Goetzei*.

S. Vandeleuri E. G. Bak. et S. Moore in Journ. of Bot. 39, 262 (1901).

The description of the leaf given by Baker and Spencer Moore is quite unlike that of any other species of *Streptocarpus*, and examination of the type specimen in the British Museum herbarium shows that the leaf in question is a radical leaf of *Berkheya setifera* DC. (*Compositae*). The species has, however, been correctly identified with more complete material from the characters of its inflorescence. Thus, although the species is clearly based on two "entirely discordant elements," there seems no necessity for proposing it as a

nomen confusum (cf. International Rules, ed. 3, Art. 64). The following description of the leaf should replace that in the original description:

"Leaf solitary, more or less cordate at the base, the living part about 15-20 cm. long, 13-20 cm. broad, closely appressed pubescent on both surfaces, crenulate-serrulate on the margins, nerves and midrib prominent below."

S. Wilmsii Engl. in Bot. Jahrb. **26**, 363 (1899); C. B. Clarke in Dyer, Fl. Cap. **4**, sect. 2, 447 (1904). **S. Muddii** C. B. Clarke in Dyer, Fl. Cap. **4**, sect. 2, 443 (1904).

TRANSVAAL. Umzeila, 1877. *Mudd.* Amongst rocks, summit of Saddleback range, Barberton, flowers white with purple spots in the throat, *Galpin* 822. Spitzkop, Lydenburg, *Wilms* 1025. Mauchsberg, Pilgrims Rest, colour white with purple spots, leaf about 12 inches long, March 1938, *v. d. Merwe* 1649.

When describing *S. Wilmsii* Engler quoted a specimen collected by Wilms but omitted to give the number. Clarke saw a duplicate of Wilms 1025, named *S. Wilmsii*, at the British Museum but came to the conclusion that it did not fit the description of that species and included it under his new species *S. Muddii*. Under *S. Wilmsii*, which he placed as an imperfectly known species, Clarke remarked that the description might do for *S. Galpini*.

The type specimen in the Berlin herbarium, which was kindly sent to Kew on loan, is numbered *Wilms* 1025 and is clearly conspecific with *S. Muddii*, which name it must supersede as it was published some five years earlier.

The fruits of this species were unknown when it was originally described, but we are now able to add the following details from *v. d. Merwe* 1649: fruit about 9 cm. long, 1.5 mm. in diameter, shortly pubescent, the hairs multicellular and spreading at right angles from the fruit wall.

SUBGENUS STREPTOCARPELLA.

S. bambuseti B. L. Burtt, sp. nov.; ad huc pro varietate *S. glandulosissimi* Engl. habitus, sed corollae tubo longiore, fauce haud clauso, fructu multo brevior facile distinguitur. *S. glandulosissimus* var. *longiflorus* Mansfeld in Notizbl. Bot. Gart. Mus. Berlin, **12**, 95 (1934).

Herba circiter 50 cm. alta, caule pilis multicellularibus glandulosis intermixtis dense obsito. *Folia* opposita, leviter inaequalia, petiolo usque 4.5 cm. longo ut caule piloso et glanduloso; lamina elliptica, usque 10 cm. longa et 4 cm. lata, apice subobtusata vel acuta, basi cuneata, inaequilateralis, utrinque pilis multicellularibus appresse pubescens, infra rubra, nervis lateralibus utrinsecus circiter 10 ascendentibus. *Inflorescentiae* longipedunculatae, axillares, etiam ex axillis foliorum infimorum orientes. *Pedunculus* infra ramos 6-13 cm. longus, pilis quam in caule brevioribus multicellularibus glandulosis intermixtis dense vestitus. *Flores* in pedicellis glandulosis 1 cm. longis per paria editi. *Calycis* lobi lanceolati 4 mm. longi, subobtusati, dense glanduloso-pubescentes. *Corollae* tubus circiter 2 cm. longus

superne leviter ampliatus; lobi 2 superiores parvi obtuse ovati circiter 6 mm. longi et 5 mm. lati, 3 inferiores multo maioribus . . . *Fructus* 4 cm. longus, stylo persistente 1 cm. longo incluso, 2.5 mm. diametro, spiraliter tortus.

TANGANYIKA TERRITORY. Nguru Mountains, Mafulumla, c. 2000 m., 9 July 1933, *Schlieben* 4094 (mus. bot. berl.)—"Nebenwald, Kraut vereinzelt im Bambusdickicht. Bl. dunkel blau. Blattunterseite rot. Kiguru: Pune. Wurzeln werden gehocht und als Medizin gegen Bauchschmerzen getrunken."

The Uluguru and Nguru Mountains of eastern Tanganyika are evidently a stronghold of *Streptocarpus* and a number of interesting species have already been described from them. It is difficult to see why *S. bambuseti* should ever have been regarded as a variety of *S. glandulosissimus* for, quite apart from the flower size, the fruits are much shorter and broader while the leaves and calyx are also easily distinguishable. Its exact affinity is uncertain, but it is probably more closely allied to *S. euanthus* Mansf. than to *S. glandulosissimus*.

S. Bequaertii De Wild.—see below under *S. glandulosissimus*.

S. Buchananii C. B. Clarke in Dyer, Fl. Trop. Afr. **4**, sect. 2, 510 (1906). *S. lilacinus* Engl. in Engl. Bot. Jahrb. **57**, 214 (1921).

TANGANYIKA TERRITORY. Im Gebiet des Rungwe um 1450 m. an einem Gebirgsbach, 25 Jan. 1910, *Stolz* 558 (type number of *S. lilacinus* Engl.). Mt. Rungwe, outer south slope of the crater-wall of the Wenzel-Heckmann Lake, "epiphyte with purple flowers and fleshy stem and leaves on tree trunks, often near base and sometimes among moss on rocks at their feet, rare and local," 7 March 1932, *St. Clair Thompson* 664. Undalie, "purple-flowered herb, common in primary forest out of earth catchments round tree stems." 1950 m., 25 Feb. 1933, *Davies* D. 857. Hills north of Lake Nyasa, *Johnson* (comm. *Waller* April 1884).

NYASALAND. Shiré Highlands, "lovely blue," *Buchanan* 410 (comm. Hort. Bot. Edinens. Dec. 1881: type).

Engler had not seen *S. Buchananii* when he described *S. lilacinus*. I have compared the type of Clarke's species with the specimen of *Stolz* 558 at Kew and can find no significant differences. *S. Buchananii* is the southernmost of the caulescent species and is geographically isolated from its allies, *S. Holstii* and *S. glandulosissimus*, which do not extend south of the Uluguru Mountains. It is closely allied to *S. Holstii* but is distinguished by its rather large thin leaves with ascending nerves.

It is presumably this plant which Engler recorded from Shiré as *S. caulescens* (Pflanzenwelt Ost-Afrikas, C, 363: 1895), for that species does not reach further south than the Uluguru Mountains.

S. caulescens *Vatke* in Linnaea, **43**, 323 (1882); Clarke in DC. Mon. Phan **5**, pt. 1, 154 (1888); Engl. Pflanzenwelt Ost-Afrikas, C, 363 (1895); Hook. f. in Bot. Mag. t. 6814 (1885); Baker et

Clarke in Dyer, Fl. Trop. Afr. 4, sect. 2, 507 (1906). *S. rivularis* Engl. in Engl. Bot. Jahrb. 18, 78 (1894); Pflanzenwelt Ost-Afrikas, C, 363 (1895); Baker et Clarke, l.c. 508 (1906). *S. caulescens* var. *pallidiflorus* Engl. in Engl. Bot. Jahrb. 19, 154 (1894). *S. caulescens* forma *pallidiflorus* Engl. Pflanzenwelt Ost-Afrikas, C, 363 (1895). *S. pallidiflorus* C. B. Clarke in Dyer, Fl. Trop. Afr. 4, sect. 2, 508 (1906).

KENYA COLONY: Teita Hills.

TANGANYIKA TERRITORY: Paré, Usambara and Uluguru Mountains.

S. caulescens is evidently variable in flower colour, but at present only the purple-blue coloured form is in cultivation. The herbarium specimens indicate that the pale form is not a single well-marked type and it is therefore preferable to drop the use of a varietal name for it until more is known of the range and importance of colour-variation in the whole species.

S. caulescens var. *ovatus* C. B. Clarke, which was afterwards raised to specific rank by the same author, is indistinguishable from *S. Holstii* Engl. (see below).

S. glandulosissimus Engl. in Engl. Bot. Jahrb. 18, 78 (1894), Pflanzenwelt Ost-Afrikas, C, 363 (1895); Baker and Clarke in Dyer, Fl. Trop. Afr. 4, sect. 2, 509 (1906). *S. Volkensii* Engl. in Engl. Bot. Jahrb. 19, 153 (1894), et in Pflanzenwelt Ost-Afrikas, C, 363 (1895); Baker and Clarke, l.c. 510 (1906). *S. ruwenzoriensis* Baker, l.c. 510 (1906). *S. Smithii* C. B. Clarke, l.c. 511 (1906). *S. Mildbraedii* Engl. in Engl. Bot. Jahrb. 57, 215 (1921). *S. Bequaertii* De Wild. in Rev. Zool. Afr. 8, Suppl. Bot. 38 (1920).

CENTRAL AND EAST TROPICAL AFRICA. Kivu and Ruwenzori, Aberdare Mts. and Mt. Kenya, Kilimanjaro, Ufume Mt. and • Uluguru Mts.

S. glandulosissimus Engl. is the most widely distributed of the caulescent species and, with the exception of *S. Rexii*, of the whole genus. Its range serves to emphasize a feature in the distribution of the genus as a whole. This is that no *Streptocarpus* has yet been found on Mt. Elgon, though *S. glandulosissimus* is known from Ruwenzori, the Aberdares, Mt. Kenya and Kilimanjaro, and other species, both caulescent and acaulescent, are known from the Aberdares, Mt. Kenya and Kilimanjaro. *Streptocarpus* is, however, essentially a south tropical genus and if it did occur on Mt. Elgon that would actually be its northernmost point in Africa.

Four of the "species" now united under *S. glandulosissimus* were known to Baker and Clarke when they prepared their account of the genus for the Flora of Tropical Africa, these were *S. glandulosissimus*, *S. Volkensii*, *S. ruwenzoriensis* and *S. Smithii* and all were retained as distinct species. *S. glandulosissimus* was widely separated from the other species in the key by being placed amongst those with glabrous ovary. This, however, was an error. The indumentum of the ovary is not mentioned by Engler in his

description (only the style is said to be glabrous) and dissection of a flower bud from Holst 2742 (one of the numbers quoted by Engler) shows that the young ovary is shortly but densely pubescent.

The characters used to discriminate between the other three species were taken from the shape of the calyx-lobes, and the relevant part of the key was:—

Calyx lobes oblong, subacute, gland-tipped.....17. *S. Volkensii*

Calyx lobes having a linear-tip ended by a gland.....18. *S. ruwenzoriensis*

Calyx lobes ovate; tip triangular without a gland...19. *S. Smithii*
From this alone it will be realized that the three "species" are very closely allied, and they are certainly indistinguishable by a merely superficial examination. Moreover, a close examination of the calyx-lobes has failed to show characters falling into the three categories indicated in the key.

The type sheet of *S. Smithii* bears three specimens which have been marked A, B and C by Clarke. A and B are flowering specimens and are the type of *S. Smithii*, C is a fruiting specimen referred by Clarke to *S. ruwenzoriensis*. Clarke has sketched an ovate-elliptic calyx-lobe from one of the flowering specimens, but I can find nothing like it; they are 2 mm. long and about 1 mm. broad and broadest very near to the base, not near the middle as Clarke shows. On specimen C the calyx-lobes are 3 mm. long, but I can find no difference in the leaves of A, B and C and I have no doubt that they all represent one species. This is confirmed by finding that the calyx-lobes tend to be slightly longer in the fruiting than in the flowering condition and the larger size of the calyx lobes in C is in this respect perfectly normal.

With regard to the presence of a gland at the tip of calyx lobes I find that this is usually present though it may be more or less suppressed. The exact shape of the tip naturally varies somewhat, but I can find no differences that can be judged in any way significant.

The type of *S. Mildbraedii* has been sent on loan to Kew from Berlin and I am quite unable to distinguish it from *S. glandulosissimus*. I have not seen the type of *S. Bequaertii*, but I have compared a specimen named at Brussels (Lebrun 151 from Kivu) and De Wildeman's description with *S. glandulosissimus* and can find no distinguishing characteristics.

Mansfeld's *S. glandulosissimus* var. *longiflorus* cannot be retained as a variety of this species and I have raised it to specific rank under the name *S. bambuseti* (p. 80).

S. Holstii Engl. in Engl. Bot. Jahrb. 18, 77 (1894); Baker et Clarke in Dyer, Fl. Trop. Afr. 4, sect. 2, 508 (1906). *S. caulescens* var. *ovatus* C. B. Clarke in DC. Mon. Phan. 5, pt. 1, 154 (1888). *S. ovatus* C. B. Clarke in Dyer, Fl. Trop. Afr. 4, sect. 2, 508 (1906).

TANGANYIKA TERRITORY. Usambara, Derema, Holst 2233. Amani district, 750 m., Greenway 754. Amani, 1050–1200 m., B. D. Burtt 4862. Magila, S. lat. 5° 8', Kirk.

Kirk's specimen, which is the type of *S. ovatus* Clarke is clearly conspecific with the Kew specimen of Holst 2233 and it is remarkable that Clarke should have retained *ovatus* and *Holstii* as distinct species. *S. Holstii* is easily distinguished from *S. caulescens* by its thin, subsetose indumentum and larger flowers.

S. Kirkii Hook. f. in Bot. Mag. t. 6782 (1884); Baker and Clarke in Dyer, Fl. Trop. Afr. 4, sect. 2, 509 (1906).

TANGANYIKA TERRITORY. "From the hilly country of the coast opposite Zanzibar," Kirk, cultivated at Kew. Anani, 900 m.; herb growing as an epiphyte in association with Bird's Nest fern on forest tree on edge of forest and exposed to full sunlight; fls. pale blue; 2 July 1928, Greenway 750. Handeni district, Mgera subdistrict, on Nyogi mountain, 1050-1200 m.; on mossy branches of trees of rain forest clothing mountain summit; succulent herb with lilac-coloured-pale blue flowers, small petals; probably commoner than one is inclined to imagine as growing in inconspicuous places; 16 Sept. 1933, B. D. Burt 4869.

Zanzibar is the locality given for this species in the Flora of Tropical Africa, but Hooker had already pointed out that it probably came from the mainland opposite, and this is confirmed by its rediscovery by Greenway and B. D. Burt.

S. lilacinus Engl.—see *S. Buchanani*.

S. Mildbraedii Engl.—see *S. glandulosissimus*.

S. ovatus C. B. Clarke—see *S. Holstii*.

S. pallidiflorus C. B. Clarke—see *S. caulescens*.

S. rivularis Engl.—see *S. caulescens*.

S. ruwenzoriensis Baker—see *S. glandulosissimus*.

S. Smithii C. B. Clarke—see *S. glandulosissimus*.

S. Volkensii Engl.—see *S. glandulosissimus*.

Species excludenda.

"**S. curvipes** Rydberg in Bull. Torr. Bot. Club, 1901, 267—North America" sec. Index Kewensis, Suppl. 3, 172—sphalm. *Streptopus curvipes* Rydberg.

IX—CONTRIBUTIONS TO THE FLORA OF TROPICAL AMERICA: XL.*

PLANTAE HINTONIANAE: X.†

THE GENUS QUERCUS. E. F. WARBURG.

The following is an enumeration of the oaks collected by Mr. G. B. Hinton in the years 1932-1937 in Mexico. It is complete with the

* Continued from K.B. 1939, 26.

† Continued from K.B. 1939, 2.

exception of a few numbers which consist of plants in flower which could not be accurately matched with existing specimens.

The collections are particularly valuable in that most of the species are represented by a good range of specimens illustrating the variation within the species which is characteristic of so many members of the genus.

For several previously known species these collections extend the range into another of the regions into which Trelease ("The American Oaks," Mem. Nat. Acad. Sc. Washington, 20, 1924) divides North America. I consider that certain species are much more widespread than Trelease believes and that species described from different regions should in some instances be reduced to synonymy.

Many species of oak described from Mexico have been based on very inadequate material. Some of these are probably based on sucker shoots of other described species, others may be true species, but until proper material is forthcoming from their type localities it is impossible to identify new collections with them and I have had to ignore them.

Quercus baldoquinae Trel. in Mem. Nat. Acad. Sc. Washington, 20, 53 (1924).

STATE OF MEXICO. District of Temascaltepec: Luvianos, "small oak, leaves grey-green, trunk black," Aug. 1933, Hinton 4503; June 1934, Hinton 6195; July 1934, Hinton 6363; Chorrera (vernacular name "Encino prieto"), June 1934, Hinton 6200; Pantoja (vernacular name "Encino prieto") Aug. 1934, Hinton 6385; Tejupilco, Sept. 1934, Hinton 6561.

STATE OF GUERRERO. District of Mina: Placeres-Puerta, 800 m., July 1936, Hinton 9051; Parotas (vernacular name "Tocuz"), grows to 1250 m., Aug. 1936, Hinton 9198.

Quercus centralis Trel. l.c. 61.

STATE OF MEXICO. District of Temascaltepec: Tejupilco, June 1932, Hinton 732; July 1934, Hinton 6331, 6332; Sept. 1934, Hinton 6564, 6565; San Lucas, June 1934, Hinton 6218.

STATE OF GUERRERO. District of Mina: Zihuaqueo-Filo Mayor, 1680 m., Aug. 1936, Hinton 9297; Zihuaqueo-Ojo de Agua, 1500 m., Aug. 1936, Hinton 9312, 9314, 9315.

Quercus platyphylla E. F. Warburg, sp. nov. Affinis *Q. macrophyllae* Née, a qua indumento foliorum brevior, costa basi et petiolo subtus glabro differt.

Arbor 6 m. alta. Ramuli 3-4 mm. diametro, glabri, leviter sulcati, brunnei, lenticellis parvis albidis instructi, sub anthesin aphylli. Gemmae dilute brunneae, obtusae, pubescentes, c. 2 mm. longae, terminales stipulis subulatis instructae. Folia obovata, 14-26 cm. longa, 8-17 cm. lata, apice obtusa, basi auriculata, marginibus crenatis, supra glabra, subtus lutescenti-stellato-tomentella, costa et nervis primariis glabris fuscis exceptis; nervi

primarii utrinque 10–15, in sinus desinentes, supra impressi, subtus prominentes; nervi secundarii plus minusve paralleli, supra impressi, subtus prominentes; nervi reticuli supra inconspicui, subtus prominentes; petioli c. 5 mm. longi, glabri. *Amenta mascula* usque 8 cm. longa, rhachii stellato-pubescente, floribus satis laxis, sepalis anguste ellipticis obtusis marginibus et nervo pubescentibus, filamentis glabris, antheris ovoideis quam filamentis paulo brevioribus. *Flores feminei* 2 vel 3 in pedunculo brevioribus, sepalis triangularibus pubescentibus, stylo brevissimo, ovario pubescente. *Fructus* 1–2, sessiles vel subsessiles; cupulae hemisphaericae, satis crassae, c. 2 cm. diametro, 1 cm. altae, intra tomentosae, cicatrice 1 cm. diametro, squamis ovatis acuminatis basi incrassatis dilute brunneis c. 4 mm. longis; glandes ovoideae, 2.5–3 cm. altae, brunneae, apice excepta glabrae, siccitatae sulcatae.

STATE OF MEXICO. District of Temascaltepec: Nanchititla, July 1934, *Hinton* 6360 (type); May 1934, *Hinton* 6058; June 1934, *Hinton* 6172; Rincón, May 1932, *Hinton* 642, 643; July 1934, *Hinton* 6259 (vernacular name "Jiote," same tree as 642); Las Mesas, March 1933, *Hinton* 3504 (from which flowers are described); June 1934, *Hinton* 6204; July 1934, *Hinton* 6242; La Labor, June 1933, *Hinton* 4038; Cerro los Berros, April 1934 (vernacular name "Encino Prieto") *Hinton* 5778; Tejupilco, May 1934, *Hinton* 6064; March 1935, *Hinton* 7443; Cucha, June 1934, *Hinton* 6071; July 1934, *Hinton* 6247 (same tree).

This species seems to differ constantly from the rather more northern *Q. macrophylla* Née (which is not represented in the collection) by the characters given above, but it varies considerably. In the type the leaves and fruit are large and the acorns sessile. The most extreme divergence from this is found in 6204 and 6242 with much smaller acute leaves and small pedunculate acorns. Numbers 6058, 6071 and 6247 show the same features in a less marked degree. Some or all of these may be hybrids with *Q. magnoliifolia* Née.

***Quercus magnoliifolia* Née** in Anal. Cienc. Nat. 3, 268 (1801). *Q. lutea* Née l.c.—*Q. circinata* Née l.c. 272.

STATE OF MEXICO. District of Temascaltepec: Tule, June 1934, *Hinton* 6088, 6252; Nanchititla, June 1934, *Hinton* 6165; Chorrera, June 1934, *Hinton* 6198; Pantoja, June 1934, *Hinton* 6220, Aug. 1934, *Hinton* 6386 (same tree); Tejupilco, June 1934, *Hinton* 6235; July 1934, *Hinton* 6329; Ocotopoc, Aug. 1934, *Hinton* 6388, 6390, 6391.

STATE OF GUERRERO. District of Mina: Filo Aguazarca (top) 1760 m. (vernacular name "Encino Amarillo"), Aug. 1936, *Hinton* 9235; Manchon, 1200 m. (vernacular name "Encino Amarillo"), Aug. 1936, *Hinton* 9241; Zihuaqueo-Ojo de Agua, 1500 m., Aug. 1936, *Hinton* 9313.

This species is very well represented in Hinton's collections and like the preceding shows considerable variation in size of acorn, the

extremes being *Hinton* 6386 with very small cups and acorns, and *Hinton* 6390 with large cups with the upper scales narrow, thus resembling those of *Q. platyphylla*.

Through the courtesy of the University of Madrid I have had the opportunity of examining the types of *Q. magnoliifolia* Née and *Q. lutea* Née. *Q. lutea* differs from *Q. magnoliifolia* only in the leaves being slightly cordate at the base and is not separable as a distinct species. *Q. circinata*, of which the type was unfortunately not available, seems to be the same species with the leaves rather more deeply toothed; some of Mr. Hinton's specimens are of this form. *Q. Liebmanni* Oerst. ex Trel. is probably the same species, but as it comes from further south I hesitate to reduce it until further material is available.

***Quercus haematophlebia* Trel. l.c. 66.**

STATE OF MEXICO. District of Temascaltepec: Chorrera, July 1934, *Hinton* 6326.

I am extremely doubtful if this species is distinct from the last.

***Quercus peduncularis* Née** in Anal. Cienc. Nat. 3, 270 (1801); Trel. l.c. 69.

STATE OF MEXICO. District of Temascaltepec: Cumbre de Tejupilco, Sept. 1934, *Hinton* 6555; Sept. 1935, *Hinton* 8422 (same tree).

***Quercus dolichopus* E. F. Warburg, sp. nov.** A *Q. pedunculari* Née et speciebus affinis tomento multo minus laxo in ramulis pedunculisque diutius persistente, a *Q. magnoliifolia* Née tomento longiore, squamis cupularum longioribus et angustioribus differt.

Frutex vel *arbor*, 3 m. alta. *Ramuli* hornotini tomentosi, haud sulcati, circiter 3 mm. diametro; annotini cinerei, lenticellis parvis cortice paulo pallidioribus instructi. *Gemmae* ovoideae, c. 2 mm. longae, tomentosae. *Folia* obovato-elliptica, 9–13 cm. longa, 3.5–6 cm. lata, apice obtusiuscula, basi rotundata, marginibus supra medium leviter repando-dentata, dentibus breviter mucronatis, supra glabra costa et nervis primariis exceptis, satis nitida, subtus dense et aliquanto lanuginose tomentosa, tomento dilute brunneo; nervi primarii utrinque 8–14, in dentes desinentes, subtus prominentes; petioli 0.5–1 cm. longi, dense tomentosi. *Fructus* 1–4 in pedunculo tomentoso 7–10 cm. longo; cupulae poculiformes, 1.4–1.8 cm. diametro, c. 1 cm. altae, intus tomentosae, cicatrice 0.8–1.0 cm. diametro, squamis ovatis acuminatis tomentosis dilute brunneis appressis haud incrassatis c. 3 mm. longis.

STATE OF MEXICO. District of Temascaltepec: San Lucas, March 1934, *Hinton* 6378.

This species, though represented only by a single gathering, is distinct in its tomentum from previously described species.

***Quercus rhodophlebia* Trel. l.c. 74.**

STATE OF MEXICO. District of Temascaltepec: Socabon, June 1932, *Hinton* 829; Oct. 1934, *Hinton* 6806, 6807; Dec. 1934, *Hinton*

7108; Comunidad-Cieneguillas (vernacular name "Encino"). June 1934, *Hinton* 6085.

***Quercus atriglans* E. F. Warburg**, sp. nov. Affinis *Q. innuncupatae* Trel., sed ramulis fuscioribus, lenticellis valde prominentibus, glandibus longioribus differt.

Arbor 10 m. alta. *Ramuli* c. 3 mm. diametro, glabri vel paulum pubescentes, leviter sulcati, brunnei, lenticellis albidis prominentibus instructi, demum cinerei. *Gemmae* ovoideae, obtusae, squamis ciliatis exceptis glabrae, 2-3 mm. longae. *Folia juvenilia* purpurea, supra parce rufo-pubescentia, subtus nervis stellato-pubescentia. *Folia adulta* obovato-elliptica, 8-16 cm. longa, 3-5-8 cm. lata, apice obtusa vel obtusiuscula, basi cordata vel auriculata, marginibus supra medium repando-dentata, dentibus saepe mucronatis, supra (costa basi excepta) glabra glaucescentia, subtus praecipue in nervis sparse lutescenti-stellato-pubescentia; nervi primarii utrinque 8-14, supra leviter impressi, subtus valde prominentes, in dentes desinentes; nervi reticuli supra aliquanto impressi, subtus prominentes; petioli 0.7-1.2 cm. longi, pubescentes. *Amenta mascula* usque ad 7 cm. longa, rhachi pubescente; flores basin versus satis sparsi, supra densiores, sepalis extus pubescentibus triangulari-ovatis, staminibus c. 8, filamentis sepalis subaequilongis glabris. *Flores feminei* in pedunculo c. 2 cm. longo suffulti, sepalis triangulari-ovatis pubescentibus, stylo brevior, stigmatibus capitatis, ovario pubescente. *Fructus* anno primo maturascentes, 1-3 in extremitate pedunculi 3-6 cm. longi 3 mm. lati; cupulae poculiformes, 1.5-2 cm. diametro, c. 1 cm. altae, intus tomentosae, cicatrice 1 cm. diametro vel minore, squamis appressis ovatis acutis c. 3 mm. longis basi incrassatis; glandes globoso-cylindricae, 1.5-2 cm. altae, apice depressae, olivaceo-fuscae, c. $\frac{1}{3}$ inclusae.

STATE OF MEXICO. District of Temascaltepec: Ypericones, Sept. 1934, *Hinton* 6549 (typus); Oct. 1934, *Hinton* 6773; Nov. 1934, *Hinton* 6993, 6994; Cajones, March 1933, *Hinton* 3475 (from which the young leaves and female flowers are described), 3481 (vernacular name "Encino Roble"); Jan. 1935, *Hinton* 7194, 7198; Pantoja March 1933, *Hinton* 3548; La Labor, Oct. 1934, *Hinton* 6592; Comunidad, Sept. 1934, *Hinton* 6585; Cuental, Oct. 1934, *Hinton* 6805 ("ripe acorn black").

STATE OF GUERRERO. District of Mina: Filo Aguazarca, Aug. 1936, *Hinton* 9217 (at 1400 m.), 9233 (at 1600 m.); Manchon, 1280 m., Aug. 1936, *Hinton* 9227; 1340 m. Oct. 1936, *Hinton* 9647; Aguazarca-Filo, Sept. 1936, *Hinton* 9572; Zihuaqueco Ojo de Agua, 1500 m., Aug. 1936, *Hinton* 9317; Zihuaqueco Filo Mayor, 1680 m., Aug. 1936, *Hinton* 9299.

This species differs from most of the series *Reticulatae* in being much less pubescent and in its narrower leaves. It may not be distinct from *Q. innuncupata* Trel., but that species is based on inadequate material and until more material from the type locality is available it seems best to keep this distinct as it is so well

represented in Hinton's collections. A notable feature of the present species is the colour of the acorn, dark olive brown when dry and, according to Mr. Hinton, black when fresh, at least in his number 6805. The leaves vary from merely sinuate to dentate on different trees. In particular *Hinton* 7198 has dentate leaves, narrower than usual, less thickened cup scales and a paler acorn (but this may not be ripe); it may be distinct. *Hinton* 6585 is similar in leaf but lacks fruit.

***Quercus scytophylla* Liebm.** in Overs. Dansk. Vidensk. Selsk. Forhandl. 1854, 180; Trel. l.c. 125.

STATE OF MEXICO. District of Temascaltepec: La Labor, Feb. 1933 (vernacular name "Encino Blanco"), *Hinton* 3242, 3244; Las Mesas, June 1934, *Hinton* 6089, 6203 (same tree); Socabon, 2320 m., June 1934, *Hinton* 6091; July 1934, *Hinton* 6246; Nanchitla, June 1934, *Hinton* 6136, 6156; July 1934, *Hinton* 6348; Feb. 1935, *Hinton* 7379; Comunidad-Cieneguillas, 2250 m., July 1934, *Hinton* 6239.

STATE OF GUERRERO. District of Mina: Tihaqueco-Filo Mayor, 1700 m., Aug. 1936, *Hinton* 9291.

Previously only recorded from Oaxaco. Apparently not a very variable species. Judging by Trelease's figure, it appears to me likely that *Q. campanariensis* Trel. (l.c. 126) is based on a sucker shoot of this species.

***Quercus crassifolia* Humb. et Bonpl.** Pl. Aequinoct. 2, 49 (1809); Trel. l.c. 128; *Q. stipularis* Humb. et Bonpl. l.c. 47; Trel. l.c. 130.

STATE OF MEXICO. District of Temascaltepec: Las Cruces, 2650 m., Feb. 1933, *Hinton* 3283; Meson Viejo, 2800 m., Feb. 1933, *Hinton* 3288; Cumbre, May 1934, *Hinton* 5920; Jan. 1935, *Hinton* 7196; Comunidad-Cieneguillas, 2200 m., May 1934, *Hinton* 5935; Sept. 1934, *Hinton* 6572, 6573; Comunidad, July 1934, *Hinton* 6243; Aug. 1934, *Hinton* 6402, 6403; San Miguel, Aug. 1934, *Hinton* 6401; Sept. 1934, *Hinton* 6586.

STATE OF GUERRERO. District of Mina: Fresnos, 2140 m., Oct. 1936, *Hinton* 9743.

This species, which appears to be widespread and rather common in central Mexico, is variable in the shape and size of its leaves. Hinton's specimens connect the large-leaved *Q. crassifolia* with the smaller-leaved and much more deeply toothed *Q. stipularis*. I retain for the combined species the better-known name used by Liebmann and de Candolle.

The differences between this species and *Q. fulva* Liebm. are misunderstood by Trelease. Ross 376, which is figured by Trelease and from which he describes the acorns, is certainly not *Q. fulva* and, judging by Trelease's figure, is *Q. crassifolia*. The fact that it comes from Michoacan would support this assumption.

Pringle 1361, Palmer 76 (both of these referred to *Q. fulva*) and Hartman 713 [referred to *Q. pennivenia* Trel. (l.c. 135)] from

Chihuahua and Durango, of all of which I have seen specimens, are either *Q. crassifolia* or more probably a distinct new species, but I have not seen fruit.

Quercus fulva differs in its much thinner rich yellow tomentum and long pointed buds. The only specimen I have seen, apart from Seeman's original gathering, is *Ortega* 973, unfortunately, like the type, unlocalised, but from Sinaloa or Tepic. It is without fruit.

Quercus moreliana Trel. (l.c. 130) is probably based on a sucker shoot of *Q. crassifolia*, but I have not seen a specimen.

***Quercus crassifolia* var. *errans* (Trel.) E. F. Warburg, stat. nov. - *Q. errans* Trel. l.c. 131.**

STATE OF MEXICO. District of Temascaltepec: Comunidad Cieneguillas, June 1934, *Hinton* 6083; Sept. 1934, *Hinton* 6574.

Differs from the type in its biennial fruit.

***Quercus Hahnii* Trel. l.c. 131.**

STATE OF MEXICO. District of Temascaltepec: Comunidad Cieneguillas, 2250 m., July 1934, *Hinton* 6240; Oct. 1934, *Hinton* 6800.

***Quercus sagata* E. F. Warburg, sp. nov.** Affinis *Q. Hahnii* Trel., a qua differt glande apice plana, foliis acutis.

Arbor 10 m. alta. *Ramuli* hornotini stellato-tomentosi, leviter sulcati, 2-3 mm. diametro, annotini cinereo-brunnei, lenticellis inconspicuis. *Gemmae* ovoideae, rufo-brunneae, glabrescentes, usque ad 5 mm. longae. *Folia* ovato-lanceolata, 8-10.5 cm. longa, 2-3.5 cm. lata, apice acuta mucronata, basi rotundata vel cordata, marginibus integra revoluta paulum undulata, supra glabra, costa basi excepta, siccitate nitida (statu vivo haud nitida sec. *Hinton*) subtus dense lanuginoso-stellato-tomentosa, tomento dilute lutescenti-brunneo; nervi utrinque 10-13, marginem versus curvati et in venulas plurimas divisi, e costa angulis diversis exeuntes, supra impressi, subtus prominentes; petioli c. 1 cm. longi, 2 mm. lati, stellato-tomentosi. *Fructus* anno secundo maturescentes, saepissime solitarii, subsessiles; cupulae poculiformes, c. 1.5 cm. diametro, intus sericeo-pubescentes, cicatrice c. 7 mm. diametro, squamis appressis obtusis puberulis dilute brunneis apice fuscioribus; glandes globoso-cylindricae, c. 1.3 cm. diametro, apice planae umbonatae, dilute brunneae, deterisile furfuraceo-pubescentes, cicatrice plana vel paulum concava.

STATE OF MEXICO. District of Temascaltepec: Cuental, Sept. 1934, *Hinton* 6577, "leaves very dark green, not shiny."

This differs from other species of this section in its flat-topped acorn. The leaves resemble in shape those of *Q. dysophylla* Benth. but are never toothed. I at first thought this species might be referred to *Q. Fournieri* Trel. but that species has a more floccose deterisile tomentum and much smaller fruits.

***Quercus esperanzae* Trel. l.c. 132.**

STATE OF MEXICO. District of Temascaltepec: Meson Viejo, Sept. 1934, *Hinton* 6587, "leaves shiny."

This has larger leaves, and veins less impressed than in the type. It may prove to be a distinct species.

***Quercus Urbani* Trel. l.c. 133.**

STATE OF MEXICO. District of Sultepec: Almoloya, Jan. 1933, *Hinton* 3224 (vernacular name "Cucharillo"). District of Temascaltepec: Nanchititla, Feb. 1933, *Hinton* 3423; June 1934, *Hinton* 6149 (vernacular name "Cucharillo"); Pantoja, June 1933, *Hinton* 4079; Comunidad-Cieneguillas, July 1934, *Hinton* 6241.

***Quercus Hintoni* E. F. Warburg, sp. nov.** Affinis *Q. Rosei* Trel. et *Q. planipoculae* Trel.; ab illa cupula fere plana, ab hac cupula multo minore (1.5 cm. nec 2-2.5 cm. diametro) margine haud involuta, ab utraque foliis angustioribus et longioribus discedit.

Arbor 8 m. alta. *Ramuli* hornotini stellato-tomentosi, sulcati, 3-4 mm. lati, annotini minus tomentosi, purpureo-brunnei, lenticellis inconspicuis. *Gemmae* ovoideae, rufo-brunneae, acutae vel obtusae, 3-4 mm. longae, glabrae, squamis ciliatis exceptis. *Folia juvenilia* supra rubra, subtus albida, utrinque tomentosa. *Folia adulta* crasse coriacea, lanceolata vel ovato-lanceolata, 9-18 cm. longa, 3-5.5 cm. lata, apice acuta vel acuminata, aristata, basi rotundata vel cuneata, margine integra vel apicem versus parcescime aristato-serrata, supra glabra, costa et nervis furfuraceo-tomentosis exceptis, haud nitentia, subtus dense et crasse lanato-tomentosa, tomento lutescenti-brunneo; nervi primarii utrinque circiter 10, supra impressi, subtus prominentes, marginem versus sursum curvantes et in venulas plurimas divisi, nervi reticuli supra impressi subtus prominentes; petioli 1-2.5 cm. longi, utrinque dense stellato-tomentosi. *Amenta mascula* usque 10 cm. longa, floribus densis, rhachi tomentosa, sepalis rubris ovatis obtusis longe ciliatis, antheris rubris glabris quam filamenta glabra paulo brevioribus. *Flores feminei* stylo longiore spatulato instructi. *Fructus* anno secundo maturescentes, 1-3 in pedunculo 0.5-1.5 cm. longo; cupulae patelliformes, c. 1.5 cm. diametro, usque ad 5 mm. altae, squamis laxae appressis triangulari-ovatis obtusiusculis cinereo-brunneis pubescentibus, intus tomentosae, cicatrice 8 mm. diametro; glandes globoso-ovoidae, apice acutae, c. 1.5 cm. altae.

STATE OF MEXICO. District of Temascaltepec: Nanchititla, Jan. 1933, *Hinton* 3096; June 1934, *Hinton* 6148; July 1934, *Hinton* 6349, 6350, 6359 (typus); Los Hornos, Dec. 1932, *Hinton* 2835; Berros, Dec. 1934, *Hinton* 5779 (from which flowers and young leaves are described); June 1934, *Hinton* 6074; Sept. 1934, *Hinton* 6570; Oct. 1934, *Hinton* 6588 (same tree as 5779); Tenayac, April 1934, *Hinton* 6074; Chorrera, June 1934, *Hinton* 6199, July 1934, *Hinton* 6327; Pantoja, June 1934, *Hinton* 6225; Tule, Aug. 1934, *Hinton* 6392.

The leaves vary considerably: some specimens have broader ovate or obovate leaves than the type, on some trees they are always entire, on others always toothed, sometimes raised between the veins

on the upper surface. The peduncles may be close together on the branches or widely spaced. The shape and size of the cup is however, very constant. A remarkable form with thin tomentum beneath, but otherwise like the type, occurs at San Lucas (July 1934, *Hinton* 6376). It may possibly be a hybrid. Possibly also hybrids with *Q. conspersa* are the following. Berros, June 1934, *Hinton* 6073; Sept. 1934, *Hinton* 6569. They have leaves like *Q. conspersa* in shape but much more tomentose below. The fruits resemble those of *Q. conspersa* (see p. 93).

***Quercus planipocula* Trel. l.c. 136.**

STATE OF GUERRERO. District of Montes de Oca: Vallecitos, 600 m., Nov. 1936, *Hinton* 9905.

***Quercus chiquihuitillonis* Trel. l.c. 139.**

STATE OF MEXICO. District of Temascaltepec: Nanchititla, Jan. 1933, *Hinton* 3102; Dec. 1933, *Hinton* 5346; May 1934, *Hinton* 6060; Nov. 1934, *Hinton* 7068; Feb. 1935, *Hinton* 7363.

***Quercus peradifolia* E. F. Warburg, sp. nov.** Affinis *Q. chiquihuitillonis* Trel. et *Q. Langlassei* Trel., a quibus fructu anno primo maturescente, foliis ovalibus latioribus discedit.

Arbor 10 m. alta. *Ramuli* hornotini dense lutescenti-tomentosi, vix sulcati, annotini glabri, cinereo-brunnei, lenticellis inconspicuis. *Gemmae* minimae (minores quam 1 mm.), conicae, glabrae. *Folia* ovalia vel obovato-ovalia, 5-7 cm. longa, 3-5 4-5 cm. lata, apice rotundata, basi cordata vel auriculata, marginibus integra paulum revoluta, supra glabra, costa basi tomentosa excepta, paulum nitida, nonnunquam aliquanto bullata, subtus haud nitida, glabra, fasciculis axillaribus exceptis; costa utrinque prominens, apicem versus bifurcata; nervi primarii utrinque 6-8, supra paulum impressi, subtus valde prominentes, marginem versus semel vel bis bifurcati et per arcus inter se conjuncti; nervi reticuli supra inconspicui, subtus aliquanto prominentes; petioli circiter 1 mm. longi, utrinque tomentosi. *Fructus* solitarii vel bini, subsessiles, anno primo maturescentes; cupulae patelliformes, c. 1-5 cm. diametro, marginibus involutae, intus sericeo-tomentosae, cicatrice c. 1 cm. diametro, squamis appressis obtusis ovato-triangularibus apice excepta tomentosis; glandes globoso-ovoidaeae, umbonatae, c. 1-7 cm. altae, glabrescentes, pallide brunneae, cicatrice plana, intus tomentosae.

STATE OF MEXICO. District of Temascaltepec: Nanchititla, May, 1934, *Hinton* 6062.

This may prove to be conspecific with the last, but in addition to the characters given above it differs in the shape of the fruit and the less conspicuous veins of the leaf. The species of this alliance (*Langlasseiae* and *Aristatae*) have not been much collected and the status of the various forms is not clear.

The figure of *Q. elliptica* Née given by Trelease strongly suggests this species in shape of leaf and venation and it is possible that it

may be found to belong to this group rather than to *Q. Castanea* Née as suggested by Trelease.

***Quercus Bourgaei* Oerst. ex Trel. l.c. 168, var. *ilicifolia* Trel. l.c.**

STATE OF MEXICO. District of Temascaltepec: Socabon, June 1932, *Hinton* 828; Sept. 1934, *Hinton* 6582 (2500-3000 m.); Meson Viejo, 2830 m., Feb. 1933, *Hinton* 3263; Los Hornos, 2550 m., Feb. 1933, *Hinton* 3296; Las Cruces, 3350 m., April 1933, *Hinton* 3693; Cumbre, 2950 m., April 1934, *Hinton* 5782; Cajones, Dec. 1934, *Hinton* 7104.

***Quercus crassipes* Humb. et Bonpl. Pl. Aequinoct. 2, 737 (1809); Trel. l.c. 175.**

STATE OF MEXICO. District of Temascaltepec: Comunidad-Cieneguillas, June 1934, *Hinton* 6084; Hornos, June 1934, *Hinton* 6094; Sept. 1934, *Hinton* 6583 (at 2500 m.).

***Quercus Rossii* Trel. l.c. 179.**

STATE OF MEXICO. District of Temascaltepec: Platanal, June 1934, *Hinton* 6210 San Lucas, June 1934, *Hinton* 6217 (vernacular name "Encino Colorado"); Oct. 1934, *Hinton* 6737 (vernacular name "Encino Chino"); Temascaltepec, Aug. 1934, *Hinton* 6398; Dec. 1934, *Hinton* 7188; La Labor, Oct. 1934, *Hinton* 6593 (vernacular name "Encino Blanco"); Cucha, Oct. 1934, *Hinton* 6804; Cajones, Jan. 1935, *Hinton* 7193.

STATE OF GUERRERO. District of Mina: Manchon, 1200-1300 m., Aug. 1936, *Hinton* 9224, 9225, 9226; Zihaqueo-Ojo de Agua, 1500 m., Aug. 1936, *Hinton* 9316; Pilas, 1600 m., Sept. 1937, *Hinton* 10736.

***Quercus conspersa* Benth. Pl. Hartweg. 92 (1842).—*Q. nitida* Mart. et Gal. in Bull. Acad. Brux. 10, 210 (1843), non Raf. (1838); Trel. l.c. 191.—*Q. uruapanensis* Trel. l.c. 143.—*Q. Candolleana* Trel. l.c. 191.**

STATE OF MEXICO. District of Temascaltepec: Timbres, June 1934, *Hinton* 6087; Oct. 1934, *Hinton* 6591; Nanchititla, June 1934, *Hinton* 6140; Aug. 1934, *Hinton* 6516; Pantoja, June 1934, *Hinton* 6224; Aug. 1934, *Hinton* 6384 (same tree); Mina de Agua, July 1934, *Hinton* 6238; Tejupilco, July 1934, *Hinton* 6330; Ocotepc, Aug. 1934, *Hinton* 6387, 6389; Temascaltepec, Aug. 1934, *Hinton* 6399, 6400; Oct. 1934, *Hinton* 6589; Cajones, 2500 m., Aug. 1934, *Hinton* 6409.

STATE OF GUERRERO. District of Mina: Manchon, 1300 m., Aug. 1936, *Hinton* 9216; Pilas, 1600 m., Sept. 1937, *Hinton* 10729, 10737.

As I understand this species it extends from Guatemala through Oaxaca to Michoacan. It is an extremely variable species in leaf form. Three main forms of leaf occur: (1) large, entire, ovate; (2) smaller, entire, ovate-lanceolate, much tapered at the apex; (3) large, setaceously serrate. These appear always to occur on

different trees. The acorn cups vary from hemispheric to obconic. These differences in the shape of cup are not in any way correlated with the leaf differences. On the other hand the texture and tomentum of the leaf, the inrolling of the margin of the cup and the biennial fruit appear to be constant. *Q. uruapancensis* Trelease, though not placed by its author near *Q. conspersa* appears to me not to differ at all from the entire-leaved form of that species.

It is possible that *Q. conspersa* will ultimately be reduced to the little known *Q. acutifolia* Née which needs collecting again in the type locality, though that species appears to differ in the much longer teeth to the leaves, and, if Humboldt and Bonpland are correct in their determination, by the rounded leaf-base.

Quercus candicans Née in Anal. Cienc. Nat. 3, 277 (1801).
Q. calophylla Cham. et Schlecht. in Linnaea, 5, 79 (1830).

STATE OF MEXICO. District of Temascaltepec: La Sierrita, March 1933, *Hinton* 3451; Nanchitilla, June 1934, *Hinton* 6147, 6169; July 1934, *Hinton* 6358, 6361; Aug. 1934, *Hinton* 6515; Oct. 1934, *Hinton* 6761, 6763; Comunidad, Oct. 1934, *Hinton* 6801.

STATE OF GUERRERO. District of Mina: Aguazarca Filo, Sept. 1936, *Hinton* 9569; Pilas, 1600 m., Sept. 1937, *Hinton* 10673, 10722, 10738.

I can see no difference between the eastern *Q. calophylla* and the western *Q. candicans*, assuming that Trelease is right, as I think he is, in regarding *Q. candicans* as a juvenile or sucker form of what he calls *Q. candicans* f. *michoacana* (l.c.). Hinton's specimens show little variation.

Quercus ochroësthes E. F. Warburg, sp. nov. Affinis *Q. candicans* Née, a qua tomento densiore lutescente, nervis supra magis profunde impressis in mucrones sed non in aristas desinentibus, cupula minus profunda differt.

Arbor 7 m. alta. *Ramuli* hornotini tomentosi, leviter sulcati, 2-3 mm. diametro, annotini purpureo-brunnei, fere glabri, lenticellis inconspicuis. *Gemmae* rufo-brunneae, ovoideo-conicae, glabrescentes, usque 3 mm. longae. *Folia* obovata, 7-9 cm. longa, 3.5-4 cm. lata, apice acuminata mucronata, basi cordata, marginibus leviter sinuata, apicem versus parce aristato-serrata, supra glabra, nitida, subtus dense lutescenti-stellato-tomentosa; nervi primarii utrinque c. 10, supra impressi, subtus prominentes, in mucrones desinentes vel marginem versus in venulas plurimas divisi; nervi reticuli supra impressi, subtus prominentes; petioli 1.5-2 cm. longi, c. 2 mm. lati, parce tomentosi. *Fructus* anno secundo maturescentes, in quaque consocie 1-3, subsessiles, consociebus ad apicem incrementi anni conglomeratis; cupulae haud profundae, poculiformes, c. 1-7 mm. diametro, usque 8 mm. altae, intus sericeo-tomentosae, cicatrice c. 8 mm. diametro, squamis triangulari-ovatis obtusis puberulis laxè appressis; glandes c. $\frac{1}{2}$ inclusae, depresso globosae, apice planae vix

umbonatae, c. 1.5 cm. altae, dilute brunneae, deterisile furfuraceo-tomentosae, intus dense tomentosae, cicatrice plana vel leviter concava.

STATE OF MEXICO. District of Temascaltepec: Mina de Agua, June 1934, *Hinton* 6077; Sept. 1934, *Hinton* 6576 (typus).

Quercus apiophylla E. F. Warburg, sp. nov. Species distincta cum *Q. candicans* Née comparanda sed forma foliorum valde distincta.

Arbor 10 m. alta. *Ramuli* hornotini lutescenti-tomentosi, leviter sulcati, 2-3 mm. diametro, annotini rufo-brunnei, fere glabri, lenticellis inconspicuis. *Gemmae* globoso-ovoideae, obtusae, 1-2 mm. longae et latae, glabrescentes. *Folia* ovata, 6.5-9.5 cm. longa, 2.5-3.8 cm. lata, apice longe acuminata, basi rotundata vel subcordata saepe inaequalia, marginibus integra, supra glabra paulum nitida, subtus dense lutescenti-stellato-tomentosa, nervis exceptis; nervi primarii utrinque c. 8, saepe cum minoribus interpositis et prope apicem, marginem versus in venulas plurimas divisi, supra impressi, subtus prominentes, nervi reticuli utrinque paulum elevati sed vix conspicui; petioli 0.7-1.5 cm. longi, c. 1 mm. lati, supra plani, furfuraceo-pubescentes, subtus teretes. *Fructus* anno secundo maturescentes, in pedunculo brevi (minore quam 1 cm.) solitarii vel bini; cupulae poculiformes, c. 1.5 cm. diametro, squamis appressis triangulari-ovatis puberulis cinereo-brunneis apice fuscioribus; glandes globoso-ovoideae, apice rotundatae sed umbonatae, c. 1.5 cm. altae, dilute brunneae, tenuiter et deterisile furfuraceo-pubescentes, intus tomentosae, cicatrice plana.

STATE OF MEXICO. District of Temascaltepec: Berros, June 1934 (vernacular name "Encino"), *Hinton* 6072; Sept. 1934, *Hinton* 6568 (typus); Mina de Agua, July 1934, *Hinton* 6237.

A very distinct species, not to be placed in any of Trelease's series.

X—CONTRIBUTIONS TO THE FLORA OF BURMA: XV.*

The regions in brackets after each species are those from which it has been reported previously.

Rhododendron aralophyllum Balf. f. et W. W. Smith [Ericaceae]. (Yunnan).

Myitkyina District: near Hpimaw Fort, 2450 m., fls. April. C. W. D. Kermode 17046, "6-10 ft. tall, fls. $1\frac{1}{2}$ in. long, white with scarlet blotch in throat"; in evergreen forest on ridge North East of Hpimaw running to the Frontier at Hpawseik Bum, 2770-3100 m., Kermode 17054, 17056, "20-30 ft. tall, fls. white spotted with crimson"; evergreen forest on Langyaw, 2175 m., fls. March, Kermode 17115, "15-25 ft. tall."

Rhododendron bullatum Franch. [Ericaceae]. (W. China).

* Continued from K.B. 1938, 296.

Myitkyina District : above Hpimaw, 1850-2100 m., fls. April, *Kermode* 17032, " fls. 3 in. across, white with patch of yellow within, strongly scented ; on ridge North East of Hpimaw running up to the frontier at Hpawseik Bum, 2460-2700 m., *Maung Po Khant* 17059, " 5 ft. tall, fls. white " ; Fengshuiling Pass, 2600 m., *Kermode* 17222, epiphytic shrub 6-8 ft. tall, fls. unscented, calyx tinged pink, corolla white, pink outside."

Rhododendron campanulatum *D. Don* [Ericaceae].
(Kashmir to Bhutan).

Myitkyina District : on way to Chimili Pass, 3700 m., fls. May, *Kermode* 17278, " 10-15 ft. tall ; fls. 2 in. across, white flushed with pink with a small blob of scarlet in throat."

Rhododendron decorum *Franch.* [Ericaceae].
(W. China).

Myitkyina District : over 1 mile above Hpimaw Fort, 2460-2700 m., fls. April, *Kermode* 17237, " 10-15 ft. tall, young leaves appearing before fls., fls. 2 in. across, white, anthers yellow-white."

Rhododendron eclectum *Balf. f. et Forr.* [Ericaceae].
(S.E. Tibet and Yunnan).

Myitkyina District : in snow on ridge North East of Hpimaw, 3400-3700 m., fls. April, *Maung Po Khant* 17057, " 10 ft. tall, leaves veined yellow, pale-yellow below ; fls. almost a deep salmon-pink, lighter inside and spotted with brown."

Rhododendron Genestierianum *Forr.* [Ericaceae].
(Yunnan).

Myitkyina District : above Zuklang, 2770 m., fls. April, *Kermode* 17156, " one plant seen, in dense shade, 4-5 ft. tall, fls. plum-purple ; buds and petals covered with plum-like bloom."

Rhododendron hypolepidotum *Balf. f. et Forr.* [Ericaceae].
(S.E. Tibet).

Myitkyina District : above Hpimaw, 2460-2770 m., fls. April, *Kermode* 17033, " 3-4 ft. tall, fls. 1 in. across, deep-yellow, anthers brown."

Rhododendron leptothrium *Balf. f.* [Ericaceae].
(Yunnan).

Myitkyina District : near Hpore Village, 1860 m., fls. May, *Kermode* 17184, 17188, " 15 ft. tall, fls. 1-1½ in. across, pale-mauve with a splash of deep-mauve in throat, or deep mauve-pink with a splash of deep-mauve in throat."

Rhododendron Lindleyi *T. Moore* [Ericaceae].
(Sikkim, Bhutan and Manipur).

Myitkyina District : Laikam-Humyetaung road, fls. April, *Kermode* 17100, " on fallen tree-trunk, 5-6 ft. tall, leaves yellow-green, dotted with red glands below ; petioles glandular ; fls. pure

waxy-white with a splash of gold in the throat on posterior petal, scented, anthers brown."

Rhododendron obtusum *Planch.* [Ericaceae].
(Japan).

Myitkyina District : near Hpore Village, 1860 m., fls. April, *Kermode* 17191, 3-6 ft. tall, branchlets reddish, fls. 1 in. long, white or pale-pink, spotted with scarlet."

Rhododendron rubiginosum *Franch.* [Ericaceae].
(Yunnan).

Myitkyina District : on way to Chimili Pass, c. 3700 m., fls. May, *Kermode* 17279, " 10-15 ft. tall, branchlets silvery, underside of leaves purplish-brown ; fls. 1½ in. across, pale-pink, two posterior petals spotted scarlet."

Rhododendron Simsii *Planch.* [Ericaceae].
(Throughout China and Formosa).

Myitkyina District : on rocks beside the Tumpang-Hka tributary about 1 mile from Saniku, 300 ft., fls. March, *Kermode* 16602, " 4-5 ft. tall, fls. salmon-pink with carmine blotches on posterior petals ; banks of Ngawchang Hka on way to Tangtung from Hpimaw, 1550 m., fls. end April, *Kermode* 17245, " 8-10 ft. tall, fls. salmon-pink " ; banks of Ngawchang Hka on Tangtung-Kangland road, 1860-2200 m., fls. end April, *Kermode* 17245, " 10-15 ft. tall, fls. 1½ in. across, deep-pink spotted scarlet."

Rhododendron suberosum *Balf. f. et Forr.* [Ericaceae].
(Yunnan).

Myitkyina District : near Chanyinku, 2200 m., fls. 1st April, *Kermode* 17143, " 10 ft. tall, fls. pale-mauve."

Rhododendron taronense *Hutch.* [Ericaceae].
(Yunnan).

Myitkyina District : on rocks beside stream near Hpore rest-house, 1860 m., fls. early April, *Kermode* 17170, " 5-6 ft. tall, fls. 3 in. across, white, posterior petal tinged gold, anthers black."

Androsace Henryi *Oliv.* [Primulaceae].
(China).

Myitkyina District : Lagwi Pass on damp bank, 2460 m., fls. April, *Kermode* 17002 ; above Pawte, 2460-2770 m., fls. May, *Kermode* 17261, " 6-8 in. tall ; fls. ¼ in. across, white with yellow 'eye'."

Primula euosma *Craib* [Primulaceae].
(Yunnan).

Myitkyina District : near snow 3100-3400 m., fls. May, *Kermode* 17295, " 3 in. tall ; veins of leaves reddish ; fls. mauve-blue with pale-yellow 'eye'."

var. **puralba** W. W. Smith.

Myitkyina District: above Hpawte on way to Chinili on rocks and wet ground, 2460-2770 m., fls. practically over in May. *Kermode* 17265, "4-6 in. tall; some leaves petiolate, others with blade down to root-level; fls. white with faint yellow 'eye'."

Primula sonchifolia Franch. [Primulaceae].
(China).

Myitkyina District: Hpimaw Pass, 3100-3400 m., fls. April. *Kermode* 17037 "8 in. tall, plant covered with farina; fls. blue with yellow 'eye'."

Breynia subterblanca C. F. C. Fischer, comb. nov. [Euphorbiaceae].

This species was published as *Glochidion subterblancum* in K.B. 1927, 211, the fruits being unknown. I am obliged to Dr. Léon Croizat for pointing out to me that it is more akin to *Breynia*, especially in its vegetative characters. I agree and therefore propose the above new combination. It is very near *Breynia glauca* Craib, but differs in the broader ovate leaves which are usually blunt and not mucronate, creamy-white below with the nerves very indistinct below.

XI—NOTES ON CAREX: V.* E. NELMES.

TWO NEAR RELATIVES OF *C. sylvatica* HUDS.

Carex sylvatica Huds. is a common European sedge which spreads thinly into western Asia and possibly into north Africa.

All the nine species, except one, associated with it by Kükenthal in the Pflanzenreich, occur at considerable distances from the area occupied by *C. sylvatica* itself. Two are Himalayan, two Chinese, three North American, and the eighth occurs in north and east Asia. The exceptional ninth, *C. latifrons* Krecz. (*C. latifolia* Boiss. et Bal.), is a plant of the Caucasus, and is the only close ally of *C. sylvatica* hitherto described. These ten species together form Subsection 6, *Longirostres* Kükenth., of Section 58, *Hymenochlaenae* Dreger. It may be worthy of mention that only two of the remaining thirty-eight members of the *Hymenochlaenae* are European plants, namely, *C. strigosa* Huds. and *C. capillaris* L., both of which extend into Britain with *C. sylvatica*.

The purpose of this Note is to record the discovery of *C. latifrons* in Europe, and to describe as a new species a second near relative of *C. sylvatica*.

Carex latifrons Krecz. (*C. latifolia* Boiss. et Bal.)

The name *Carex latifolia* Boiss. et Bal. (1884), is a later homonym of *C. latifolia* Gmelin (1791) and *C. latifolia* Moench. (1794), and Kreczetowicz has accordingly renamed the plant *C. latifrons*.

It was discovered by Balansa (no. 990) in the Djimil Valley, Lazistan, in July 1866, and described in Boissier, Fl. orient. 5, 421

*Continued from K.B. 1938, 248.

(1884). N. Albow, Prodr. fl. colchic. 251 (1895) gave a "descriptio emendata" based on "mes nombreux échantillons d'Abkhasie et de Mingrélie." This plant of the Caucasus may be briefly described as resembling *C. sylvatica*, but differing in its stouter stems, broader leaves, and more densely-flowered spikes with shorter utricles.

In July 1932 Messrs. N. Y. Sandwith of Kew and A. H. G. Alston of the British Museum discovered a sedge in "damp shady ravines in beech woods on the upper slopes of a valley, at about 1250 m., Armensko, W. of Florina, N.W. Greek Macedonia."

This plant is considered to be conspecific with *C. latifrons* and therefore new to the flora of Europe. It, too, bears the number 990!

Several slight differences indicate that the Macedonian plant is variably distinct from *C. latifrons*, but their precise relationship is left undecided until more material is available. The most noticeable of these differences is the position of the terminal (male) spike, which in the one is long peduncled, but in the other almost sessile between the two uppermost female spikes. It should be noted that in each plant the male spikes consist of one of normal length and a very short and small one at its base. *C. sylvatica*, on the other hand, has almost always only one male spike. The other differences, in addition to the peduncled male spike, found in the Macedonian plant, are that the terminal male spike, the female spikes, and the utricles are all slightly longer than in the other. The bracts, too, are smaller and fall short of the long inflorescence, whereas in *C. latifrons*, with its more congested terminal spikes, the bracts overtop it. The significant thing is that the more important parts of the European plant—the female spikes, the glumes, and the utricles—differ only in size, and only slightly, from the same parts of the plant from the Caucasus.

Carex algeriensis Nelm.

Two years ago, in the Grande Kabylie mountain region of northern Algeria, Messrs. A. H. G. Alston and N. D. Simpson collected a *Carex* which is sufficiently distinct from *C. sylvatica* Huds. to constitute a new species.

Carex algeriensis Nelm., sp. nov.; affinis *C. sylvaticae* Huds., sed culmis longioribus, spicis masculis tribus aureis, spicis femineis longioribus gracilioribus distantioribus magis laxifloris, utriculis longioribus in rostrum magis sensim attenuatis differt.

Culmus ad 95 cm. longus, gracilis, laevis, foliatus. *Folia* inflorescentia breviora, 4-8 mm. lata, plana. *Inflorescentia* e spicis 7-9 composita; spicae inferiores pedunculis e vaginis bractearum longe exsertis, superiores pedunculis inclusis. *Spicae* 3 superiores masculae, aureae, graciles, cylindricae, terminalis 5 cm. longa, ceterae breviores, sessiles; ceterae superiores 1-2 androgynaeceae excepta femineae, 5-6 cm. longae, graciles, laxiflorae, pedunculatae, pedunculis secus angulos scabris. *Bractae* inferiores foliaceae, inflorescentia breviores, longe vaginantes. *Squamae* femineae

ellipticae, membranaceae, albescentes, nervo mediano interdum viridi leviter excurrente. *Utriculi* squamas multo superantes, 5.5-6 mm. longi, membranacei, ellipsoidei, obtuse trigoni, vix patentes, pallide virides, glabri, obsolete nerves, in basin contracti, in rostrum longum laeve vel scabridiusculum ore bidentatum albescens dentibus strictis brevissimis praeditum sensim attenuati. Stigmata 3.

ALGERIA: Yacoûren; between Bougie and Tizi Ouzou, ravine in deciduous oak forest; April 27 1937, *Alston and Simpson* 37,614.

Through the kindness of Dr. R. Maire I have examined the material under the name *C. sylvatica* in the University of Algiers. It consists of two gatherings, undated, but made by Dr. L. Trabut some years ago in Algeria. The specimens are rather poor; in one the utricles are immature and in the other they have mostly fallen. So far as can be ascertained these plants present characters intermediate between those of *C. sylvatica* and *C. algeriensis*.

XII—MISCELLANEOUS NOTES.

Prof. L. G. M. Baas Becking.—We learn with interest that Prof. Baas Becking, Director of the Botanical Laboratory and Garden of the State University, Leiden, has been appointed Director of the Government Botanic Gardens, Buitenzorg, Java. Prof. Baas Becking has now taken up his duties, and we wish him every success in his new work.

Mr. F. L. Squibbs.—Mr. Squibbs, who left Kew in 1924 and who has been Director of Agriculture in the Seychelles since 1934, has been appointed Agricultural Officer in the Gold Coast.

JOHN AIKMAN.—The death on 22nd December, 1938, in his 72nd year, at his home, 40, Mortlake Road, Kew, of Mr. John Aikman, M.B.E., after a painful illness borne with great fortitude, is deeply regretted by his many friends. Born on 10th October, 1867, the eldest son of Robert and Margaret Aikman, at Johnstield, Duns, in Berwickshire, Aikman was educated locally and he must have been an unusually apt pupil of a very competent instructor if one may judge from the accuracy and conciseness with which, later in life, he drafted reports and recorded the minutes of meetings in a script as legible as printed matter and more pleasant to read than anything typewritten.

Aikman's early training, which lasted 7 years, was gained at Duns Castle, where his father was Head Gardener. On coming of age he applied for appointment to Kew and on 10th December, 1888, he began work as a student gardener. Two years later, as from 1st January, 1891, he became a Temporary Technical Assistant in the Herbarium. In his case the term "temporary" proved literally accurate; his tenure of the post endured only long enough

to enable the Keeper of the Herbarium and the Director himself to appreciate the quality of Aikman's early education, for, on 7th July, 1891, he was appointed Assistant in the Director's Office, a post he was destined to fill from that date until his retirement from Government Service, on reaching the age limit on 8th October, 1932. The official recognition of his work by the conferment of the M.B.E., announced in the *Gazette* of 1st January, 1930, was amply merited.

Aikman's work during the forty-one years of his tenure of this post under three Directors was marked by a very high sense of public duty and a constant regard for the reputation and welfare of Kew as an Imperial as well as a National Institution. To a complete mastery of business methods and a very retentive memory were added in his case maturity and sobriety of judgment which earned the confidence of those he served; his unfailing courtesy and tact gained for him the respect of all who had occasion to visit the Director's Office; while all who consult the Kew Bulletin are indebted to him for having compiled the General Index to the volumes of that periodical for the years 1887-1918, which was published in 1920.

In addition to his purely official duties, Aikman performed also those of Clerk to the Trustees of the Bentham Fund (later the Bentham-Moxon Fund) and in that capacity showed that his ability as an accounting officer equalled his ability as a clerical and an executive officer. These duties he continued to carry out after his retirement from Government Service until the progress of the malady which was to prove fatal had so impaired his vigour as to render attention to business no longer possible. D. PRAIN.

New Combinations in the Gramineae.—The following new names are published here in order that they may be included in the new edition of the "List of Herbaceous Plants cultivated at Kew."

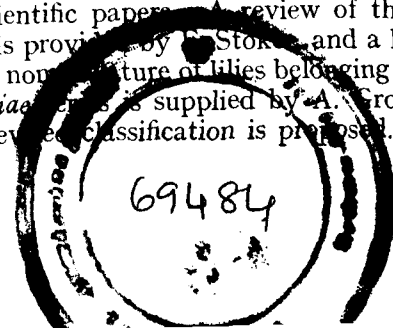
***Bothriochloa caucasica* (Trin.) C. E. Hubbard**, comb. nov. *Andropogon caucasicus* Trin.

***Festulolium loliaceum* (Huds.) C. E. Hubbard**, comb. nov. *Festuca loliacea* Huds.

***Helictotrichon Blavii* (Aschers. et Janka) C. E. Hubbard**, comb. nov. *Avena Blavii* Aschers. et Janka.

***Helictotrichon bromoides* (Gouan) C. E. Hubbard**, comb. nov. *Avena bromoides* Gouan.

Lily Year-book.—The volume of this journal for 1938 contains several important scientific papers. A review of the lilies of the *L. carnolicum* group is provided by E. Stokes, and a lengthy article on the taxonomy and nomenclature of lilies belonging to the *Davidi-sutchuenense-Willmottiae* group is supplied by A. Grove and A. D. Cotton, in which a revised classification is proposed. The volume



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Im 56. N39
N140

also contains a very valuable summary with critical notes on the more important hybrid lilies which have been raised and introduced to gardens, which is contributed by F. C. Stern. A paper of exceptional interest is that by A. B. Stout and W. M. Porterfield, entitled "Seed patterns and incompatibilities in *Lilium candidum*." This paper not only explodes current fallacies as to seed production in *L. candidum*, but is of much wider significance and is of importance to all interested in the production of fertile and non-fertile seeds in plants in general, both in the wild condition and under cultivation. There are about a dozen other articles, which are mainly concerned with cultivation and are of considerable interest to the horticulturist.

An African Survey.—The area covered by this survey,* embracing as it does the whole of Africa south of the Sahara, is vast, and as the subjects discussed include all aspects of governmental activities, the result is a complete compendium of the existing state of affairs in Africa which is worthy of the closest study.

The chapters on agriculture and the problems allied to it are naturally of particular interest and indicate clearly how closely agricultural development is bound up with other branches of administration, such as forestry, veterinary service, education, public health, and so on.

The arguments for and against capitalist farming and peasant agriculture are clearly put and it is pointed out that only in the case of a few crops such as sisal, tea and sugar can the capitalist expect to obtain results commensurate with the money invested. It is a pity that these two systems are regarded in some quarters as irrevocably opposed to each other, as there is no real reason why this should be the case. Instances could be quoted from other parts of the tropics where the two systems have been combined to the mutual advantage of both; the planting company providing the capital for the necessary machinery and processing plants, thus ensuring the quality of the product, and the peasant, either producing the whole of the raw material on his own land or else growing a portion of it and devoting the rest of his time to raising food crops or hiring his labour to the plantation estates. This necessitates land settlement for peasants and the references to this important subject are of particular value at the present time when so much consideration is being devoted to the problems in the West Indies and other parts of the Empire.

Mention is made of the various experimental stations or laboratories that have now been established for agricultural work and the need for closer co-operation between the various research workers is strongly advocated. Although much has been done in

recent years by means of inter-departmental conferences, by the Colonial Agricultural Advisory Council, and by frequent inspections by the Agricultural Adviser to the Secretary of State, the author is still not satisfied that sufficient co-ordination has been achieved and is of opinion that much can still be done to insure continuity in research policy and to prevent overlapping. He compares the British methods with those followed in the French Territories where research is under the direction of scientific institutions in Paris and the work of local officers is largely confined to field inquiries. Although the adoption of this system is not definitely recommended it is stated that it makes for closer co-ordination of effort and for some economy in staff, although it is said to leave less scope for individual initiative.

It may perhaps be remarked that economy in staff will naturally follow when trained natives become available to fill some of the posts that are at present occupied by Europeans. Africa at present suffers from a disability in this respect compared with other parts of the Tropics where trained local staff is more readily available. The chapters on the progress of education are therefore of particular value in this connexion.

Since agriculture is, and is always likely to be, the main industry of the continent, the preservation or increase of soil fertility has naturally been given great attention. The account given of the extent of soil erosion and the measures that are being taken to arrest it are of great interest. This question is bound up with re-afforestation, over-stocking with cattle and changes in the methods of cultivation. In connexion with the latter it may be remarked that the introduction of ploughs, row cultivation and new crops such as cotton, tend to increase soil erosion, unless very careful measures are taken simultaneously to demonstrate control measures such as the use of cover crops, contour drains and the establishment of a system of mixed farming.

A perusal of these pages does, nevertheless, convey a definite impression that a great deal is now being done to put agriculture on a sounder basis and that the efforts that are being made are the forerunners of still greater progress in the future.

There is no doubt that the publication of this volume will do much to educate public opinion in this country to our great responsibilities towards the British possessions in Africa. That such a stimulus is needed is evidently the view of the author, as he has suggested the establishment of an African Bureau in London. The proposal will doubtless be given the fullest consideration but whether it will be more practical to expand the activities of some such body as the African Society rather than to attempt the formation of a completely new institution is a matter for careful examination.

G. EVANS.

* "An African Survey: A study of problems arising in Africa south of the Sahara." By Lord Hailey, G.C.S.I., G.C.I.E. Oxford University Press, 1938. Pp. xxxviii + 1837. Price 21s.

Lloydia: A Quarterly Journal of Biological Science.*

We note with interest the appearance of a new periodical devoted to biological science, published by the Lloyd Library of Natural History, Cincinnati. "Lloydia" we may hope commemorates at least in part the name of Mr. C. G. Lloyd, the celebrated mycologist who so often visited Kew, and thus continues the practice adopted by other recently published periodicals such as "Brittonia," "Bartonia," "Blumea," "Herbertia," etc., of perpetuating names famous in the world of botanical and biological science. The adoption of such brief titles is obviously an advantage in citation. The articles contained in the first issue are of a varied and interesting character and it is evident that the periodical intends to cover a wide field. It is well produced both as to printing and illustrations, and the format is pleasing.

The Leyden Botanic Garden. Two years ago the Botanical Garden at Leyden, Holland, celebrated its three hundred and fiftieth anniversary, and an attractive volume† has been published in commemoration. This is very ably written in English by H. Veendorp, "Hortulanus," and L. G. M. Baas Becking "Praefectus Horti," ancient titles which are still retained for the Curator and Director respectively.

The University of Leyden dates from 1575, when Prince William of Orange granted the burghers the privilege of the Foundation as a reward for their defence of the city against the Spaniards in 1574.

Twelve years later the ground around the University was set aside as a garden, and Professor Geraerdt de Bont was given an increase in salary "if willing to continue as well in winter times to explain and administer the anatomy, as in summer to explain the herbs to students of medicine."

Since then the names of many botanists connected with the garden have been commemorated by genera of flowering plants. These include Pieter Pauw (*Pavia* Boerh.), Professor of Medicine; D. O. Cluyt (*Clutia* Boerh.), apothecary at Delft, and the first Superintendent; Carolus Clusius (*Clusia* Linn.), the first *Praefectus Horti*; P. Hermann (*Hermannia*), P. Hotton (*Hottonia*), H. Boerhaave (*Boerhaavia*), A. van Royen (*Royena*), and Brugmans (*Brugmansia*). Cluyt was one of the first Dutchmen to write a book on beekeeping, and the Hortus contained several hives. In the recently constructed *Hortus Clusianus* six old-type straw hives have been placed in a stall, on which Cluyt's motto may be read "God feeds all Creatures."

Cluyt's son, Augerius, succeeded his father as Superintendent, and travelled extensively in search of plants, even visiting North

Africa. We learn too that he wrote the first book on packing and shipping of trees, plants and seeds, especially over long distances.

There is still one plant alive in the garden from Clusius' time. This is a tree of *Laburnum anagyroides* Med., which stands at the entrance to the gardens. It was planted in 1600, is now 4.90 metres in circumference at the base, 17 metres high, and the crown is 11 metres in diameter. It flowers profusely every year.

In 1594 about a thousand species were growing at Leyden, in 1675 the number had increased by only 500 species, in 1685 it contained 3000 species of living plants, whilst in 1740, immediately after Boerhaave's time, there were 7000 species. Even nowadays the number is little more (8000-8500).

Leyden acted as a centre of distribution for plants from the Cape of Good Hope, which were dominant in the new acquisitions for a century after the earliest colonisation by Jan van Riebeck in 1652. The earliest Cape plants grown at Leyden were a *Mesembryanthemum*, *Haemanthus coccineus* Linn., and *Pelargonium triste* Ait.

Leyden also had a great deal to do with Rheede's "Hortus Indicus Malabaricus," a classical work of pre-Linnean botanical information from the East. Seyen, director of the garden from 1670 to 1678, supplied commentaries and notes to the first part, which ran into twelve volumes, and was later edited by others including Commelin. Hendrik Adriaan van Rheede tot Draakestein (1635-1691) was a Utrecht nobleman who entered the navy at the age of 14. At 20 years of age he was appointed midshipman in the East India Company, and ended by being a Member of the Council of India and Governor of Malabar. We learn that on the pretext of expeditions to the interior in his function as governor, van Rheede was accompanied by hundreds of natives, who collected plants for him. He was assisted by Paulus Hermann, a surgeon, who later held the chair of botany at Leyden as successor to Seyen, and he employed four native artists to draw plates from the living specimens. Later, in 1672, at the instigation of Seyen, Hermann sailed for Africa, India and Ceylon "in order to collect curious plants and make those plants better known by accurate descriptions." Hermann's collection of dried plants and drawings of Ceylon plants was used by Linnaeus in his "Flora Zeylanica" (1747). Linnaeus found the collection at Copenhagen, and it is now in the Sloane Collection at the Natural History Museum, South Kensington, Sir Joseph Banks having purchased it for £75! There are, however, two collections in book form in the Leyden Herbarium containing 157 sheets of plants collected by Hermann in Ceylon. In 1682 Hermann visited the gardens of Oxford and Chelsea and took back with him about 200 living plants.

Peter Hotton only lived 14 years to direct the garden (1695-1709) and then was followed by the most famous of all, Herman Boerhaave. The latter was born in 1668 in the hamlet of Voorhout, near Leyden, and we learn that he was appointed to Leyden in 1709 and held the

* "Lloydia: A Quarterly Journal of Biological Science." Vol. I. Nos. 1-4, 1938. Lloyd Library of Natural History, Cincinnati, Ohio. Pp. 254. Ann. Subs. \$3.00. Single issues \$1.00.

† "Hortus Academicus Lugduno Batavus 1587-1937." By H. Veendorp and L. G. M. Baas Becking. Typographis Enschedaiana, Haarlem 193 pp. 218.

post until 1730. Although he published very little, he was a celebrated teacher and had a large number of correspondents, including George Clifford, William Sherard, and Sir Hans Sloane.

Linnaeus visited the Leyden garden in 1735, and his "Genera Plantarum" is dedicated to Boerhaave. The latter's prophecy seems to have been fulfilled, for he wrote of it "Centuries shall praise it, the good will follow it, all will derive profit from it." The account of Linnaeus and Boerhaave provides very interesting reading, for which there is not space here for further comment. It was, as will be remembered, through Boerhaave's influence that Linnaeus obtained the post of private physician to George Clifford, the English envoy to the Netherlands and a patron of the Sciences.

Boerhaave was followed by the van Royens (Adriaan and David), Brugmans, Reinwardt (who established the Buitenzorg Garden in Java), C. L. Blume (Director of the Herbarium), W. H. de Vriese, W. F. R. Suringar, and until 1938, J. M. Janse.

The authors of the book under review are now in charge and the garden would appear to be in good hands; for they conclude: "We have great cause to feel contented, but *we should take care lest we be satisfied.*"

The sketches illustrating the work are very delicately drawn and distinctive, and are the work of several artists, Jo Spier, D. A. Bueno de Mesquita, J. Raphael and Miss Claterbos. Those by Spier, depicting Boerhaave, Brugmans and other worthies, are particularly delightful.

The volume has a preface written by the Director of Kew which is followed by a chapter giving some account of earlier Botanic Gardens in other countries such as Pisa, Padua, etc. A list of literature, an index of plant names mentioned in the volume, and an excellent general index complete this very interesting volume.

J. HUTCHINSON.

Science in Africa.*—This volume is a complement to "An African Survey" by Lord Hailey, and is one of a series of reports prepared in connexion with that Survey (see above, p. 102).

The purpose of this book, as stated by the author, is to summarize the present position of studies in the various sciences which have a bearing on African conditions. As far as possible, the more important work up to 1936 has been mentioned. The field covered is very wide, and the difficulties of collating the various branches into a comprehensive summary must have been correspondingly great. The author has wisely sought the advice of specialists on the different subjects and suitably acknowledges their assistance. Shortage of time has resulted in the omission of interesting work in the Union of South Africa and in the French territories, but the work that is being undertaken in the British Colonies, in particular, is fully discussed.

* "Science in Africa," by E. B. Worthington, PhD. Oxford University Press, London, 1938. Pp. 746. 8 plates, 5 maps. Price 10s. 6d.

So far as agriculture is concerned there is particular interest in his remarks on soil surveys. Some doubt is expressed about the feasibility of detailed soil surveys owing to the huge area to be covered and to the small size of individual peasant holdings. Their value is stated to be not so much in their immediate practical application, as in the data which can be obtained from them on the fundamental qualities of the soil. Whilst few will deny the importance of such data, many will disagree with the statement that a soil survey is not of immediate practical application. One is glad to note that attention is drawn to the termite problem which is of particular importance to Africa. In the past it has been customary to regard these insects solely as agents of destruction, but there is no doubt that many ground species are agents in the evolution of soils, and their effect on fertility is worthy of close study.

A detailed account is given of the botanical work that is being undertaken at the various research stations in Africa, including those of the French, Belgian and Portuguese territories, and the advice and assistance that is supplied by institutions in this country such as the Royal Botanic Gardens, Kew, is recorded. The value of taxonomic studies in such matters as pasture deterioration and ecology in connexion with agricultural surveys is emphasized.

Forestry problems are fully discussed and the author is probably correct in his assertion that in many parts of Africa deforestation has proceeded beyond the safety limit. Mention is made of the fact that a considerable proportion of Africa is, for reasons of soil and climate, suited only to tree growing, and consequently the conversion of useless bushlands into useful forests is urged, and the planting of exotic species of commercial value is advocated. Time alone will show whether these introduced species will well and truly adapt themselves to local conditions.

The chapter on crop plants is a valuable synopsis of work that has been done, much of which has not yet been published in an easily accessible form. One learns, for example, that the Uganda Department now recommend the planting of cassava, groundnuts and sweet-potatoes as locust-proof crops; it is not clear, however, whether these crops are actually proof to attack or whether they are more distasteful to locusts than other crops. The improvement of crops is also discussed in some detail, including the measures that are being taken by plant-breeders for yield, quality and disease- or pest-resistance.

A perusal of the section on animal husbandry gives one some idea of the many difficulties that beset the efforts directed to improvement. Overstocking problems are discussed and an interesting account is given of the tsetse fly campaign and of the movement towards extending mixed peasant farming on new land settlements as an alternative to shifting cultivation.

One of the most important sections of the volume deals with public health but this hardly falls within the scope of this review,

although a perusal of its contents is essential to all who are concerned in the amelioration of agricultural conditions in Africa.

The book forms a valuable work of reference and is commended to the attention of all who are interested in the future of our great African Dependencies.

G. EVANS.

Genetics and Horticulture.*—It is now nearly four decades since the recognition of the importance of Mendel's work on the garden pea led to the establishment of the science of genetics. During this period an enormous amount of research on inheritance in both plants and animals has been carried out, especially in institutions established entirely or mainly for or diverted to genetical investigations. Amongst such institutions, on the plant side, the John Innes Horticultural Institution at Merton stands pre-eminent, and the book here reviewed is another proof that it is fulfilling an important function both in research and in making the results of research easily accessible to a wide range of investigators and plant growers. The first edition was published in 1934, and the fact that a second has been called for is a pleasing tribute to the authors and, since it also shows the wide interest now being taken in plant genetics, to all who are engaged in genetical research.

The format of the work is excellent, it is well illustrated, and the fount is clear. The eleven chapters summarize most of the more important genetical and a good deal of the cytological work done on horticultural plants, except in the realm of arboriculture. The first three chapters adequately outline the principles of cytogenetics. Then follow excellent concise accounts of results obtained by breeding and correlated cytological investigation in plants grown for their flowers, for their vegetative parts, and for their fruits. A chapter on the chemical and genetical basis of flower colour is interpolated. Chimaeras are considered at relative length but hardly sufficient space is given to somatic variations and fluctuations. Incompatibility and sterility are dealt with in separate chapters and numerous useful suggestions as well as established facts are to be found in the final chapter dealing with the origin of new and improved forms. The book is heartily recommended to horticulturists and to botanists in general. The study of cultivated plants is not only of economic importance but it also throws light on a wide range of biological problems, the more so if the differences, not in the basic means and methods of inheritance, but in the relative importance of the factors influencing evolution be remembered.

A list of chromosome numbers of cultivated plants is given as an appendix. The authors have wrongly anticipated the appearance of the Merton Catalogue (*New Phytologist*), which it is hoped will shortly be published. A glossary, bibliography, and index end the book.

W. B. TURRILL.

* The Genetics of Garden Plants, by M. B. Crane and W. J. C. Lawrence, Macmillan & Co., Ltd., London, pp. 287, 62 figures, second edition 1938, 12s. 6d. net.

BULLETIN OF MISCELLANEOUS INFORMATION

No. 3 1939

ROYAL BOTANIC GARDENS, KEW

XIII—CONTRIBUTIONS TO THE FLORA OF SIAM.
ADDITAMENTUM LI.* NEW AND RE-NAMED SIAMESE ACANTHACEAE.
J. B. IMLAY.

NELSONIEAE.

Staurogyne argentea Wall. var. *breviaristata* Imlay, var. nov., a typo bracteis sepalisque mucronatis nec longe aristatis glabris 2 mm. latis differt.

SURAT. Langsuan, Pato, c. 100 m., in bamboo forest, *Kerr* 12171! (*type*). PUKET. Ranawng, Kao Pawta Chongdong, c. 600 m., in evergreen forest (*Kerr*) *Nai Noe* 17523!

Staurogyne punctata Imlay, sp. nov., a *S. brachystachya* R. Ben. foliis subtus punctatis et glabris usque 5 cm. longis, racemis multifloris saepe basi ramosis minute pubescentibus, bracteis 5–7 mm. longis, calycis lobis inaequalibus oblongis obtusis recedit.

Caules erecti, teretes, lignei, saepe ramosi, primo pubescentes, demum glabri. *Folia* lanceolata vel anguste elliptica, ad apicem subacutum attenuata, basi cuneata, vel breviter attenuata, superiora aliquando alterna vel subopposita, exsiccata supra fusco-viridia subtus pallidissima, supra glabra, subtus sparse pubescentia et punctata, 4–5 cm. longa, 1–2 cm. lata, costa compressa nervisque lateralibus arcuatis utrinque 6–7 conspicuis, margine subintegro subrecurvato, petiolo 0.5–1 cm. longo subglabro suffulta. *Racemi* terminales et ex axillis superioribus orti, 4–6 cm. longi, basi saepe ramosi vel bini, minute pubescentes; pedicelli 0–1.5 mm. longi; bractee oblongae vel ellipticae, obtusae, glabrae, virides, nervosae, 5–7 mm. longae, 1.5 mm. latae; bracteolae 4 mm. longae, bracteis similes sed angustiores et apice minus obtusae. *Calyx* 9 mm. longus, glaber, extus albo-punctatus; lobi subaequales, 3 postici 8 mm. longi, 1 mm. lati, oblongi, subobtusi, 2 antici 5 mm. longi, angusti, lineares, acuti. *Corolla* candida (ex *Kerr*), extus glabra, 1.4 cm. longa; tubus supra basin sensim ampliatus, intus pubescens; lobi 2 mm. longi. *Stamina* 4, cum staminodio minuto 3 et 4 mm. supra basin corollae affixa, 5.5 et 7 mm. longa, apice breviter glanduloso-pilosa; connectivus expansus, biramosus, glandulosus; antherae loculi divergentes. *Ovarium* glabrum; stylus 11 mm. longus, glaber.

UDAWN. Loi, Kao Krading, c. 1200 m., by stream in open forest, *Kerr* 20094!

* Continued from K.B. 1938, 454.

Staurogyne dispar Imlay, sp. nov., a *S. subglabra* C. B. Clarke foliis exsiccatis pallidis, floribus haud secundis basi spicae subsessilibus, sepalis inaequalibus postico ceteris multo majore differt.

Caules basi prostrati et radicales, demum erecti, primo glanduloso-puberuli, mox glabri. *Folia* opposita, aliquando subaequalia, lanceolata, ad apicem subacutum attenuata, basi subito breviter attenuata, chartacea, supra et nervis subtus minute viscido-pubescentia, 4-8 cm. longa, 1.6-3.2 cm. lata, costa supra conspicua subtus compressa subprominente, nervis lateralibus utrinque 6 subtus conspicuis intra marginem subintegrum anastomosantibus, petiolo 1.5-3 cm. longo puberulo suffulta. *Spicae* terminales, 2-5 cm. longae, floribus haud secundis basi subsessilibus; pedunculus 1 cm. longus, basi folia parva gerens; bractee calyce longiores, ellipticae, apice subacutae, virides, basi albae, 1.2 cm. longae, 4.5 mm. latae, glabrae, nervosae, extus apice albo-punctatae; bracteolae 4 mm. longae, lineares, glabrae, apice virides. *Calyx* extus basi minute puberulus; lobi intus glabri, apice virides, nervosi; posticus oblongus, acutus, 9 mm. longus, 3 mm. latus; 2 anteriores angusti, lanceolati, 6 mm. longi, 1 mm. lati; 2 laterales 3 mm. longi, 0.5 mm. lati. *Corolla* candida (ex Kerr), extus glabra, 2 cm. longa; tubus 3 mm. supra basin ampliatus. *Stamina* 3 mm. supra basin corollae affixa, 1 et 1.2 cm. longa, breviter pilosa, apice pilis glandulosis densioribus ornata; connectivus biramosus; antherae loculi divergentes. *Ovarium* glabrum; stylus 1.7 cm. longus, glaber; stigma bilobatum, lobo altero in duos ramos patentes diviso.

PAYAP. Doi Pepo, Mè Hawng Sawm, c. 800-1000 m., common in evergreen forest, Kerr 6178!

The largest pair of leaves is nearest the apex, and in more than one case a smaller pair of leaves alternates with a larger pair.

Staurogyne cuneata Imlay, sp. nov., a *S. longispica* Ridley foliorum nervis lateralibus utrinque 8 superne arcuatis subtus pubescentibus, spicis terminalibus multo brevioribus, pedunculo 1 cm. longo, bracteis majoribus differt.

Caules tenues, basi prostrati, demum erecti, primo pubescentes, mox glabri. *Folia* ovato-lanceolata, elliptica, ad apicem subacutum breviter acuminata, basi cuneata, supra glabra, subtus nervis pubescentia, exsiccata subnigra, 5.5-11.5 cm. longa, 2-5 cm. lata, costa supra conspicua subtus prominente, nervis lateralibus utrinque 8 subtus conspicuis superne arcuatis, margine subintegro, petiolo 1.5-2 cm. longo pubescente suffulta. *Spicae* plerumque terminales, solitariae, simplices, 2-6 cm. longae; pedunculus 1 cm. longus; bractee late ovatae, obtusae, glabrae, exsiccatae brunneo-nigrae, 7-13 cm. longae, 4-8 mm. latae, inferiores majores, brevissime petiolatae, obscure 3-nervosae; bracteolae lineares, 3 mm. longae, glabrae; pedicelli c. 1 mm. longi. *Calyx* 3-5 mm. longus, extus glaber; lobi subaequales: posticus longior latiorque, 3-nervosus; ceteri anguste lineares, acuti, intus glabri, glanduloso-punctati.

Corolla subrosea (ex Kerr), 1.5 cm. longa, extus glabra; tubus 3 mm. supra basin ampliatus, intus infra stamina pilosus. *Stamina* 3 mm. a basi corollae affixa, 5 et 8 mm. longa breviter pilosa, superne glandulosa; connectivus expansus, breviter glandulosus; antherae loculi ovoidei, horizontales. *Ovarium* glabrum; stylus 11 mm. longus; stigma bilobatum, lobo altero biramoso.

RACHABURI. Prachuap, Kao Luang, c. 800 m., in evergreen forest, Kerr 10811! SURAT. Chumpawn, Kao Tung, c. 700 m., in evergreen forest, Kerr 11534! (type).

RUELLIEAE.

Synnema biplicatum (Nees) Imlay, comb. nov.

Adenosma biplicata Nees in Wall. Pl. As. Rar. 3, 79 (1832).

Pedicularis avana Wall. ex Benth. Scroph. Ind. 52 (1835).

Synnema avana (Wall. ex Benth.) Benth. in DC. Prodr. 10, 538 (1846).

Cardanthera avana (Wall. ex Benth.) Benth. ex C. B. Clarke in Hook. f. Fl. Brit. Ind. 4, 405 (1884), etc.

Hygrophila salicifolia (Vahl) Nees var. **quadrivalvis** (Buch.-Ham.) Imlay, comb. nov.

Ruellia undulata Vahl, Symb. Bot. 3, 82 (1794).

Ruellia (?) or *Hygrophila quadrivalvis* Buch.-Ham. in Trans. Linn. Soc. 14, 291 (1825).

Hygrophila quadrivalvis Nees in Wall. Pl. As. Rar. 3, 80 (1832).

Antirrhinum molle Blanco, Fl. Filip. 503 (1837).

H. undulata (Vahl) Nees in DC. Prodr. 11, 91 (1847), partim.

H. obovata Nees sec. Wight, Ic. 4, pt. 4, expl. p. 18, t. 1489 (1849), non Nees.

H. angustifolia var. *quadrivalvis* (Buch.-Ham.) Williams in Bull. Herb. Boiss. sér. 2, 5, 435 (1905).

H. angustifolia var. *assurgens* (Nees) C. B. Clarke ex Williams, l.c., tantum quoad specim. Siam.

Hygrophila stricta (Vahl) Lindau var. **siamensis** (C. B. Clarke) Imlay, stat. nov.

Nomaphila siamensis C. B. Clarke in Bull. Herb. Boiss. sér. 2, 5, 716 (1905).

Hygrophila intermedia Imlay, sp. nov., ab *H. episcopali* (R. Ben.) R. Ben. (e descr.) foliis integris 2 cm. longis, bracteis haud oppositis calyce corolla capsulaque minoribus, bracteolis nullis, facile distinguenda.

Caules usque 40 cm. alti, lignei, basi prostrati, glanduloso-pubescentes. *Folia* parva, opposita, anguste oblongo-elliptica, et apice et basi obtusa vel subacuta, lineolata, utraque pagina subtomentosa, usque 2 cm. longa, 0.5 cm. lata, costa nervisque obscuris, margine integro pilis multicellularibus et glandulosis ciliato, petiolo c. 1.5 mm. longo suffulta. *Florès* 1-4, subsessiles, in fasciculis parvis axillaribus cymosis dispositi, pedunculo 1-2 mm. longo

glanduloso-pubescente; bracteae alternae, 1 mm. longae; bracteolae nullae. *Calycis* lobi anguste lineares, obtusi, fere usque ad basin liberi, glanduloso-pubescentes, 6 mm. longi, posterior longior et latior. *Corolla* purpurea (ex *Kerr*), extus glanduloso-puberula, 1-2 cm. longa, tubo 7 mm. longo superne ventricosus, limbo bilabiato, labio inferiore plicato. *Stamina* 2 et 4-5 mm. longa, infra faucem corollae affixa, glabra, antherae loculis 1 mm. longis muticis parum divaricatis. *Ovarium* apice minute glanduloso-puberulum, c. 24-ovulatum; stylus 8 mm. longus, puberulus. *Capsula* apice glanduloso-puberula, 1 cm. longa, oblonga, 24-sperma.

PITSANULOK. Mûang Petchabun, c. 200 m., growing in gravel bed of stream, *Kerr* 5698!

Ruellia malasica (C. B. Clarke) Imlay, comb. nov.

Acanthopale? *malasica* C. B. Clarke in Journ. As. Soc. Beng. 74, 659 (1908).

Aporuellia axillaris C. B. Clarke, l. c. 650 (1908).

Ruellia subulata Imlay, sp. nov., *R. patulae* Jacq. affinis, sed foliis lanceolatis apice acuminatis acutis nec obtusis rotundatisve, bracteolis longe petiolatis obovato-spatulatis, calycis laciniis multo longioribus subulatis, capsula clavato-ellipsoidea nec clavato-globosa, facile distinguenda.

Caules tenues, subteretes, breviter albo-pubescentes, pilis patentibus. *Folia* opposita, subaequalia, petiolata, lanceolata vel oblongo-lanceolata, acuta vel apice breviter acuminata, basi acuta, chartacea, obscure lineolata, pagina superiore et subtus costa nervisque pubescentia, 3-8 cm. longa, 1-5-3.3 cm. lata, costa nervisque lateralibus utrinque 5-6 supra conspicuis subtus prominulis, nervis transversis multis subtus conspicuis, margine integro vel subintegro, petiolo 0.7-1.5 cm. longo suffulta. *Flores* axillares, solitarii, subsessiles, in axillis oppositis; bracteolae longe petiolatae, obovato-spatulatae, apice obtusae vel rotundatae, calyce breviores, 1-2 cm. longae, fructu maturescente accrescentes, breviter pubescentes, nervosae, petiolo tam longo quam lamina. *Calyx* 11 mm. longus, usque 1.8 cm. longitudine accrescens, extus pubescens, lobis linearisubulatis pubescentibus basi $\frac{1}{2}$ connatis. *Corolla* purpurea (ex *Kerr* 19760), extus pubescens, 4.5 cm. longa, tubi parte angusta basali quam parte expansa multo brevior, lobis subaequalibus rotundatis. *Stamina* glabra, filamentis 6 et 10 mm. longis, antheris curvatis 3 mm. longis. *Ovarium* glabrum; stylus hirsutus. *Capsula* 2 cm. longa, glabra, clavato-ellipsoidea, apice breviter acuminata, haud globosa. *Semina* 6-7, in capsulae parte superiore, ovata, compressa, margine dense hirsuta.

RACHASIMA. Korat, Lat Bua Kao, *Put* 4369! (*type*). RACHABURI. Rachaburi, c. 50 m. low shrub in bamboo forest, *Kerr* 19760!

Ruellia dissimilis Imlay, sp. nov., a *R. prostrata* Lam. bracteolis subsessilibus anguste ellipticis haud spatulatis, calyce fere glabro

lobo postico ceteris longiore, capsula glabra apice globosa 6-8-sperma recedit.

Caules tenues, basi prostrata radicanes, subteretes, pubescentes. *Folia* opposita, subaequalia, breviter petiolata, lanceolata, apice acuta vel subacuta, basi brevissime attenuata, supra lineolata, glabra, costa subtus parce pubescente, 2.5-6.5 cm. longa, 1.5-2.5 cm. lata, costa cum nervis lateralibus utrinque 5 supra conspicuis subtus prominulis, nervis lateralibus saepe intra marginem connexis, nervis transversis subtus conspicuis, margine integro vel subintegro glabro, petiolo 5-8 mm. longo parce pubescente. *Flores* axillares, 1-2-nati, subsessiles; bracteolae anguste lanceolato-ellipticae, apice subobtusae, subsessiles, c. 1-3 cm. longae, 3 mm. latae, lineolatae, nervosae, fere glabrae. *Calyx* 7 mm. longus, extus lineolatus et fere glaber, lobis linearibus breviter acuminatis fere ad basin divisus postico ceteris 1 mm. longiore et 1 mm. lato. *Corolla* alba vel albo-rosea (ex *Kerr*), extus puberula, c. 3 cm. longa, tubi parte angusta basali quam parte expansa multo brevior, lobis subaequalibus oblongis obtusis. *Stamina* glabra, filamentis 6 et 8 mm. longis, antheris 1.5 mm. longis. *Ovarium* glabrum; stylus 1.5 cm. longus, hirsutus. *Capsula* c. 1.4 cm. longa, clavata, apice globosa, glabra pilis paucis brevissimis apice exceptis. *Semina* 6-8, in parte capsulae globosa.

SURAT. Ban Kawp Kêp, c. 10 m., in clearing, *Kerr* 13308! (*type*); Yanyao, c. 50 m., in evergreen forest at foot of limestone hill, *Kerr* 19344! Chumpawn, Bang Son, *Put* 1508! PUKET. Krabi, Tambon Kao Panom, c. 100 m., in scrub, *Kerr* 19393! PATTANI. Banang Sta, c. 50 m., in evergreen forest on limestone, *Kerr* 7305! c. 100 m., in evergreen forest, *Kerr* 7893!

Ruellia hirtella Imlay, sp. nov., a *R. Kerrii* Craib, cui affinis, floribus breviter pedicellatis, bracteolis lanceolatis nec spatulatis, calyce subglabro lobo postico ceteris longiore, corolla 2.5 cm. longa differt.

Caules basi prostrati, primo pilis patentibus instructi, demum glabrescentes. *Folia* opposita, subaequalia, petiolata, lanceolata vel ovato-lanceolata, ad apicem acutum breviter acuminata, basi cuneata, lineolata, supra et subtus costa nervisque pilis longis albis mollibus sparse instructa, chartacea, 3.5-9 cm. longa, 1.8-3.8 cm. lata, costa prominula, nervis lateralibus utrinque 4-5 supra conspicuis subtus prominulis, nervis transversis conspicuis, margine subintegro breviter ciliato; petioli subaequales, usque 2 cm. longi. *Flores* et axillares et terminales, saepissime in axillis superioribus, solitarii, brevissime pedicellati nec sessiles; pedicelli 1-2 mm. longi, hirsuti; bracteolae lanceolatae vel lanceolato-oblongae, obtusae, breviter petiolatae, 1-1.3 cm. longae, 5 mm. latae, nervosae, lineolatae, sparse pilosae. *Calyx* 4.5 mm. longus, extus fere glaber; lobi lineari-acuminati, lineolati, basi usque ad tertiam partem connati, postico ceteris 1 mm. longiore. *Corolla* subpurpurea (ex *Kerr*), extus pubescens, 2.5 cm. longa;

tubi pars angusta basalis parte expansa multo brevior; lobi subaequales, apice fere truncati, 5 mm. longi. *Stamina* glabra, filamentis 3 et 5 mm. longis; antherae 1.25 mm. longae. *Ovarium* glabrum; stylus 1.2 cm. longus, hirsutus. *Capsula* ignota.

RACHASIMA. Korat, Kao Sisiat A, Chantuk, 300 m., in bamboo forest, Kerr 9092!

Ruellia siamensis Imlay, sp. nov., a *R. ciliata* Hornem. foliis lanceolatis acuminatis, bracteolis calyce longioribus lanceolatis, calycis lobis basi usque ad tertiam partem connatis differt.

Caules quadrangulares, pilis recurvis breviter pubescentes, et pilis longioribus uniseriatis patentibus pilosi. *Folia* opposita, subaequalia, breviter petiolata, lanceolato-acuminata, apice acuta, basi cuneata, supra lineolata, utraque pagina pilosa, pilis uniseriatis basi turgidis, immatura tomentosa, 5-8 cm. longa, 1.5-3.5 cm. lata, costa nervisque lateralibus utrinque 5-6 supra conspicuis subtus prominulis, his intra marginem ascendentibus, nervis transversis subtus prominulis, margine obscure serrulato ciliato, petiolo 5-10 mm. longo dense pubescente suffulta. *Flores* axillares, 1-3-nati, sessiles; bracteolae foliaceae, petiolatae, lanceolatae, acutae, indumento ei foliorum simili, lamina circiter 2 cm. longa 1 cm. lata, petiolo 5 mm. longo. *Calyx* 2 cm. longus, bracteolis brevior, extus pilosus, pilis uniseriatis; lobi lineari-subulati, basi costati, usque ad tertiam partem connati. *Corolla* purpurea (ex Kerr), extus puberula, 3.5 cm. longa; pars tubi angusta basalis parte expansa multo brevior; lobi subaequales, rotundati. *Stamina* glabra, filamentis 7 et 10 mm. longis; antherae 3 mm. longae. *Ovarium* glabrum; stylus 2 cm. longus, hirsutus. *Capsula* ignota.

PAYAP. Khun Tan, 700 m., in deciduous jungle, Kerr 3075!

This is described as a new species only because it is distinct enough not to be matched with any other *Ruellia*. The material is just sufficient for the description.

Echinacanthus siamensis Imlay, sp. nov., ab *E. Andersoni* C. B. Clarke foliis glanduloso-puberulis nervis lateralibus utrinque 9, calyce 7 mm. longo, paniculis densius ramosis glanduloso-pubescentibus differt.

Frutex usque 2 m. altus (ex Kerr). *Rami* tenues, erecti, obtuse quadrangulares, primo glanduloso-pubescentes, demum glabri. *Folia* petiolata, inaequalia, ovato-acuminata, apice acuta, basi inaequaliter rotundata, chartacea, lineolata, nervis basi glanduloso-puberulis exceptis subglabra, 6-11 cm. longa, 3-5 cm. lata, costa supra conspicua subtus basi prominente, nervis lateralibus utrinque 8-9 supra conspicuis subtus prominulis, margine denticulato glanduloso-ciliolato, petiolo 2-2.5 cm. longo dense glanduloso-pubescente et piloso suffulta. *Paniculae* cymosae, laxae ramosissimae, axillares, in paniculam magnam terminalem cymosam collectae, glanduloso-pubescentes; bracteae angustae, lineares, 2.5 mm. longae, glanduloso-pubescentes; bracteolae 1 mm. longae.

Calycis lobi 7 mm. longi, oblongi, obtusi, extus lineolati, glanduloso-pubescentes. *Corolla* alba, lobis lilacinis (ex Kerr), extus glabra, 1.3 cm. longa; tubus 11 mm. longus, supra medium ventricosus, palato piloso; lobi rotundati, 2 mm. longi. *Stamina* 4, inclusa, 1.5 et 3 mm. longa, basi sparse pilosa; antherae oblongae, muticae, 1 mm. longae. *Ovarium* glabrum, 20-ovulatum; stylus 6 mm. longus, glaber. *Capsula* glaber, oblonga, 11 mm. longa.

MAHARAT. Nan, Doi Pu Ka, c. 600 m.; in evergreen forest by stream, Kerr 4944!

Eranthemum obovatum Imlay, sp. nov., ab affini *E. tetragono* Wall. ex Nees foliis brevioribus ovatis vel ovato-lanceolatis, bracteis obovatis apice rotundatis vel brevissime attenuatis, corollae lobis apice truncatis differt.

Herba c. 0.5 m. alta (ex Kerr). *Caules* quadrangulares, puberuli, lineolati. *Folia* ovato-lanceolata, ad apicem subacutum attenuata, basi attenuata, lineolata, subtus nervis puberulis exceptis glabra, 7-9 cm. longa, 2.5-3.5 cm. lata, costa supra conspicua subtus prominente, nervis lateralibus utrinque 7-8 prominulis, margine integro paulum recurvato, petiolo usque 2.5 cm. longo puberulo lineolato suffulta. *Spicae* terminales, lineares, 3-5 cm. longae, 1-1.5 cm. latae; bracteae obovatae, apice rotundatae vel brevissime attenuatae et obtusae, imbricatae, virides, 1.5-1.7 cm. longae, 7-8 mm. latae, pilosae et subtus glanduloso-pubescentes, margine integro glanduloso-piloso-ciliato; bracteolae 6-7 mm. longae, lineari-lanceolatae, virides, lineolatae, pubescentes. *Calycis lobi* 6 mm. longi, acuminati, basi lineolati, extus apice pubescentes et ciliati. *Corolla* purpurea (ex Kerr), extus glanduloso-pubescentis, 4 cm. longa; tubus 3 cm. longus, apice paulo ampliatus, intus glaber; lobi late obovati, truncati, 9-10 mm. longi et lati. *Stamina* 2 fertilia, basi utrinque cum staminodio 1 mm. longo, glabra; antherae 2 mm. longae. *Ovarium* apice glandulosum; stylus 3 cm. longus, superne pubescens. *Capsula* 1.4 cm. longa, apice glanduloso-pubescentis. *Semina* in aqua dense pilosa.

RACHABURI. Kanburi, c. 50 m., in mixed deciduous forest, Kerr 10126! (type). Prachuap, Kan Kradai, Put 2330! Bangtapan, Put 1376! (?).

Strobilanthes Cusia (Nees) Imlay, comb. nov.

Ruellia Cusia Ham. ex Wall. Cat. 2386 (1830), nomen.

Goldfussia Cusia Nees in Wall. Pl. As. Rar. 3, 88 (1832).

Strobilanthes flaccidifolius Nees in DC. Prodr. 11, 194 (1847).

Ruellia indigofera Griff. Journ. Trav. 237 (1847).

Dipteracanthus (?) *calycinus* Champion in Hook. Kew Journ. Bot. 5, 133 (1853).

Strobilanthes Championi T. Anders. ex Benth. Fl. Hongk. 261 (1861).

R. indogotica Balfour, Cyclop. Ind. 4 (1873).

S. flaccidus G. Mann, Assam For. Rep. par. 135 (1877).

S. Balansae Lindau in Bull. Herb. Boiss. 5, 672 (1897).

Although this plant has been known for so long under the name of *S. flaccidifolius*, there is no doubt that *Cusia* is the earliest valid epithet.

***Strobilanthes strobilatus* Imlay**, nom. nov.

Endopogon Ridleyi C. B. Clarke in Journ. As. Soc. Beng. **74**, 654 (1908); non *Strobilanthes Ridleyi* Merr. (1934).

***Strobilanthes apricus* (Hance) T. Anders.**, var. **glaber** Imlay, var. nov., a typo caulibus glabris pilis paucis nodalibus exceptis, foliis subglabris differt.

PAYAP. Lampun, Mè Kaw, 430 m., in *pé* jungle open grassland, Winit 1231!

***Strobilanthes gramineus* Imlay**, sp. nov., ab affini *S. aprico* (Hance) T. Anders. foliis anguste lineari-lanceolatis haud asperis, omnibus partibus glabris recedit.

Suffrutex caespites rotundatos humiles efformans (ex Kerr). *Caules* multi, erecti, tenues, glabri, apice sulcati, nodis inferioribus turgescens, internodiis inferioribus elongatis. *Folia* opposita, sessilia, anguste lineari-lanceolata vel anguste oblonga, apice acuta, basi obtusa, 5-6 cm. longa, 5-8 mm. lata, glabra et lineolata, coriacea, costa supra depressa subtus prominente, nervis lateralibus utrinque 5 adscendentibus supra conspicuis subtus obscuris, margine integro recurvo. *Inflorescentiae* caulem et ramulos axillares superiores terminantes, capitatae, pauciflorae, glabrae, pedunculis 2-3 cm. longis glabris suffultae; bracteae exteriores steriles majores, raro caducae, ovatae vel oblongo-ovatae, in apicem oblique acuminatae, glabrae, dense lineolatae, 1-2 cm. longae, 5 mm. latae; bracteae interiores minores, exterioribus inclusae; bracteolae oblongo-lineares, obtusae, 10 mm. longae, 2 mm. latae, glabrae, supra dense lineolatae. *Calyx* 10 mm. longus, glaber, bilabiatus, tubo 5 mm. longo; labium posticum breviter 3-lobatum, lobis acuminatis acutis, lobo medio majore 2 mm. longo; labium anticum 2-lobatum, lobis oblongis acuminatis acutis glabris lineolatis 8 mm. longis. *Corolla* subpurpurea (ex Kerr), extus glabra, 4 cm. longa, tubi parte basali anguste cylindrica 2 cm. longa, parte superiore ventricosa prorsum curvata, lobis subaequalibus obtusis basi constrictis c. 7 mm. longis. *Stamina* 2, 2-3 cm. a basi tubi corollae affixa, filamentis 11 mm. longis glabris, antheris subexsertis oblongis 3 mm. longis; pollinis grana globosa, papilloso-echinata. *Ovarium* glabrum, loculis 4-ovulatis; stylus 4 cm. longus, glaber.

NAKAWN SAWAN. Kampèng Pét, Kao Hua Mot, 700-900 m., on limestone hill, Kerr 6118!

The plant grows in thick low bushy clumps and is very abundant among low grass of savannah; it sometimes forms nearly pure growth (ex Kerr). The ovary is unlike that of other *Strobilanthes* in having eight ovules.

***Strobilanthes serratus* Imlay**, sp. nov., a *S. Neesii* Kurz (e descr. foliis supra glabris minoribus, calyce minore, corolla extus pubescente seminibus 2 perfectis differt.

Suffrutex usque 3 m. altus. *Rami* quadrangulares, sulcati sulcis et juventute pubescentes. *Folia* ovata, in apicem acuminata basi attenuata et in petiolum breviter decurrentia, chartacea superiora minora, sessilia vel subsessilia, saepe lanceolata, 10 cm. longa, usque 5.7 cm. lata, inferiora longipetiolata, 14-17.5 cm. longa, 6.5-9.5 cm. lata, utraque pagina glabra et lineolata, costa supra conspicua subtus prominente et pubescente, nervis lateralibus utrinque 9-10 conspicuis, nervis transversis multis, margine serrato vel crenato-serrato laevi recurvo glabro. *Inflorescentiae* terminales et in axillis superioribus, paniculatae, 5-8 cm. longae, glanduloso-pubescentes, floribus sessilibus oppositis basi distantibus apice densioribus; bracteae inferiores foliaceae, superiores lanceolatae, acuminatae, nervosae, caducae, calyce longiores, c. 1.8 cm. longae, 3-5 mm. latae, glabrae, costa subtus apice pubescente; bracteolae lineari-oblongae, obtusae, 4-5 mm. longae, 0.75 mm. latae, subtus et margine pubescentes. *Calyx* extus dense glanduloso-pubescent, 6 mm. longus; lobi lineares, obtusi, subaequales, 4-4.5 mm. longi, 0.5 mm. lati, sub fructu 8 mm. longi, apice intus pubescentes, margine integro glanduloso-pubescenti-ciliato. *Corolla* purpurea (ex Kerr), extus pubescens, cum pilis paucis glandulosis, 3-3.5 cm. longa, tubi parte basali angusta 8 mm. longa, parte superiore sensim ventricosa 2.3 cm. longa; lobi 4-5 mm. longi, subaequaliter emarginati, glabri. *Stamina* 2 perfecta cum 2 rudimentariis, 2.2 cm. supra basin corollae affixa; filamenta 4 mm. longa, glabra; antherae ovoideae, muticae, 2 mm. longae; pollinis grana subglobosa, longitudinaliter costata. *Ovarium* apice dense pubescens, cristatum; stylus 2.7 cm. longus. *Capsula* 10 mm. longa, apice pubescens. *Semina* 2 perfecta et 2 imperfecta, pilosa.

PAYAP. Doi Chiengdao, c. 1900 m., Kerr 6587! forming a thick undergrowth in evergreen forest.

***Strobilanthes albo-viridis* Imlay**, sp. nov., a *S. kinabaluensi* Stapf et a *S. Kerrii* Craib foliis basi aequalateralibus, calyce bilabiato viridi et albo glanduloso-pubescente, floribus suboppositis distinguendus.

Suffrutex usque 1.5 m. altus. *Rami* obtuse quadrangulares, puberuli, superne bisulcati, nodis pubescentibus. *Folia* opposita inaequalia, ovata vel elliptica vel ovato-elliptica, apice breviter obtuse acuminata, majora basi breviter attenuata vel cuneata, 7-16.5 cm. longa, 3.3-7.5 cm. lata, minora basi cuneata vel rotundata, 3-6 cm. longa, 2.5-4 cm. lata, utraque pagina glabra et lineolata, costa supra conspicua subtus prominente et puberula, nervis lateralibus utrinque 6-7 conspicuis, nervis transversis multis parallelis, margine subintegro vel serrulato glabro, petiolo 0.3 cm. longo pubescente suffulta. *Spicae* terminales et

axillares, paniculatae, floribus suboppositis basi distantibus apicem versus densioribus et subcapitatis; pedunculi longi, glanduloso-pubescentes; bracteae lineari-oblongae, obtusae, 8 mm. longae, 1 mm. latae, apice subtus et supra dense glanduloso-pubescentes, post anthesin caducae, margine dense glanduloso-ciliato; bracteolae anguste lanceolatae, obtusae, 8 mm. longae, bracteis similes. *Calyx* basi albus, apice viridus, extus glanduloso-pubescent, bilabatus, 1.2 cm. longus, tubo 2 mm. longo; labium superius 10 mm. longum, lobis 3 oblongis apice rotundatis 5 mm. longis 1.3 mm. latis, inferius 2-lobatum, 6 mm. longum, 1.5 mm. latum, apice intus dense minute pubescens, margine integro glanduloso-ciliato. *Corolla* purpurea (ex *Kerr*), extus glabra, 3.3 cm. longa, tubi parte basali angusta 6 mm. longa, parte superiore sensim ventricosa 2.2 cm. longa; lobi obtusi, subaequaliter emarginati, 6 mm. longi, 8-9 mm. lati. *Stamina* 4, 1.2 cm. supra basin tubi corollae affixa; filamenta longiora 5 mm. longa, pilosa, breviora 1.5 mm. longa, connectivo apice producto et recurvo; antherae oblongae, 2 mm. longae; pollinis grana ellipsoidea, longitudinaliter costata. *Ovarium* apice minute glanduloso-pubescent; stylus 1.6 cm. longus, pilosus. *Capsula* 1.1 cm. longa, minute glanduloso-pubescent. *Semina* hirsuta.

SURAT. Chumpawn, Ta Ngaw, c. 100 m., in evergreen forest, *Kerr* 11493! (*type*). CHANTABURI. Krat, Dan Chumpon, c. 100 m., in evergreen forest, *Kerr* 17678! PUKET. Krabi, Panom Benchu, c. 700 m., in evergreen forest, *Kerr* 18675! NAKAWN SRITAMARAT. Patalung, Klawng Hui Kao, c. 300 m., in evergreen forest, *Kerr* 15286!

Also found in SUMATRA: Sibolangit, *Md. Nur* 7356! This collection was originally referred to *S. hirticalyx* Ridley, by Ridley in Journ. As. Soc. Mal. Br. 1, 82 (1923).

***Strobilanthes suborbicularis* Imlay**, sp. nov., foliis parvis sessilibus suborbicularibus, tota planta foliis supra exceptis glabra exsiccano brunnea coriacea distinguendus.

Caules obtuse quadrangulares, praecipue in angulis pubescentes. *Folia* superiora sessilia, inferiora subsessilia, ovata vel late ovata vel suborbicularia, apice subacuta vel obtusa vel rotundata, basi obtusa vel rotundata, raro subcordata, 2-3.5 cm. longa, 1-2.5 cm. lata, lineolata, supra sparse pilosa, pilis pluricellularibus e basi plana paucicellulari ortis, subtus subglabra, costa conspicua, nervis lateralibus utrinque 4-6 intra marginem serratum ciliatum conjunctis, petiolo 0-2 mm. longo piloso suffulta. *Inflorescentia* axillaris et terminalis, subcapitata, 2-3-5-flora, pedunculo 1.5-3.5 cm. longo sparse piloso suffulta; bracteae persistentes, ovatae vel obovatae, apice obtusae, basi attenuatae, 5-8 mm. longae, 2-4 mm. latae, glabrae, lineolatae, nervis inconspicuis, margine integro; bracteolae angustae, oblanceolatae, apice obtusae, 8 mm. longae, 1-2 mm. latae, glabrae, nervis inconspicuis. *Calycis* tubus 2 mm. longus, extus glaber; lobi oblanceolati, trinerves, subaequales,

apice intus pubescentes, ciliati, 2 anteriores majores, 12 mm. longi, 3 mm. lati, posterior 11 mm. longus, 2 mm. latus, 2 laterales 10 mm. longi, 2 mm. lati. *Corolla* extus glabra, 4-6 cm. longa, tubi parte basali angusta cylindrica 10 mm. longa, parte superiore sensim ampliata ventricosa 2.8 cm. longa; lobi 7-8 mm. longi, breviter emarginati, glabri. *Stamina* 4, 2.6 cm. supra basin tubi corollae affixa; filamenta longiora 6 mm. longa, basi pilosa, breviora 1 mm. longa arcuata; antherae horizontales, ovatae, obtusae, 1.5 mm. longae; pollinis grana ellipsoidea, longitudinaliter costata. *Ovarium* glabrum; stylus 2.9 cm. longus, glaber. *Capsula* 1-1.2 cm. longa, glabra. *Semina* 4, ovata, plana, in aqua dense hirsuta. PAYAP. Chiangmai, Doi Lang Ka, *Put* 3302!

***Strobilanthes Maingayi* C. B. Clarke**, var. **glaber** Imlay, var. nov., a typo ramis glabris, foliis ovatis nervis lateralibus utrinque 5-6, bracteis glabris apice dentatis, bracteolis apice dentatis, calyce 1.2 cm. longo lobis apice minute dentatis, filamentis pilosis differt. RACHABURI. Prachuap, Kao Luang, c. 1000 m., in open evergreen forest, *Kerr* 10835! (*type*). NAKAWN SRITAMARAT. Kao Luang, c. 1740 m., in jungle, *Eryl Smith* 744! (partly).

***Strobilanthes pectinatus* T. Anders.**, var. **acuminatus** Imlay, var. nov., a typo ramis glabris, foliis glabris exsiccatis griseis nervis lateralibus utrinque 5-6, petiolo usque 3 cm. longo, bracteis exterioribus apice longe acuminatis usque 3.5 cm. longis interioribus apice dentatis, calycis lobis apice minute dentatis, filamentis pilosis differt.

NAKAWN SRITAMARAT. Kao Luang, c. 900 m., in evergreen forest, *Kerr* 15464! May be specifically distinct.

var. **glandulosus** Imlay, var. nov., a typo ramis stramineis pilis multis patentibus brunneis multicellularibus glandulosis instructis, foliis exsiccatis subnigris, bracteis basi albis pilis ut rami instructis, calyce scarioso glabro differt.

MAHARAT. Nan, Pu Huat, c. 1500-1600 m., common in evergreen, *Kerr* 4993!

var. **punctatus** Imlay, var. nov., a typo foliis supra densius hirsutis, bracteolis ellipticis obtusis 10-11 mm. longis apice pilosis integris, calyce 11 mm. longo glabro nigro-punctato, filamentis pilosis, capsula 11 mm. longa differt.

PUKET. Satul, Kao Keo Range, c. 600 m., in evergreen forest, *Kerr* 14512! (*type*). PATTANI. Kao Kalakiri, 800-900 m., common in undergrowth in evergreen forest, *Kerr* 14954!

***Strobilanthes Evrardi* R. Ben.**, var. **parviflorus** Imlay, var. nov., a typo ramis tantum pubescentibus pilis subappressis deflexis, foliis angustioribus lanceolatis supra pilis e basibus parvis tuberculis ortis subtus densius pilosis, corolla 2.5 cm. rarius 3 cm. longa differt.

SURAT. Chumpawn, Ban Tung Maha, c. 10 m., by stream in evergreen forest, *Kerr* 11363! Langsuan, Kao Nom Sao, c. 800 m., in bamboo forest, *Kerr* 12074! PUKET. Krabi, Klawng Wa, c. 50 m., in evergreen forest, *Kerr* 16335! (*type*).

***Strobilanthes incisus* Imlay**, sp. nov., a *S. venusto* Craib foliis glabris, bracteis angustis, calycis lobo postico ceteris brevior apice emarginato recedit.

Suffrutex 0.5 m. altus (ex *Winit*). *Ramuli* obtuse quadrangulares, sulcati, glabri. *Folia* sessilia, subaequalia, lanceolato-elliptica, ad apicem acutum acuminata, basi attenuata auriculata, lineolata, glabra, 13–20 cm. longa, 3–4.8 cm. lata, costa supra conspicua subtus prominente, nervis lateralibus utrinque 12–13 subtus conspicuis, margine serrulato scabrido-ciliato. *Spicae* axillares et terminales, strobiliformes, 3–5 cm. longae; bracteae imbricatae, obovatae, apice acutae vel saepe obtusae, basi attenuatae, 10 mm. longae, 5 mm. latae, albo-tomentosae, cum pilis multis glandulosis, subtus pilosae, lineolatae, margine integro pubescenti-ciliato et albo-piloso; bracteolae 0. *Calyx* 6 mm. longus, extus glanduloso-pilosus; lobi inaequales, basi 1.5 mm. connati, intus appresse albo-pilosi, glanduloso-ciliati, lineares, obtusi, anteriores 4.5 mm. longi, laterales breviores, posterior brevior apice emarginatus. *Corolla* violacea (ex *Winit*), extus glabra, 3 cm. longa; tubi pars basalis angusta 6 mm. longa, subito ampliata; lobi 5 mm. longi, 6–7 mm. lati, obtusi. *Stamina* 4, 1.6 cm. a basi tubi corollae affixa, 1.5 et 6 mm. longa, glabra; antherae 1 mm. longae, erectae. *Ovarium* glabrum; stylus 2.5 cm. longus, glaber. *Capsula* ignota.

MAHARAT. Lampang, Mè Chang, in mixed forest, 400 m., *Winit* 1818!

***Strobilanthes turgidinodis* Imlay**, sp. nov., ob caules succulentos, nodos turgidos, internodia brevia, folia multinervia facile distinguendus.

Frutex sarmentosus, usque 2 m. altus (ex *Kerr*). *Rami* crassi, succulenti, glabri, nodis turgidis, internodiis brevibus. *Folia* elliptica vel oblongo-elliptica, ad apicem acutum acuminata, basi breviter attenuata vel cuneata, exsiccata brunneo-viridia, dense lineolata, glabra, 7–16 cm. longa, 2–5.5 cm. lata, costa nervisque lateralibus utrinque 11–14 supra conspicuis subtus prominentibus villosis, nervis transversis subtomentosis, margine breviter serrato dentibus cristatis ciliato, petiolo 1.5 cm. longo glabro suffulta. *Spicae* 3–8 cm. longae, terminales et axillares, saepe breviter ramosa, brevissime pubescentes et glanduloso-pilosae; flores sessiles; bracteae anguste lanceolatae, ad apicem acutum acuminatae, 1.3 cm. longae, 2 mm. latae, glanduloso-pubescentes, margine integro pilis longis et brevibus glandulosis ciliatae; bracteolae 7–8 mm. longae, 0.8 mm. latae, angustae, acuminatae, glanduloso-pubescentes. *Calyx* 10 mm. longus, extus breviter glanduloso-pubescentis; lobi oblanceolati vel elliptici, acuminati, subaequales,

6–7–8 mm. longi, 1–1.5 mm. lati, intus superne pubescentes, pilis appressis haud glandulosis. *Corolla* purpurea, lobo postico albo-et luteo-maculata (ex *Kerr*), extus puberula, 4 cm. longa; tubi pars basalis angusta 1.5 cm. longa, demum subito ventricosa; lobi 6 mm. longi. *Stamina* 4, 2 cm. supra basin corollae affixa, 2 et 6.5 mm. longa, basi pilosa, apice producto recurvo; antherae oblongae, 1.5 mm. longae. *Ovarium* glanduloso-puberulum; stylus 3.2 cm. longus, sparse pubescens. *Capsula* ignota.

RACHABURI. Kanburi, Ta Kanun, c. 500 m., on limestone rocks, *Kerr* 10286!

***Strobilanthes argenteus* Imlay**, sp. nov., a *S. recurvo* C. B. Clarke inflorescentia laxa pauciflora, bracteis oblongo-ellipticis obtusis nec ovatis recurvis differt.

Rami obtuse quadrangulares, sulcati, primo pilis longis patentibus albis vel argenteis dense vestiti. *Folia* aequalia vel inaequalia, inferiora ovata vel ovato-elliptica, ad apicem subacutum breviter acuminata, basi brevissime attenuata, longe petiolata, superiora late ovata vel cordata, sessilia, lineolata, utraque pagina pilis longis flaccidis pluricellularibus vestita, maxima 11.5 cm. longa, 6 cm. lata, costa supra conspicua subtus prominente, nervis lateralibus utrinque 6–7 conspicuis, margine crenato ciliato, petiolo 3–3.5 cm. longo suffulta. *Spicae* breves, basi interruptae, laxae, pauciflorae, 1–4 cm. longae, terminales et ramulos axillares e nodis foliorum sessilium cordatorum ortos terminantes; pedunculi saltem 2 cm. longi, erecti, pilis argenteis patentibus vestiti; flores oppositi, solitarii, sessiles, basi spicae remoti; bracteae persistentes, oblongo-ellipticae, obtusae, 7 mm. longae, 2 mm. latae, griseae, extus breviter glanduloso-pilosae, intus pilosae, margine integro glanduloso-ciliato; bracteolae 5 mm. longae, 1 mm. latae, ceteroquin bracteis similes. *Calyx* 9 mm. longus, extus breviter glanduloso-pilosus, intus apice tantum pubescens, fere a basi bilabiatus; labium anticum alte bilobatum, lobis 8 mm. longis lineari-lanceolatis acutis, posticum a medio trilobatum. *Corolla* 3.3 cm. longa, extus puberula; tubus curvatus, basi per 10 mm. angustus, demum ventricosus; lobi 5 mm. longi, apice oblique emarginati. *Stamina* 4, didynamia, 1.7 cm. a basi tubi corollae affixa, 5 et 7 mm. longa, longiora sparse pilosa; antherae oblongae, 2 mm. longae. *Ovarium* apice pilis erectis albis vestitum; stylus 2.4 cm. longus, pilosus. *Capsula* ignota.

PAYAP. Chiangmai, Doi Lang Ka, *Put* 3331!

***Strobilanthes articulatus* Imlay**, sp. nov., a *S. geniculato* C. B. Clarke foliis pilosis minute lineolatis, pedunculis et pedicellis pilosis, sepalis haud glandulosis apice pubescentibus differt.

Rami obtuse quadrangulares, tenues, primo pilosi, demum pubescentes. *Folia* maxime inaequalia, late lanceolata vel ovato-elliptica, ad apicem acutum longe acuminata, basi obtusa vel cuneata, supra minute lineolata, pilosa, subtus nervis pilosa,

majora 7-13 cm. longa, 2.8-4.5 cm. lata, minora saepe caduca, 1-5.5 cm. longa, 1-2.5 cm. lata, costa supra conspicua subtus prominente, nervis lateralibus utrinque 6 utraque pagina conspicuis, margine serrato ciliato, petiolo 7 mm. longo pubescente suffulta. *Spicae* parvae, capitellatae, 2-3-florae, pedunculis longis tenuissimis filiformibus articulatis 6-9 cm. longis saepe ramosis glanduloso-pubescentibus et pilosis suffultae; pedicelli pilosi; flores bracteae paucis sterilibus exterioribus ante anthesin caducis inclusi; bracteae lanceolatae, acuminatae, concavae, 9-10 mm. longae, 4.5 mm. latae, glabrae, lineolatae, margine integro apice ciliato; bracteolae 0. *Calyx* 7 mm. longus, extus apice puberulus, lobis subaequalibus lineari-lanceolatis 3-nervosis ciliatis. *Corolla* candida (ex *Kerr*), extus alabastro puberula, 3.5 cm. longa; tubus 5 mm. supra basin ampliatus; lobi 6-7 mm. lati, apice emarginati. *Stamina* 4, didynamia, 1.6 cm. supra basin corollae tubi affixa, 1 et 6 mm. longa, longiora pilosa, breviora glabra externe curvata; antherae ovoideae, horizontales, 1 mm. longae, subpurpureae (ex *Kerr*). *Ovarium* glabrum; stylus 2.4 cm. longus, superne sparse pilosus. *Capsula* 1.6 cm. longa, minute glanduloso-puberula. *Semina* pilosa.

CHANTABURI. Chantabun, Kao Soi Dao, c. 1300 m., in evergreen forest, often on rocks, *Kerr* 9630!

***Strobilanthes latibracteatus* Imlay, sp. nov., a *S. pectinato* T. Anders.** caulibus minute pubescentibus, foliis subcoriaceis, bracteis exterioribus 2-3 cm. latis, bracteolis apice integris, filamentis basi pilosis differt.

Frutex usque 1.5 m. altus (ex *Kerr*). *Rami* primo quadrangulares, sulcati, minute pubescentes. *Folia* inaequalia, oblongo-elliptica, apice breviter acuminata, basi attenuata, subcoriacea, lineolata, subtus costa tantum sparse pilosa, 4-14 cm. longa, 2-4 cm. lata, costa supra conspicua subtus prominente, nervis lateralibus utrinque 7-9 supra conspicuis subtus prominulis, margine obscure serrulato, petiolo 0.5-2 cm. longo suffulta. *Spicae* capitatae, breviter pedunculatae, glabrae, 3 cm. longae, 2-3 cm. latae, axem et ramos axillares terminantes; bracteae exteriores steriles, late ovatae, apice subacutae, integrae, minute lineolatae, glabrae, 3 cm. longae, 2.5 cm. latae, interiores breviores apice serrulatae; bracteolae 1.6 cm. longae, oblongae, obtusae, integrae, glabrae. *Calyx* 1.6 cm. longus, extus lineolatus, glaber, lobis subaequalibus oblongo-linearibus apice obtusis vel rotundatis integris intus basi sparse pilosis 1.5 mm. latis. *Corolla* candida (ex *Kerr*), 4.5 cm. longa, extus glabra; tubus 8 mm. supra basin ampliatus; lobi apice subaequaliter bilobati. *Stamina* 4, medio tubo affixa, 2 et 7 mm. longa, basi pilosa; antherae oblongae, erectae, 2.5-3 mm. longae. *Ovarium* glabrum; discus ovario aequilongus; stylus 3 cm. longus, superne puberulus. *Capsula* ignota.

PUKET. Trang, Kao Soi Doi, c. 800 m., in open patch in evergreen forest, *Kerr* 19190!

***Strobilanthes corrugatus* Imlay, sp. nov., a *S. lilacino* C. B. Clarke** spicis brevioribus, bracteis ovatis acutis crenatis 6 mm. longis, calyce 9 mm. longo eglanduloso recedit.

Rami teretes, lignei, dense villosi, pilis pluricellularibus eglandulosis. *Folia* valde inaequalia, ovata, ad apicem acutum breviter acuminata, basi inaequaliter rotundata vel cordata, supra pilis pluricellularibus e basibus papillosis ortis scabrido-hirsuta, subtus praecipue in nervis dense molliter pilosa, majora 4-6.5 cm. longa, 2-3.5 cm. lata, petiolo 7-10 mm. longo suffulta, minora 1.5 cm. longa, petiolo 2-4 mm. longo suffulta, costa utraque pagina dense hirsuta conspicua, nervis lateralibus utrinque 8 supra depressis subtus conspicuis, nervis transversis multis supra depressis, margine undulato-crenato breviter ciliato. *Spicae* brevissimae, subcapitatae, saepe interruptae, axillares et ramos brevissimos axillares terminantes, saepe ramosae, breviter pedunculatae; flores oppositi; bracteae inferiores foliaceae, calyce longiores, dense hirsutae eglandulosae; superiores ovatae, acutae, basi attenuatae, crenatae, hirsutae, 6 mm. longae, 3 mm. latae; bracteolae calyce breviores, oblanceolatae, apice obtusae, hirsutae, 6 mm. longae. *Calyx* 9 mm. longus, extus hirsutus; lobi oblongi, medio latiores, obtusae, intus apice medioque albo-hirsuti, posteriores 6 mm. longi, anteriores 6.5 mm. longi. *Corolla* alabastro apice dense tomentosa, demum pubescens, 3 cm. longa, tubi parte basali 10 mm. longa sensim ampliata; lobi apice breviter bilobati. *Stamina* 4, 1.8 cm. supra basin corollae affixa, 2 et 5 mm. longa, pilosa; antherae lineares, 2.5 mm. longae. *Ovarium* in crista apicali pubescens et glanduloso-pubescent; stylus 2.5 cm. longus, superne puberuli. *Capsula* ignota.

PAYAP. Doi Chiengdao, among rocks, *Put* 372!

***Strobilanthes viscidus* Imlay, sp. nov., a *S. lilacino* C. B. Clarke** foliis majoribus haud asperis, bracteis minoribus obovatis vel spatulatis nec oblongis, corolla minore differt.

Frutex usque 1.5 m. altus (ex *Kerr*). *Rami* teretes, lignei, viscido-pubescentes. *Folia* inaequalissima, ovata, ad apicem acutum acuminata, basi inaequaliter rotundata vel cordata, lineolata, supra pilis pluricellularibus e basibus papillosis ortis breviter hirsuta, subtus costa praecipue nervisque lateralibus utrinque 8-9 supra conspicuis subtus prominentibus, his supra parum depressis, margine crenulato pubescente ciliato, petiolo 0.7-3.5 cm. longo dense glanduloso-pubescente suffulta. *Spicae* solitariae, 2-3.5 cm. longae, dense viscido-pubescentes, terminales vel axillares, strobilatae; pedunculi 5-10 mm. longi, dense viscido-pubescentes; bracteae spatulatae, ovatae, obtusae, 9 mm. longae, apice 3.5 mm. latae, basi 1.25 mm. latae, virides, utraque pagina viscido-pubescentes, ciliatae. *Calyx* 9 mm. longus, extus viscido-pubescent, lobis linearibus obtusis intus appresse albo-pilosis glanduloso-ciliatis. *Corolla* purpurea (ex *Kerr*), alabastro extus apice pubescens, 3.3 cm. longa, tubi parte basali angusta 11 mm. longa. *Stamina* 4,

in medio corollae partis ampliatae affixa, 2 et 7 mm. longa, membranacea, pilosa; antherae lineares, 2.5 mm. longae, uno loculo paulo supra alterum disposito. *Stylus* 1.6 cm. longus, glaber. *Capsula* ignota.

PAYAP. Doi Chiengdao, 1650–1770 m., abundant, plant has aromatic smell, *Kerr* 2874! (*type*); Doi Suteh, 250 m., in evergreen forest, *Kerr*! 1650 m., *Kerr*!

***Strobilanthes bombycinus* Imlay**, sp. nov., a *S. Evardi* R. Ben. ramis glabris, foliis maturis sparse hirsutis, bracteis margine glanduloso-ciliatis, staminibus 2 et 4 mm. longis in medio corollae tubi affixis differt.

Frutex c. 1 m. altus (ex *Kerr*). *Rami* teretes, bisulcati, glabri. *Folia* maxime inaequalia, late ovata vel ovato-lanceolata, vel elliptica, ad apicem subacutum breviter acuminata, basi cuneata vel breviter attenuata, lineolata, immatura basi pubescentia utraque pagina hirsuta, matura inter nervos laterales sparse hirsuta, majora 7–12 cm. longa, 3.5–7 cm. lata, costa hirsuta supra conspicua subtus prominente, nervis lateralibus utrinque 8–9 conspicuis, margine crenato, petiolo 1–2.8 cm. longo suffulta. *Spicae* breves, densae, capitellatae, bracteatae, 1–2 cm. longae, 1.5 cm. latae, terminales saepe axillares; pedunculus usque 2 cm. longus, apice folia parva 1–2 gerens; bractee plus minusve imbricatae, calyce longiores, lanceolatae, obtusae, c. 1.3 cm. longae, 4 mm. latae, basi pilis albis multicellularibus instructae, superne pubescentes, margine dense molliter glanduloso-ciliatae, persistentes; bracteolae oblanceolato-ellipticae, acutae, 10 mm. longae, 1 mm. latae, a basi pilis longis bombycinis dense instructae, apice margineque breviter glanduloso-pubescentes. *Calyx* 10 mm. longus, indumento illi bractearum simili, lobis subaequalibus lineari-oblongis obtusis intus albo-sericeis. *Corolla* subpurpurea (ex *Kerr*), extus puberula, 3.5 cm. longa; tubus 10 mm. a basi sensim ampliatus; lobi 5 mm. longi. *Stamina* 4, 2 cm. a basi corollae affixa, 2 et 4 mm. longa, longiora pilosa; antherae oblongae, 2 mm. longae. *Ovarium* apice dense pilosum; stylus 2 cm. longus, pilosus. *Capsula* 8 mm. longa, superne dense pilosa. *Semina* dense sericea.

RACHABURI. Kanburi, Sisawat, c. 100 m., in evergreen forest, *Kerr* 10211!

BARLERIEAE.

***Barleria biloba* Imlay**, sp. nov., species distincta, a *B. courtallica* Nees bracteis ovatis vel ellipticis nec lineari-lanceolatis calyci aequalibus, sepalis anticis alte bilobatis, corollae tubo sursum attenuato nec ampliato, corollae lobo antico a medio tubo libero facile distinguitur.

Frutex suberectus, usque 30 cm. altus (ex *Kerr*). *Caules* subteretes, dense lineolati, glabri, nodis strigosis distantibus. *Folia* petiolata, subaequalia, ovata, ad apicem acutum breviter acuminata, basi subito breviter attenuata, lineolata, supra sparse

strigosa, subtus villosa, 4–10 cm. longa, 2–6.5 cm. lata, costa supra conspicua subtus prominente, nervis lateralibus utrinque 4 subtus prominulis, margine integro molliter ciliato, petiolo 1–2 cm. longo suffulta. *Spicae* densae, oblongae vel ovatae, 2–6 cm. longae, 2–3 cm. latae, caulem et ramulos terminantes, saepe axillares; bractee late ovatae vel ellipticae, ad apicem cuspidatum recurvatum acuminatae, 2–2.3 cm. longae, 7–10 mm. latae, conspicue 3-nerves, pilis brevibus pubescentibus cum paucis longis vestitae, margine minute denticulato pilis brevibus saepe glandulosis et longis albis sericeis ciliatae; bracteolae oblongae, apiculatae, 1.5 cm. longae, 2 mm. latae, supra glabrae, subtus pubescentes, costa conspicua, margine longe ciliatae et breviter glandulosa-ciliatae. *Calycis* sepalae exteriores subaequales, oblongo-acuminatae, 5-nerves, apice breviter cuspidatae, breviter pubescentes, saepe glandulosae et pilosae, margine longe et breviter ciliatae, postica major, 2.3–2.5 cm. longa, 6–7 mm. lata, apice integro, antica 2 cm. longa, apice alte bilobata; laterales lineari-acuminatae, 1.3 cm. longae, breviter pubescentes, saepe glandulosae et pilosae, costa conspicua. *Corolla* lilacina (ex *Kerr*), 4.5 cm. longa, extus puberula; tubus 2.7 cm. longus, ad apicem attenuatus; labium anticum unipetalum, c. 1.3 cm. longum, a medio tubo liberum; posticum 4-lobatum, lobis subaequalibus oblongis vel ovatis 1.5–1.9 cm. longis. *Stamina* 2 perfecta exserta, cum staminodiis 3 minutis 7 mm. supra basin corollae affixa, basi pilosa, perfecta 4 cm. longa glabra; antherae oblongae, 6 mm. longae. *Ovarium* apice pubescens; stylus 5.2 cm. longus, basi sparse pilosus. *Capsula* 1.7 cm. longa, apice minute pubescens. *Semina* 4, compressa, pilis densis nigris sericeis vestita.

AYUTHIA. Chaibadan, Dong Paya Yen, c. 100 m., in mixed forest, *Kerr* 7997! RACHABURI. Prachuap, Sam Roi Yawt, *Put* 2508! (*type*).

***Lepidagathis dissimilis* Imlay**, sp. nov., a *L. falcata* Nees foliis subsessilibus coriaceis, calycis lobis anterioribus basi brevissime connatis, bracteis omnibus 5-nervibus differt.

Herba (?), c. 30 cm. alta. *Caules* obtuse quadrangulares, pilis subappressis sursum curvatis pubescentes, dense lineolati. *Folia* subsessilia, subaequalia, elliptica vel elliptico-lanceolata, apice subacuta, basi attenuata, coriacea, lineolata, supra glabra, nervis subtus pilosa, 5–8.5 cm. longa, 2–3.5 cm. lata, costa nervisque lateralibus utrinque 5–6 supra conspicuis subtus prominentibus, nervis transversis obscuris, margine subintegro recurvo, petiolo 2–3 mm. longo suffulta. *Spicae* unilaterales, axillares et terminales, solitariae vel 2–3-natae, subsessiles, densae, oblongae, 2.5–5 cm. longae, 2.5 cm. latae; bractee steriles lanceolatae vel falcatae, acutae, sessiles, axi oblique affixae, 1.5 cm. longae, 4 mm. latae, conspicue 5-nerves, margine sparse ciliato excepto glabrae; bractee fertiles uniflorae, oblongae, acuminatae, scariosae, ceteroquin sterilibus similes; bracteolae lineari-lanceolatae, glabrae,

virides, 1.3 cm. longae, 2 mm. latae. *Calyx* 1.3 cm. longus, margine sparse ciliato excepto glaber, scariosus; lobi 2 anteriores basi brevissime connati, 2-nerves, oblongo-acuminati, 1-2 cm. longi, 2 mm. lati; lobus posterior oblongo-acuminatus, 3-5-nervis, 1.3 cm. longus, 3-5 mm. latus. *Corolla* alba purpureo-maculata (ex Kerr), extus glabra, 10 mm. longa; tubus supra basin ampliatus, intus pilosus; labium inferius 3-lobatum, lobis oblongis rotundatis 1.5-2 mm. longis, superius truncatum, breviter bilobatum. *Stamina* 4, ad basin tubi corollae affixa, glabra, anteriora 4-5 mm. longa, antheris bilocularibus, posteriora 3 mm. longa, antheris unilocularibus. *Ovarium* glabrum; stylus 7 mm. longus, basi puberulus. *Capsula* 8 mm. longa, glabra. *Semina* 4, plana, pilosa.

NAKAWN SAWAN. Raheng, c. 100 m., among grass in deciduous jungle, Kerr 4576!

ANDROGRAPHEAE.

Andrographis tenera (Nees) Imlay, comb. nov.

Justicia tenuiflora Wall. Cat. 7185 (1832), nomen.

Haplanthus tener Nees in Wall. Pl. As. Rar. 3, 116 (1832).

Andrographis tenuiflora T. Anders. in Journ. Linn. Soc. 9, 502 (1867).

Gymnostachyum Parishii and *andrographioides* T. Anders. l.c. 504 (1867).

Leptostachya (?) *oblongifolia*, *spathulifolia*, *axillaris* C. B. Clarke apud Hosseus in Engl. Bot. Jahrb. 41, 72 (1907).

Wallich's MS. name *Justicia tenuiflora* was cited in synonymy under var. β *elongatus* of *Haplanthus tener* Nees, but was never validly published. T. Anderson adopted the epithet *tenuiflora* when he transferred *H. tener* to *Andrographis*, but excluded the var. β *elongatus*.

Graphandra Imlay, gen. nov., *Andrographi* Wall. affinis, sed floribus in spicis brevibus bracteatis dispositis, bracteis plus minusve imbricatis calyce majoribus, calyce 4-lobato, antheris minute mucronatis medio breviter pilosis basi haud barbatis, capsula vix compressa, seminibus compressis laevibus differt.

Herba procumbens. *Folia* opposita, integra, sessilia vel subsessilia. *Flores* in spicis bracteatis simplicibus axillaribus et terminalibus dispositi; bracteae oppositae, laxe imbricatae, calyce longiores; bracteolae 2, calyci aequilongae vel eo parum longiores. *Calycis lobi* 4, usque ad basin liberi. *Corollae* tubus limbo fere aequilongus; limbus bilabiatus, labio superiore angusto integro vel subintegro, inferiore oblongo 3-lobato lobis alabastro imbricatis. *Stamina* 2, tubo corollae ope membranae tenuis affixa, demum in fauce tubi libera; antherae loculi 2, paralleli, basi minute mucronati, medio breviter pilosi, basi haud barbati; pollinis grana subglobosa, minute punctata, obturamentis 3 in sulcis parvis jacentibus. *Ovarium* biloculare, 12-ovulatum; stylus apice minute bifidus.

Capsula oblonga, vix compressa, haud stipitata, 12-sperma. *Semina* basalia, compressa, laevia, subglabra.

Graphandra procumbens Imlay, sp. nov., adhuc unica.

Herba ramosa, procumbens. *Caulis* tenuis, virides, glabri. *Folia* sessilia vel subsessilia, aequalia, ovato-oblonga, apice acuta vel subacuta, basi acuta, subcoriacea, utraque pagina subglabra, 0.6-2.2 cm. longa, 4-8 mm. lata, costa nervisque lateralibus utrinque 3 subtus subobscuris, margine integro incrassato glabro, petiolo 0-2 mm. longo suffulta. *Spicae* simplices, bracteatae, ramos laterales erectos terminantes; flores solitarii, alterni; bracteae plus minusve imbricatae, oppositae, cujusque paris altera sterili, oblongae vel oblanceolatae, apice acutae, glabrae, obscure nervosae, 9-10 mm. longae, 3-4 mm. latae; bracteolae oblongo-lanceolatae, apice brevissime acuminatae, glabrae, 8 mm. longae, 1 mm. latae, calyce parum longiores. *Calycis lobi* 4, anguste lanceolati, acuminati, 7 mm. longi, minute puberuli et ciliati, pilis multis glandulosis obtecti. *Corolla* albo-rosea (ex Kerr), extus puberula, 1.3 cm. longa; tubus rectus, angustus, intus basi puberulus, 6 mm. longus; labium superius anguste lanceolatum, apice obtusum subintegrum, basi parum concavum, 6 mm. longum, 2 mm. latum, inferius oblongum, 7-5 mm. longum, 4 mm. latum, trilobum, lobis 2 mm. longis obtusis medio latiore. *Stamina* 2, tubo corollae per 5 mm. adnata, demum libera, 1 mm. longa, glabra; antherae loculi 2, basi brevissime mucronati, 2 mm. longi, medio dense pubescentes. *Ovarium* sparse pubescens; stylus 8 mm. longus, sparse pubescens. *Capsula* 8 mm. longa, oblonga, vix compressa, apice puberula excepta glabra, 12-sperma. *Semina* ovoidea, compressa, laevia, pilis paucis ornata.

UDAWN. Nakawn Panom, Ta Utên, c. 200 m., in open grassy ground, Kerr 8454!

This genus clearly belongs to the subtribe *Andrographieae* on account of the twelve-seeded capsule, the hooked ejaculators, the two stamens, the corolla lobes imbricate in the bud, and the similar pollen grains. It is most closely related to *Andrographis*, but has several striking points of difference. The plant is small and procumbent, and the small bracteate spikes are borne on erect branchlets. This habit and the bracts larger than the calyx are as yet unknown in *Andrographis*. Also the calyx is persistently 4-lobed, the stamens are attached to the corolla tube for a short distance by a thin membrane, and the anther loculi are definitely not bearded at the base but have a dense pubescent patch at the middle. In *Andrographis* the capsule is flattened, and the seeds are subglobose and pitted, while in *Graphandra* the capsule is scarcely flattened, if at all, and the seeds are compressed with a smooth surface.

Gymnostachyum decurrens Stapf var. **Robinsonii** (Ridley) Imlay, stat. nov.

G. Robinsonii Ridley in Journ. Roy. As. Soc. Str. Br. 86, 305 (1922); Fl. Mal. Pen. 2, 579 (1923).

var. **glabrum** Imlay, var. nov., a typo spicis calyce capsulaque omnino glabris differt.

SURAT. Surat, Kantuli, Put 4116! (type), Put 4156!

Gymnostachyum signatum (R. Ben.) Imlay, comb. nov.

Cryptophragmium signatum R. Ben. in Bull. Soc. Bot. France, 81, 602 (1934), et in Lec. Fl. Gén. Indo-Ch. 4, 700 (1935).

Gymnostachyum coriaceum Imlay, sp. nov., a *G. affini* Nees foliis minoribus coriaceis, spicis secundis floribus haud oppositis, corollae lobis rotundatis, antheris basi acutis nec mucronatis differt.

Caules erecti, 10–20 cm. longi, saepe basi ramosi, dense pubescentes. *Folia* ovata, apice obtusa, basi rotundata vel breviter cuneata, coriacea, supra glabrata, subtus pubescentia, 2.5–5 cm. longa, 1.5–3 cm. lata, costa nervisque lateralibus utrinque 4–5 conspicuis, margine paulum recurvato, petiolo 5 mm. longo tomentoso suffulta. *Spicae* terminales et axillares, 2–3-natae, densae, secundae, fere glabrae, 4–8 cm. longae, breviter pedunculatae; flores solitarii; bractae lanceolatae, acutae, virides, 3-costatae, corneae, calyce breviores, 5 mm. longae, 1 mm. latae, glabrae, ciliatae, extus punctatae; bracteolae lanceolatae, acuminatae, 4 mm. longae. *Calyx* 6 mm. longus, extus glaber, punctatus; lobi basi 1.5 mm. connati, lineari-acuminati, 3-costati, ciliolati. *Corolla* extus glabra, 7–8 mm. longa; tubus tam longus quam limbus, fauce pubescens; labium superius subintegrum vel minute bilobatum; inferius 3-lobatum, lobis brevibus rotundatis. *Stamina* ad apicem corollae tubi affixa, 1 mm. longa, glabra; antherae oblongae, 2 mm. longae, subaequales, basi acutae. *Ovarium* glabrum; stylus 4 mm. longus, pilosus. *Capsula* 1 cm. longa, glabra, a basi 9–10-sperma.

UDAWN. Sakon, Wa Nawn, c. 200 m., in bamboo jungle, Kerr 8498!

Phlogacanthus paniculatus (T. Anders.) Imlay, comb. nov.

Cystacanthus paniculatus T. Anders. in Journ. Linn. Soc. 9, 458 (1867); C. B. Clarke in Hook. f. Fl. Brit. Ind. 4, 514 (1884).

var. **dejectus** Imlay, var. nov., a typo inflorescentia saepe axillari minute pubescente pilis aliquando glandulosis, calyce 9–12 mm. longo lobis post capsulam maturatam deflexis differt.

NAKAWN SAWAN. Kampéngpét, c. 100 m., in open deciduous forest, Kerr 5960!

The deflexed sepals give this plant a dejected appearance, which suggested the varietal epithet.

var. **abbreviatus** (Craib) Imlay, stat. nov.

Cystacanthus abbreviatus Craib in Kew Bull. 438 (1911).

Phlogacanthus abbreviatus (Craib) R. Ben. in Lec. Fl. Gén. Indo-Ch. 4, 712 (1935).

Phlogacanthus pedunculatus Imlay, sp. nov., a *P. paniculato* (T. Anders.) Imlay paniculis laxioribus longius pedunculatis, calyce longiore differt.

Frutex c. 4.5 m. altus (ex Kerr). *Rami* quadrangulares, glabri, cortice tenui pallido obtecti. *Folia* subaequalia, late lanceolata vel ovato-lanceolata, ad apicem subacutum attenuata, basi cuneata vel breviter attenuata, chartacea, dense lineolata, supra glabra, subtus minute pubescentia, 8–19 cm. longa, 4–8 cm. lata, costa cum nervis lateralibus utrinque 8 supra conspicuis subtus prominulis, nervis transversis subtus conspicuis, margine integro, petiolo 1–4.5 cm. longo minute pubescente suffulta. *Panicula* angusta, laxa, terminalis, ramis remotis simplicibus vel cymosis 1–2.5 cm. longis, glanduloso-pubescentibus; bractae infimae foliaceae, petiolatae, 2 cm. longae, superiores minimae; bracteolae parvae, 0.5 mm. longae, glanduloso-pubescentes. *Calyx* sub anthesi 1–2 cm. longus, sub fructu 1–7 cm. longus, dense glanduloso-pubescentibus, lobis oblongis acuminatis 2 mm. latis posteriore paulo longiore. *Corolla* lilacina (ex Kerr), extus glanduloso-pubescentibus, c. 2 cm. longa, tubo 5 mm. a basi curvato et ventricoso, lobis subaequalibus rotundatis. *Stamina* 2 fertilia, staminodiis nullis, 1–2 mm. longa, antheris 4 mm. longis. *Ovarium* dense pilosum, apice glandulosum; stylus 1–4 cm. longus, pilosus. *Capsula* 2–8 cm. longa, oblongo-linearis, attenuata, tetragona, a basi 2-sperma. *Semina* minute verrucosa et pilosa.

PAYAP. Me Ping Rapids, Kêng Soi, 180 m., in evergreen by river, Kerr 2939! (type); Lampun, Mé Li, 480 m., near stream, Winit 248! MAHARAT. Lampang Province, Chê Hom, c. 350 m., in mixed jungle, Kerr 4797! RACHABURI. Kanburi, Sisawat, c. 100 m., in evergreen forest, Kerr 10200!

Phlogacanthus pauciflorus Imlay, sp. nov., a *P. paniculato* (T. Anders.) Imlay racemis simplicibus 3 cm. longis, calyce 10 mm. longo, foliis utraque pagina puberulis ciliolatis differt.

Suffrutex c. 1 m. altus (ex Winit). *Caules* e radice perenni orti, annui, recti, quadrangulares, puberuli, cortice stramineo obtecti. *Folia* oblanceolata, oblongo-lanceolata vel late lanceolata, apice breviter vel vix obtuse acuminata, basi cuneata, chartacea, pagina utraque puberula, supra fusca, subtus pallidiora, 4.5–7 cm. longa, 1.5–2.6 cm. lata, costa nervisque lateralibus utrinque 6 supra conspicuis subtus prominulis, nervis transversis paucis, margine ciliolato, petiolo usque 1.5 mm. longo suffulta. *Racemi* terminales, ciliolati, petiolo usque 1.5 mm. longo suffulta. *Bractae* lineari-lanceolatae, 5 mm. longae, usque 3 cm. longi; bracteolae minimae. *Calyx* 10 mm. longus, dense pubescentibus; bracteolae minimae. *Corolla* glanduloso-pubescentibus, lobis lineari-lanceolatis 1 mm. latis. *Corolla* purpurea (ex Kerr), extus glanduloso-pubescentibus, 2.5 cm. longa, tubo 3 mm. a basi curvato et ventricoso, lobis subaequalibus rotundatis. *Stamina* 2 fertilia, staminodiis nullis, 6 mm. a basi corollae affixa, basi tantum pilosa, antheris 4 mm. longis. *Ovarium* sparse puberulum; stylus 1.5 cm. longus, subglaber. *Capsula* 2–8 cm. longa, a basi 12-sperma.

MAHARAT. Lampang, Palat near Lakon, 360 m., in deciduous bamboo jungle, Kerr 2330! (type); Lampang, Mé Saloi, c. 200 m.,

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CHANTABURI. Krat, Kao Kuap, c. 400 m., in evergreen forest,
Kerr 17707!

Herba (?), usque 0.5 m. alta, basi ramosa. *Ramuli* pauci, erecti, tenues, quadrangulares, faciebus oppositis pilis recurvis instructis. *Folia* sessilia vel subsessilia, lineari-lanceolata vel lineari-elliptica apice obtusa, apice cuneata, dense lineolata, supra glabra, subcoriacea, subtus costa sparse pilosa punctata, 1.5-5 cm. longa, 3-9 mm. lata, costa prominente, nervis lateralibus utrinque 5-6 obscuris, petiolo 0-2 mm. longo suffulta. *Flores* subsessiles, solitarii usque terni, axillares; bractee oblongo-ellipticae, obtusae, usque 3 cm. longae, 2.5 mm. latae, foliaceae, lineolatae, subtus sparse pilosae, costa prominente; bracteolae lineari-acuminatae, 3 mm. longae, 0.5 mm. latae. *Calyx* 6 mm. longus, extus glanduloso-pubescent, lobis subacutis obscure 3-nerviis intus subglabris. *Corolla* alba (ex *Kerr*), 3 cm. longa, extus glabra; tubus angustus, apice 3 mm. ampliatius; lobi subaequales, elliptici, obtusi, 10 mm. longi, 4-5 mm. lati, apice crenulati et sparse setulosi. *Stamina* 2 fertilia, cum staminodiis 2 minutis in corollae parte ampliata affixa, 1 mm. longa, glabra: antherae oblongae, 1.5 mm. longae, in tubo

RACHASIMA. Korat, Sikiu, c. 200 m., in bamboo scrub, *Kerr*
19909! (*type*). Pak Tong Chai, c. 200 m., in scrub jungle, *Kerr*
8095!

Herba (?), c. 0·5 m. alta. *Caules* tenues, erecti, superne pubescentes. *Folia* ovata vel ovato-lanceolata, ad apicem acutum breviter acuminata, basi cuneata vel breviter attenuata, chartacea, lineolata, primo utraque pagina glanduloso-pubescentia, demum subglabra, 5–10 cm. longa, 2–4 cm. lata, suprema minora bracteiformia costa nervisque lateralibus utrinque 6–7 supra conspicuis subtus prominulis, his intra marginem conjunctis, nervis transversis obscuris, margine sub INTEGRO vel obscure denticulato primo glanduloso-ciliata, petiolo 0·5–1·5 cm. longo pubescente suffulta. *Spicae* terminales et axillares, simplices, 3–7 cm. longae, pubescentes, floribus 1–3-natis; bractee ovatae et obovatae, acuminatae vel mucronatae, nervosae, petiolatae, dentatae, pubescentes vel glanduloso-pubescentes, infimae foliaceae, 0·5–1·5 cm. longae, 0·4–1 cm. latae, petiolo 3–6 mm. longo; bracteolae lineari-acuminatae, 4–5 mm. longae, dense pubescentes. *Calyx* 6–7 mm. longus, extus glanduloso-pubescent, lobis aequalibus lineari-acuminatis obscure nervosis. *Corolla* rosea, lobis maculatis (ex Kerr), extus pilosopubescent, 4·4–5 cm. longa, tubo apice parum ampliato; lobi subaequales, oblongo-ovati, obtusi, 9–10 mm. longi. *Stamina* 2 fertilia, cum staminodiis 2 minutis in parte corollae ampliata affixa, 2 mm. longa, glabra; antherae oblongae, 2 mm. longae, in tubo corollae subinclusae. *Ovarium* apice puberulum; stylus 2·7 cm. longus, pilosus. *Capsula* 1·7 cm. longa, pubescens. *Semina* 4, una pagina foveolata, altera granulata.

una pagina foveolata, altera granulata.
NAKAWN SAWAN. Takli, *Put* 2113! (*type*). RACHASIMA. Chai-
yapum, Chawng Sam Maw, c. 200 m., in deciduous forest,
Kerr 19976!

Pseuderanthemum glomeratum Imlay, sp. nov., ab affini *P. Parishii* (T. Anders.) Lindau floribus semper fasciculatis remotis nunquam solitariis, pedunculo longiore, foliorum nervis lateralibus utrinque 7-9, corollae lobis brevioribus, staminodiis 2 et 5 mm. longis recedit. pubescentes. *Folia* elliptica vel

Caules subteretes, erecti, primo pubescentes. *Folia* elliptica vel lanceolata, ad apicem obtusum breviter acuminata, basi cuneata vel attenuata, purpureo-variegata, lineolata, supra glabra, nervis subtus pubescentia, 10–16 cm. longa, 4–6.5 cm. lata, costa supra conspicua subtus prominente, nervis lateralibus utrinque 7–9 conspicuis intra marginem subintegrum conjunctis, petiolo 1.5–3 cm. longo pubescente suffulta. *Inflorescentia* terminalis, spiciformis.

simplex vel ramosa, longe pedunculata, glanduloso-pubescent; flores in fasciculis remotis oppositis cymosis dispositi, nunquam solitarii; bracteae 3 mm. longae, lineari-acuminatae, glanduloso-pubescentes; bracteolae 2.5 mm. longae; pedicelli usque 3 mm. longi, glanduloso-pubescentes. *Calyx* 6 mm. longus, extus glanduloso-pubescent et glanduloso-ciliatus, lobis subaequalibus linearibus subacutis intus puberulis. *Corolla* lilacina (ex *Kerr*), extus glabra, c. 5 cm. longa; tubus angustus, 3.9 cm. longus, apice infundibuliformus, intus glaber; lobi subaequales, elliptici, subacuti, 8-10 mm. longi. *Stamina* 2 anteriora fertilia, cum staminodiis 2 antheris imperfectis basi partis corollae tubi ampliatae affixa, filamentis 9-11 mm. longis glabris; antherae loculi subexserti, elliptici, 3 mm. longi, altero paulum altius affixo. *Ovarium* glabrum; stylus 4 cm. longus, glaber. *Capsula* 2.5 cm. longa, glanduloso-pubescent. *Semina* 4, in parte superiore capsulae affixa.

MAHARAT. Nan, Doi Wao, 900 m. in evergreen jungle, *Kerr* 2438!

Pseuderanthemum siamense Imlay, sp. nov., ab affini *P. Parishii* (T. Anders.) Lindau inflorescentia subsessili haud ramosa, corolla extus pubescente lobis obtusis, filamentis 5 mm. longis, staminodiis puberulis recedit.

Suffrutex. *Caules* teretes, erecti, superne pubescentes. *Folia* oblongo-elliptica, lanceolata vel late lanceolata, ad apicem breviter acuminata, basi cuneata, nervis purpureo-variegata, lineolata, supra sparse setulosa vel subglabra, nervis subtus pubescentia, 11.5-13.5 cm. longa, 3.5-5.5 cm. lata, costa supra conspicua subtus prominente, nervis lateralibus utrinque 6-7 conspicuis; margine integro subrecurvato, petiolo 1.3-2 cm. longo pubescente suffulta. *Inflorescentia* terminalis, spiciformis, haud ramosa, pubescent, 5-10 cm. longa, sessilis vel subsessilis; flores solitarii, raro 2-nati; pedicelli usque 2 mm. longi; bracteae 2.5-3 mm. longae, lineari-acuminatae, puberulae, ciliolatae; bracteolae cum bracteis basi pedicelli affixae, 2 mm. longae. *Calyx* 7 mm. longus, extus breviter glanduloso-pubescent et glanduloso-ciliatus, lobis aequalibus linearibus acutis 3-nerviis. *Corolla* roseo-lilacina (ex *Garrett*), extus pubescent, 4.5 cm. longa, tubo apice ampliato, lobis subaequalibus ellipticis obtusis 1.1-1.3 cm. longis. *Stamina* 2 anteriora fertilia, cum staminodiis 2 clavato-capitatis in parte corollae tubi ampliatae affixa, filamentis fertilibus 5 mm. longis basi puberulis; antherae subexsertae, lineares, acutae, 2.5 mm. longae. *Ovarium* glabrum; stylus 3.4 cm. longus, glaber. *Capsula* 2 cm. longa, minute glanduloso-pubescent, in parte superiore 4-sperma.

PAYAP. Chiangmai, Doi Sutep, c. 1050 m., in evergreen jungle, *Kerr* 2543! 1779! MAHARAT. Nan, Doi Pa Ngua, c. 1130 m., *Garrett* 141! (type).

Pseuderanthemum longistylum Imlay, sp. nov., a *P. palatifero* (Wall.) Radlk. foliis ovatis vel ovato-lanceolatis glabris nervis

lateralibus utrinque 5, inflorescentia raro basi ramosa, corollae tubo apice parum ampliato, ovario capsulae puberulis differt.

Frutex. *Rami* teretes, subglabri, cortice stramineo obtecti. *Folia* aequalia, ovata vel ovato-lanceolata, ad apicem subacutum brevissime acuminata, basi cuneata vel breviter attenuata, lineolata, glabra, 3.5-11 cm. longa, 2-6 cm. lata, costa supra conspicua subtus prominente, nervis lateralibus utrinque 5 supra conspicuis subtus prominulis, nervis transversis obscuris, margine subintegro parum recurvato, petiolo 0.5-2 cm. longo suffulta. *Inflorescentia* terminalis et in axillis superioribus, solitaria vel gemina, simplex vel raro basi ramosa, ramis haud patentibus, c. 22 cm. longa, minute pubescent vel glanduloso-pubescent; flores oppositi, aliquando subalterni, solitarii vel 2-3-nati, breviter pedicellati; bracteae cum bracteolis minutae, lanceolatae, puberulae, pedicello vix longiores. *Calyx* 5 mm. longus, minute pubescent et glanduloso-pubescent, lobis lineari-acuminatis. *Corolla* rosea, basi lobi anterioris rubro-maculata (ex *Kerr*), extus puberula, 3.5-4 cm. longa, tubo recto apice parum ampliato; lobi oblongi vel ovati, obtusi, 2 posteriores usque ad tertiam partem connati. *Stamina* 2 fertilia, cum staminodiis 2 minutis in fauce corollae affixa, 1 mm. longa; antherae oblongae, 1.5 mm. longae, subexsertae. *Ovarium* superne puberulum; stylus 2-6 cm. longus, sparse pilosus. *Capsula* 1.8 cm. longa, puberula.

RACHASIMA. Chaipayum, Pu Kio, c. 1000 m., in evergreen forest, *Kerr* 20247! CHANTABURI. Chantabun, Kao Sabap, c. 100 m., on rocky ground in evergreen forest, *Kerr* 18090! Krat, Baw Rai, c. 200 m., in evergreen forest, *Kerr* 9460! KRUNGTEP. Bangkok, plant brought from Kan Kradai, Prachuap, and cultivated in Bangkok, *Kerr* 19866! (type); Bangkok, in scrub jungle, *Kerr* 6752! Temple, Bangkok, *Marcan* 494! Tidal, on old brick work, *Kerr* 3995! RACHABURI. Kanburi, Sisawat, c. 100 m., in mixed deciduous forest, *Kerr* 10202! Kanburi, Takanun, c. 100 m., growing among limestone rocks, *Kerr* 10503! Pran, *Put* 2455! Prachuap, Hui Yang, *Put* 3192! Bangtapan, *Put* 1416! 1400! SURAT. Ban Krut, c. 50 m., in evergreen forest, *Kerr* 18163! Kaw Tao, near sea level, in evergreen forest, *Kerr* 11149! c. 100 m., in evergreen forest, *Kerr* 12708! PUKET. Ranawng, Kaw Chang, c. 5 m., very common in evergreen forest, *Kerr* 16609! Lam Lieng, c. 10 m., in scrub, *Kerr* 16418!

Pseuderanthemum crenulatum (Wall. ex Lindl.) Radlk. var. ***ecorticatum*** Imlay, var. nov., a typo ramis ecorticatis, foliis usque 22 cm. longis nervis lateralibus utrinque 8-10, inflorescentia longe pedunculata axi crasso costato, calyce glanduloso-pubescente, corolla extus glabra, ovario puberulo differt.

SURAT. Chumpawn, Ta Ngaw, c. 100 m. by stream in evergreen forest, *Kerr* 11491! (type); Tasan, c. 20 m., in open evergreen forest, *Kerr* 16271! PUKET. Pang-nga, Tap-put, c. 100 m., by stream in evergreen forest, *Kerr* 19355!

var. **glabrum** Imlay, var. nov., a typo foliis omnino glabris, corolla capsulaque glabra differt.

PUKET. Pang-nga, Nop Pring, c. 100 m., on limestone rocks, Kerr 19367! (type). NAKAWN SRITAMARAT. Tung Song, Put 2366!

JUSTICIEAE.

Marcania Imlay, gen. nov., *Graptophyllo* Nees affinis, sed corolla $\frac{1}{2}$ longitudinis alte bilabiata, staminibus haud exsertis prope basin corollae tubi in tomento insertis, antheris dense tomentosis, staminodiis nullis differt.

Frutex. Folia opposita, integra, ovata, petiolata. Flores terminales et in axillis superioribus, in fasciculis parvis vel cymis paucifloris dispositi; bracteae et 2 bracteolae parvae. Calycis lobi 5, aequales vel subaequales, fere usque ad basin liberi. Corollae tubus brevis, supra basin ventricosus; limbus alte bilabiatus, labio superiore oblongo apice breviter bilobo, inferiore recurvato apice latiore alte 3-lobato, lobis oblongis haud linearibus in alabastro imbricatis. Stamina 2, prope basin corollae in tomento inserta, staminodiis nullis; antherarum loculi 2, oblongi, paralleli, dense tomentosi; pollinis grana ellipsoidea, fasciis punctatis latis 3 et angustis 6 in polis convergentibus ornata, obturamentis 3 in sulcis inter fascias angustas jacentibus. Ovarium biloculare, 4-ovulatum; discus annularis, grandis; stylus apice minute bifidus. Capsula ignota.

Marcania grandiflora Imlay, sp. nov., adhuc unica.

Frutex c. 1-2 m. altus (ex Marcan). Rami teretes, glabri, cortice griseo rugoso tecti. Folia ovato-acuminata, apice acuta, basi rotundata aliquando inaequaliter, lineolata, glabra, exsiccata, supra brunnea subtus viridia, 6-12.5 cm. longa, 3-6.5 cm. lata, costa supra conspicua subtus prominente, nervis lateralibus utrinque 7 supra vix conspicuis subtus subprominentibus apice anastomosantibus, margine integro, petiolo 1-3.5 cm. longo glabro suffulta. Flores terminales et in axillis superioribus, in cymis paucifloris dispositi; pedicelli 3-5 mm. longi, dense breviter villosi, pilis multicellularibus; bracteae basi pedicelli affixae, lineari-lanceolatae, acuminatae, 5 mm. longae, 1 mm. latae, dense villosopubescentes; bracteolae medio pedicelli affixae, bracteis similes, 4 mm. longae. Calyx 1.5-1.7 cm. longus, extus dense breviter villosopubescentis, lobis subaequalibus lineari-lanceolatis 2-3 mm. latis 3-costatis intus breviter pubescentibus. Corolla alba (ex Marcan), 4.5-5 cm. longa, extus pubescens, tubo c. 1.5 cm. longo intus tomentoso; labium superius oblongum, apice breviter bilobum, lobis 6 mm. longis rotundatis; inferius recurvatum, apice latius, lobis oblongis rotundatis 10 mm. longis 7 et 11 mm. latis medio latiore. Stamina basi corollae in tomento inserta, 2 cm. longa, glabra, staminodiis nullis; antherae inclusae, basi acutae, dense tomentosae, 4.5 mm. longae. Ovarium dense albo-pilosum; stylus 3-6 cm. longus, pilosus.

RACHABURI. Petchaburi, hill, 70 m., Marcan 539! (type); under 50 m., in crevices of precipitous limestone cliff, Kerr 10999!

The two parallel and equal anther cells, the similar pollen grains, the bilabiate corolla and the 4-ovulate ovary relate this genus very closely to *Graptophyllum* in the tribe *Justicieae*. But it can be readily distinguished by the complete absence of staminodes, of which there are always two in *Graptophyllum*, and by the stamens, which are included, and inserted near the base of the corolla tube in a tomentose ring. The anther cells, too, are distinctive in being densely tomentose. The corolla differs in being bilabiate for more than two-thirds of its length, and in the lobes of the lower lip being not linear and obtuse but oblong and rounded.

The genus can also be related to *Cyclacanthus* S. Moore, with which it agrees in the complete absence of staminodes and in the number of ovules, but differs strikingly in the shape of the corolla and in the level of staminal insertion.

The genus is named in honour of the collector, Mr. A. Marcan.

Thysanostigma Imlay, gen. nov., *Filetia* Miq. affinis, sed staminibus duobus posticis antheras uniloculares ferentibus, stigmatibus aequaliter bilobato ciliolato differt.

Herba. Folia opposita, integra. Spicae axillares, simplices, pedunculatae; flores alterni; bracteae suboppositae, lanceolatae, calyce paulo longiores; bracteolae 2, lineares, parvae. Calycis calyce paulo longiores; bracteolae 2, lineares, parvae. Calycis lobi 5, subaequales, usque ad basin liberi. Corolla tubulosa, limbo bilabiato; labium superius erectum, apice emarginatum, inferius oblongum, brevissime 3-lobatum, lobis alabastro imbricatis. Stamina 4, didynamia, inclusa, basi labii superioris inserta, filamentis posticis brevioribus; antherae posticae uniloculares, anticae biloculares, loculis parallelis subaequalibus muticis; pollinis grana ellipsoidea, minute foveolata, fasciis duobus circa grana plus minusve contortis obturamenta 2 in sulcis parvis continentibus ornata. Ovarium biloculare, 4-ovulatum; stigma bilobatum, lobis aequalibus rotundatis ciliolatis. Capsula ignota.

Thysanostigma siamense Imlay, sp. nov., adhuc unica.

Herba. Caules tenues, quadrangulares, sulcati, primo pilis saepe glandulosis puberuli, mox glabri, internodiis elongatis. Folia subaequalia, lanceolata vel ovato-lanceolata, apice acuta vel subacuta, basi cuneata vel breviter et inaequaliter attenuata, chartacea, lineolata, nervis pagina inferiore puberulis exceptis glabra, 7-13 cm. longa, 2.5-5 cm. lata, costa nervisque lateralibus utrinque 7-8 supra conspicuis subtus prominentibus, his intra marginem integrum superne arcuatis, petiolo 3.5-4 cm. longo sparse pubescente suffulta. Spicae axillares, simplices, c. 12 cm. longae, breviter glanduloso-pubescentes; pedunculus 4 cm. longus; flores solitarii, alterni, sessiles; bracteae suboppositae, anguste lanceolatae, costatae, 7 mm. longae, 1.5 mm. latae, breviter glanduloso-pubescentes, sterilibus minoribus; bracteolae lineares, 5 mm. longae,

breviter glanduloso-pubescentes. *Calyx* 5 mm. longus, extus glanduloso-pubescent, intus puberulus, margine glanduloso-ciliatus, lobis lineari-acuminatis 2 anterioribus paulo majoribus 2-3-nerviis. *Corolla* lutea, labio inferiore brunneo-maculato (ex *Kerr*), extus fere glabra, 1-8 cm. longa; tubus erectus, cylindricus, 11 mm. longus, intus glaber; labium posticum erectum, lanceolatum, apice emarginatum, 8 mm. longum, 4 mm. latum, anticum oblongum, 9 mm. longum, 6 mm. latum, breviter 3-lobatum, lobis rotundatis. *Stamina* 4, didynamia, basi labii postici affixa; filamenta antica 4 mm. longa, glabra, antheras biloculares ferentia, postica 3 mm. longa, antheras uniloculares ferentia, loculis oblongis subaequalibus muticis 1-5 et 2 mm. longis. *Ovarium* glabrum; stylus 1-5 cm. longus, glaber; stigma breviter bilobatum, lobis aequalibus rotundatis patentibus ciliolatis.

PATTANI. Banang Sta, c. 100 m., in evergreen forest, *Kerr* 7388! (*type*); Betong, c. 200 m., climbing on rocks and trees, *Kerr* 7531!

The genus is named from the very distinct stigma, which has two equal and rounded ciliolate lobes. This type of stigma is as yet unique among the *Acanthaceae*. The pollen grain, too, although of lesser importance, is unique, and does not fall readily into any of the groups classified by Lindau (*Engl. Bot. Jahrb.* 18, 36-64: 1893).

Thysanostigma can be related to *Filetia* Miq., but the stigma and the pollen together with the shorter posterior stamens bearing unilocular anthers are striking points of difference. The arrangement of the stamens and anthers, however, is similar to that of *Lepidagathis* Willd., but *Thysanostigma* differs in the calyx being subequally 5-lobed, as well as in the stigma and pollen.

Justicia quadrifaria (Wall. ex Nees) T. Anders. var. ***salicifolia*** (T. Anders.) Imlay, stat. nov.

Justicia salicifolia T. Anders. in Journ. Linn. Soc. 9, 414 (1867).

Justicia muticitheca Imlay, nom. nov.

Dianthera debilis C. B. Clarke in Hook. f. Fl. Brit. Ind. 4, 542 (1884), non Forssk.

Leptostachya debilis (C. B. Clarke) Hosseus in Engl. Bot. Jahrb. 41, 73 (1907), in nota.

Ptyssiglottis debilis (C. B. Clarke) S. Moore in Journ. Bot. 60, 355 (1922).

Dianthera debilis Forssk. (Fl. Aegypt-Arab. 9: 1775) equals *Justicia debilis* (Forssk.) Lam. [*Monechma debile* (Forssk.) Nees], an Arabian species.

Justicia diacantha Imlay, sp. nov., a *J. bicalcarata* Craib bracteis 1 mm. latis, calyce glanduloso-pubescente, corolla 1-5 cm. longa extus pubescente, filamentis 7 mm. longis recedit.

Frutex. Rami quadrangulares, primo et in nodis pubescentes, demum lineis duobus puberulis ornati. Folia petiolata, aequalia, ovata, ad apicem subacutum vel obtusum attenuata, basi obtusa

vel rotundata, subcoriacea, obscure lineolata, supra glabra, nervis subtus molliter pubescentia, immatura densius pubescentia, 5-15 cm. longa, 2-9 cm. lata, costa nervisque lateralibus utrinque 7 supra conspicuis subtus prominentibus stramineis, nervis transversis conspicuis, margine subintegro, petiolo 1-3.5 cm. longo pubescente suffulta. Racemi terminales, simplices, 5-9 cm. longi, brevissime pedunculati, pubescentes; bractee 6 mm. longae, 1-1.5 mm. latae, lanceolatae, acuminatae, pubescentes, costa obscura; bracteolae lineari-lanceolatae, 4-5 mm. longae, pubescentes. *Calyx* 6 mm. longus, extus pubescens, minute glandulosus; lobi lineari-acuminati, nervosi, 1 mm. lati, intus puberuli. *Corolla* extus molliter pubescens, 1-5 cm. longa; tubus limbo paulo longior, basi intus puberulus; labium superius ovatum, brevissime bilobatum; inferius usque ad medium trilobatum, intus glabrum. *Stamina* sub fauce corollae affixa, 7 mm. longa, basi pilis paucis instructa; antherae 1-5 mm. longae, basi calcaratae. *Ovarium* apice pubescens; stylus 10 mm. longus, basi pubescens.

RACHABURI. Prachuap, Sam Roi Yawt, Put 2500! (*type*). Pran, Ban Pak Tawan, 200 m., on limestone hill, Marcan 2602!

Justicia procumbens Linn. var. ***glandulosa*** Imlay, var. nov., a typo ramis primo pubescentibus, foliis pilis basi articulatis hirsutis, bracteis bracteolis spicisque dense breviter glanduloso-pubescentibus et ciliatis, capsula densius pubescente differt.

UDAWN. Loi, Kao Krading, c. 1200 m., in open rocky ground, *Kerr* 20073!

Justicia suratensis Imlay, sp. nov., a *J. chlorantha* Craib foliis ellipticis vel oblanceolatis, inflorescentiae axi minute glanduloso-pubescente, corolla candida 10 mm. longa differt.

Rami subteretes, obscure angulares, glabri. Folia ovata vel ovato-lanceolata vel saepe lanceolata, ad apicem acutum acuminata, basi attenuata cuneata, chartacea, dense lineolata, glabra, 7-15.5 cm. longa, 3-8.5 cm. lata, costa nervisque lateralibus utrinque 6-7 supra conspicuis subtus prominentibus, nervis transversis obscuris, margine integro paulum recurvato, petiolo 0.5-2.5 cm. longo suffulta. Spicae terminales, simplices, solitariae, minute glanduloso-pubescentes; flores remoti, oppositi, sessiles, 2-3-nati, nunquam solitarii; bractee cum bracteolis minutae, subglabrae. *Calyx* 2 mm. longus, minute puberulus; lobi lineari-acuminati, obscure 3-nerviis. *Corolla* candida (ex *Kerr*), extus glabra, 10 mm. longa; tubus limbo paulo longior; labium superius erectum, subito angustatum, attenuatum, obtusum, integrum, inferius obovatum, patens, minute 3-lobatum. *Stamina* in fauce corollae affixa, 3 mm. longa, glabra; antherae loculi divergentes, inferior albo-caudatus. *Ovarium* glabrum; stylus 6 mm. longus, sparse pilosus. *Capsula* ignota.

SURAT. Panom, under 50 m., in evergreen forest, *Kerr* 12365! (*type*). King Panom, c. 100 m., in evergreen scrub, *Kerr* 18300!

Yanyao, c. 50 m., in evergreen forest at foot of limestone hill, *Kerr* 18192!

Justicia vasculosa (Wall. ex Nees) T. Anders. var. **laxa** Imlay, var. nov., a typo foliis elliptico-lanceolatis glabris, paniculis laxis ramis ramosis patentibus glanduloso-pubescentibus, floribus raro geminatis differt.

PAYAP. Mé Kang, Mé Yom, 460 m., *Garrett* 132! (type). MAHARAT. Nan, Hui Sai, 240 m., in evergreen jungle, *Kerr* 2414! Hui Kua, c. 300 m., in evergreen by stream, *Kerr* 5029!

Although this plant may be regarded as specifically distinct, the differences separating it from *J. vasculosa* are so slight as to make it more convenient to treat it as a variety.

Justicia fragilis Wall. ex C. B. Clarke var. **glandulosa** Imlay, var. nov., a typo floribus semper solitariis oppositis, bracteis oblongis obtusis 4-5 mm. longis calyce raro longioribus, bracteolis 3-4 mm. longis oblongis, calyce minute glanduloso-pubescente differt.

RACHABURI. Kanburi, Baw Noi, c. 700 m., *Kerr* 10249! (type); Sisawat, c. 200 m., in evergreen forest, *Kerr* 10224!

Justicia trichocarpa Imlay, sp. nov., ab affini *J. pubiflora* C. B. Clarke foliis multo longioribus nervis lateralibus utrinque 11-12, calyce 7 mm. longo intus glanduloso-punctato, capsula dense pubescente recedit.

J. ventricosa Wall. var. **major** R. Ben. in Lec. Fl. Gén. Indo-Ch. 4, 744 (1935) et in Not. Syst. 5, 120 (1936).

Frutex usque 1.5 m. altus (ex *Kerr*). *Rami* subquadrangulares, pubescentes, primo dense fulvo-villosi. *Folia* petiolata, aequalia, oblongo-elliptica vel oblanceolata-elliptica, ad apicem acutum acuminata, basi elongata inaequaliter cuneata, chartacea, immatura basi laminae et nervorum dense breviter fulvo-villosa, matura subglabra, subtus nigro-punctata, usque 32 cm. longa, 7.5-10.5 cm. lata, costa supra prominula subtus prominente, nervis lateralibus utrinque 11-13 supra conspicuis subtus prominulis, nervis transversis subtus obscuris, margine subintegro minute denticulato, petiolo 5-7 cm. longo sulcato dense fulvo-villoso suffulta. *Spicae* terminales et in axillis superioribus, simplices, unilaterales, c. 19 cm. longae, dense pubescentes; pedunculus 4-7 cm. longus, dense villosus; bractae in seriebus duabus dispositae, uniflorae, obovatae, apice rotundatae, basi breviter unguiculatae, 8-10 mm. longae, 7 mm. latae, 5-nerves, pubescentes, punctatae, margine pubescente ciliatae; bracteolae spathulatae, apice acuminatae, acutae, curvatae, usque 10 mm. longae, 2 mm. latae, 3-nerves, indumento ei bractearum simili. *Calyx* 7 mm. longus, pubescens; lobi aequales, lineari-acuminati, 3-nerves, intus nigro-punctati et apice pubescentes, margine ciliolati. *Corolla* subviridis (ex *Kerr*), extus pubescens, 1.4 cm. longa; tubus 8 mm. longus, intus sub fauce pubescens; labium superius 6 mm. longum,

ovatum, apice brevissime bilobatum; inferius 3-lobatum. *Stamina* 5 mm. a basi corollae affixa, 7 mm. longa, basi pubescentia; antherae locus inferior albo-caudatus. *Ovarium* apice dense pubescens; stylus 8 mm. longus, basi pilosus. *Capsula* 2.3 cm. longa, pubescens. *Semina* dense rugoso-verrucosa.

SURAT. Chumpawn, Ta Ngaw, c. 50 m., in evergreen forest, *Kerr* 11458! Siep Yuan, c. 20 m., at edge of evergreen forest, *Kerr* 16261! PUKET. Pang-nga, Tap-put, c. 100 m., by stream in evergreen forest, *Kerr* 18369! (type); Langkawi, Kesap, near Kuah, sea level, on limestone, M. R. Henderson 29176! Curtis 2117!

The plant on which R. Benoist founded his var. *major* of *J. ventricosa* differs from *J. ventricosa* in many ways, especially in the bracts, inflorescence, capsule and leaves.

Justicia Kerrii Imlay, sp. nov., a *J. argyrostachya* (Wall. ex Nees) T. Anders. foliis supra dense lineolatis basi cuneatis haud longe attenuatis, spicis terminalibus raro axillaribus, bracteis apice minute glanduloso-puberulis, corolla 1.7 cm. longa differt.

Suffrutex circiter 1.5 m. altus (ex *Kerr*). *Rami* tenues, teretes, primo quadrangulares et lineis duobus pilorum brevium ornati. *Folia* petiolata, subaequalia, lanceolata vel ovato-lanceolata, aliquando elliptica, ad apicem acutum acuminata, basi cuneata, lineolata, glabra, chartacea, 7-16 cm. longa, 4-6.5 cm. lata, costa sparse pilosa supra conspicua subtus prominente, nervis lateralibus utrinque 7-8 supra conspicuis subtus prominulis, margine integro, petiolo 2-7 cm. longo supra pubescente suffulta. *Spicae* terminales, raro axillares, simplices, 4-8.5 cm. longae, brevissime pedunculatae; flores oppositi, solitarii; bractae imbricatae, 4-seriatae, omnes fertiles, ovatae, acutae, subvirides nervis purpureis (ex *Kerr*), circiter 1.3 cm. longae, 1 cm. latae, apice tantum minute glanduloso-puberulae, margine purpureo longe ciliato; bracteolae lanceolatae, scariosae, nervosae, 10 mm. longae, 3 mm. latae, margine ciliatae. *Calyx* 5 mm. longus, margine minute glanduloso-ciliatus; lobi lineari-lanceolati, acuminati. *Corolla* rosea (ex *Kerr*), circiter 1.7 cm. longa, extus pubescens; tubus limbo longior; labium superius ovatum, obtusum, integrum, inferius breviter 3-lobatum. *Stamina* in fauce corollae affixa, 5 mm. longa, glabra; antherae locus inferior albo-caudatus. *Ovarium* pubescens; stylus 1.3 cm. longus, sparse pilosa. *Capsula* 1.1 cm. longa, pubescens, placentis dehiscentia non elasticis.

CHANTABURI. Krat, Takum, c. 50 m., bracts white veined brown, in evergreen forest, *Kerr* 17852! Baw Rai, c. 400 m., in evergreen forest, *Kerr* 9481! SURAT. Chumpawn, Ta Ngaw, c. 100 m., common in evergreen forest, *Kerr* 11569! PUKET. Ranawng, Kao Pawta Luang Kêo, c. 500 m., on rocky ground by stream in evergreen forest, *Kerr* 16900! (type). NAKAWN SRITAMARAT. Wat Kiriwong, c. 100 m., in evergreen forest, *Kerr* 15592! Tungsong Put 2383! Khao Ram, Eryl Smith 677!

Justicia decurrens Imlay, sp. nov., a *J. Kurzii* C. B. Clarke foliis oblongo-lanceolatis angustatis basi petiolo alato subauriculatis nervis lateralibus utrinque 11, bracteolis calyce brevioribus lanceolatis, calyce 7 mm. longo, corolla 1.5 mm. longa, capsula 1.7-2.2 cm. longa differt.

Frutex usque 2 cm. altus (ex Kerr). *Rami* obtuse quadrangulares, fere glabri. *Folia* aequalia, oblonga vel oblongo-lanceolata, ad apicem acutum acuminata, basi attenuata petiolo alato demum auriculata, lineolata, glabra, costa supra pubescente excepta, chartacea, 13-26 cm. longa, 4-8 cm. lata, costa supra depressa conspicua subtus prominente, nervis lateralibus utrinque 9-11 supra conspicuis subtus prominulis ascendentibus, margine integro scabrido-pubescente, petiolo 3-5 mm. longo alato suffulta. *Spicae* terminales, raro axillares, 6-10 cm. longae, breviter pedunculatae; flores oppositi, solitarii; bractae laxae imbricatae, 4-seriatae, omnes fertiles, ovatae, acuminatae, 1.5 cm. longae, 8 mm. latae, glabrae, nervosae, margine breviter ciliatae; bracteolae calyce multo breviores, 3 mm. longae, 1 mm. latae, lanceolato-acuminatae, margine breviter ciliatae. *Calyx* 7 mm. longus; lobi oblongo-acuminati, 3-nerves, breviter ciliati. *Corolla* extus pubescens, 1.5 cm. longa; tubus basi intus puberulus; labium superius ovatum, obtusum, integrum, inferius transverse nervosum, 3-lobatum. *Stamina* sub fauce corollae affixa, subexserta, 7 mm. longa, glabra; antherae loculus inferior albo-caudatus. *Ovarium* fere glabrum; stylus 1.1 cm. longus, basi sparse pilosus. *Capsula* 1.7-2 cm. longa, dense pubescens.

PAYAP. Mûang Fang, Doi Pahom Pok, c. 1900 m., in dense evergreen forest, Kerr 5192! (*type*); Chiangmai, Doi Ka, 1430 m., in evergreen forest, Winit 1428!

Justicia oligoneura Imlay, sp. nov., ab affini *J. punduana* (Wall. ex Nees) C. B. Clarke foliorum nervis lateralibus utrinque 6-7, bracteolis calyce minoribus, calyce 8 mm. longo, corolla 1.5 cm. longa recedit.

Suffrutex. *Rami* teretes, primo lineis duabus pubescentibus ornati, demum glabri. *Folia* petiolata, subaequalia, elliptica, apice basique acuta, lineolata, supra glabra, subtus nervis villosopubescentia, subcoriacea, 6-13 cm. longa, 2-6 cm. lata, costa supra conspicua subtus prominente, nervis lateralibus utrinque 5-7 conspicuis intra marginem ascendentibus, nervis transversis obscuris, margine integro, petiolo 1-3 cm. longo pubescente suffulta. *Spicae* terminales, saepe 2-3-natae et axillares, 2-4 cm. longae, brevissime pedunculatae; flores solitarii, alterni; bractae dense imbricatae, 4-seriatae, seriebus 2 sterilibus, ovatae, fere rhomboideae, acutae, nervosae, extus pubescentes, intus glabrae, 1-2 cm. longae, 10 mm. latae, margine scarioso purpureo; bracteolae oblongae vel oblanceolatae, mucronatae, calyce breviores, 7 mm. longae, 1.5 mm. latae, pubescentes, 1-nerves. *Calyx* 8 mm. longus, pubescens, cum pilis multis glandulosis; lobi lineari-setacei, 1-nerves. *Corolla*

candida, labio inferiore purpureo-maculato (ex Kerr), 1.5 cm. longa, extus pubescens; tubus limbo longior, intus sub fauce puberulus; labium superius brevius, acutum, integrum, inferius 6 mm. longum, breviter 3-lobatum. *Stamina* sub fauce corollae affixa, 3 mm. longa, glabra; antherae loculi dorso minute pubescentes, inferior albo-caudatus. *Ovarium* glabrum; stylus 8 mm. longus, basi sparse pilosus. *Capsula* 8 mm. longa, pubescens; placentae dehiscentia a basi elastice superne curvatae.

SURAT. Langsuan, Kao Nom Sao, c. 300 m., in evergreen forest, Kerr 12014! (*type*). PUKET. Ranawng, Kaw Chang, c. 5 m., in evergreen forest, Kerr 16560! La-un, c. 50 m., in evergreen forest, Kerr 16511!

Justicia polyneura Imlay, sp. nov., ab affini *J. punduana* (Wall. ex Nees) C. B. Clarke foliis supra pilis brevibus sparse vestitis basi rotundatis, nervis lateralibus utrinque 12-16, petiolis 3-8 cm. longis, bracteis pubescentibus differt.

Suffrutex. *Caules* primo subquadrangulares, lineis duabus pilorum brunneorum crispatorum ornati, demum cylindrici et glabri. *Folia* longe petiolata, subaequalia, oblongo-lanceolata, raro elliptica, ad apicem acutum acuminata, basi rotundata, aliquando inaequaliter cuneata, supra albo-punctata, pilis setulosis sparsis ornata, subtus lineolata, nervis dense pubescentia, 9-18 cm. longa, 5-7 cm. lata, costa nervisque lateralibus utrinque 12-16 supra conspicuis subtus prominulis, his apice anastomosantibus, nervis transversis subtus conspicuis, margine integro, petiolo 2.5-7.5 cm. longo pubescente suffulta. *Spicae* terminales et in axillis supremis, 4-6 cm. longae, brevissime pedunculatae; flores solitarii; bractae imbricatae, 4-seriatae, seriebus 2 sterilibus, obovatae, acuminatae, nervosae, sparse pilosae, 1-1.5 cm. longae, 8-11 mm. latae, margine scarioso sparse ciliato; bracteolae angustae, oblongae, ad apicem longe acuminatae, 9 mm. longae, 1 mm. latae, sparse pilosae et ciliatae. *Calyx* 6 mm. longus, pubescens; lobi lineari-acuminati, 1-nerves. *Corolla* extus fere glabra, 1.3 cm. longa; labium superius 4 mm. longum, integrum, inferius 6 mm. longum, oblongum, breviter 3-lobatum. *Stamina* sub fauce corollae affixa, 4 mm. longa, glabra; antherae loculi lineares, dorso minute pubescentes, inferior albo-caudatus. *Ovarium* glabrum; stylus 6 mm. longus, glaber. *Capsula* 8 mm. longa, apice sparse pilosa; placentae dehiscentia a basi superne curvatae.

PUKET. Ranawng, La-un, c. 50 m., Kerr 17512! (*type*). Pang-nga, Kao Bangto, c. 900 m., by stream in evergreen forest, Kerr 17211!

Justicia adnata Imlay, sp. nov., ab affini *J. secundiflora* Ridley caulibus glabris, foliorum nervis lateralibus utrinque 10, pedunculis 3 cm. longis, bracteis posticis sterilibus axi oblique adnatis glabris, corolla 2 cm. longa pubescente recedit.

Caules subteretes, glabri. *Folia* petiolata, subaequalia, oblanceolata, ad apicem subacutum breviter acuminata, basi attenuata, lineolata, nervis subtus pubescentia, chartacea, 12-21 cm. longa, 5.5-9.5 cm. lata, costa supra conspicua subtus compressa prominula, nervis lateralibus utrinque 10 subtus conspicuis intra marginem subintegrum anastomosantibus, nervis transversis subtus conspicuis, petiolo 1-3.5 cm. longo glabro suffulta. *Spicae* terminales, simplices, solitariae, unilaterales, c. 5 cm. longae; pedunculi 2-3.5 cm. longi; flores solitarii, alterni; bracteae imbricatae, 4-seriatae, eae serierum 2 posteriorum steriles et axi oblique adnatae, lanceolatae, acutae, albo-punctatae, margine sparse scabrido-ciliatae, costa excentrica, nervis lateralibus intra marginem anastomosantibus, 1.5 cm. longae, 5 mm. latae; bracteolae ellipticae, obtusae, apice apiculatae, 1-nerves, obscure lineolatae, margine sparse ciliatae. *Calyx* 7 mm. longus; lobi lineari-acuminati, 1-nerves, glandulis multis parvis subsessilibus ornati. *Corolla* candida (ex Eryl Smith), 2 cm. longa, extus sparse pubescens; tubus limbo longior, intus basi puberulus; labium posticum 6 mm. longum, apice obtusum, integrum, anticum 8 mm. longum, breviter 3-lobatum. *Stamina* sub fauce corollae affixa, 6 mm. longa, glabra; antherae loculi 2 mm. longi, inferior albo-caudatus. *Ovarium* glabrum; stylus 1.5 cm. longus, basi sparse pilosus. *Capsula* ignota.

NAKAWN SRITAMARAT. Kao Luang, 1740 m., in jungle, Eryl Smith 736! (type); 900-1100 m., in evergreen forest, Kerr 15462!

***Justicia subtilifolia* Imlay**, sp. nov., a *J. burmannica* C. B. Clarke caulibus glabris, foliis membranaceis glabris costa nervisque compressis glabris, bracteis imbricatis exsiccatis sub-brunneis haud lineolatis margine anguste scarioso recedit.

Frutex (?), usque 0.75 m. altus (ex Kerr). *Rami* obtuse quadrangulares, glabri. *Folia* petiolata, subaequalia, elliptica vel lanceolato-elliptica, ad apicem acutum acuminata, basi acuta, obscure lineolata, glabra, membranacea, 9-22 cm. longa, 4-8.5 cm. lata, costa compressa nervisque lateralibus utrinque 11-13 conspicuis, his intra marginem integrum anastomosantibus, petiolo 2.5-4.5 cm. longo glabro suffulta. *Spicae* terminales, aliquando in axillis supremis, simplices, 5-18 cm. longae; pedunculi 3 cm. longi; flores alterni, solitarii; bracteae grandes, imbricatae, 4-seriatae, eae serierum 2 posteriorum steriles, majores, obovato-orbiculares, apice rotundatae, nervosae, membranaceae, glabrae, 1.5-2.5 cm. longae, 1-2 cm. latae, margine anguste scarioso purpureo-tincto; bracteolae ellipticae, acuminatae, calyce longiores, 10 mm. longae, glabrae, scariosae, 1-nerves. *Calyx* 6 mm. longus, glaber, lobis lineari-acuminatis 1-nervibus punctatis. *Corolla* 2 cm. longa, extus glabra, tubus limbo longior; labium posticum ovatum, subacutum, integrum, 6 mm. longum, anticum 10 mm. longum, breviter 3-lobatum. *Stamina* sub fauce corollae affixa, 5 mm. longa, glabra; antherae loculi oblongi, 2 mm. longi, inferior albo-caudatus. *Ovarium* glabrum; stylus 1-3 cm. longus, basi sparse

pilosus. *Capsula* 1-2 cm. longa, glabra; placentae a basi elastice superne curvatae.

PUKET. Satul, Kao Keo Range, c. 700 m., in evergreen forest, Kerr 14529!

***Justicia graphocaula* Imlay**, sp. nov., *J. glabrae* Koen. ex Roxb. proxima, sed foliis exsiccatis nigris, caulibus robustis conspicue nigrostriatis, cymis axillaribus 2-3-natis petiolo multo brevioribus, corolla subviridi, seminibus verrucoso-rugosis recedit.

Frutex c. 1.5 m. altus (ex Kerr). *Ramuli* teretes, glabrescentes, nigro-striati. *Folia* petiolata, aequalia vel subaequalia, ovata et late ovata, ad apicem acutum acuminata, basi subito angustata et cuneata vel breviter attenuata, saepe inaequaliter, exsiccata subnigra, lineolata, supra glabra, subtus nervis puberula, 6.5-15 cm. longa, 3.5-8.5 cm. lata, costa supra conspicua subtus subprominente, nervis lateralibus utrinque 7, margine integro vel subintegro, petiolo 1.5-4 cm. longo glabrescente suffulta. *Flores* in cymis axillaribus breviter pedunculatis saepe 2-3-natis petiolo brevioribus dispositi; pedunculi 5-8 mm. longi, puberuli; bracteae bracteolaeque minutae, triangulares, puberulae, 1-1.5 mm. longae. *Calyx* 2 mm. longus, extus puberulus; lobi lineari-lanceolati, acuminati, intus apice puberuli. *Corolla* subviridis (ex Kerr 18227), extus pubescens, 9-10 mm. longa; tubus limbo paulo longior, intus fauce pubescens; labium superius emarginatum, inferius 3-lobatum, lobo medio latiore. *Stamina* in medio tubo affixa, 4 mm. longa, glabra; antherae loculus inferior albo-caudatus. *Ovarium* apice tantum pubescens; stylus 8 mm. longus, a basi pilosus. *Capsula* 1.5-2 cm. longa, pubescens. *Semina* verrucoso-rugosa, glabra.

SURAT. King Panom, c. 100 m. in evergreen scrub, Kerr 18301! Yanyao, c. 50 m., in evergreen forest, at foot of limestone hill, Kerr 18227! Ta Kanawn, under 50 m., in scrub, Kerr 12322! PUKET. Krabi, c. 50 m., in evergreen on rocky limestone hill, Kerr 18846! Krabi, Ao Lûk, c. 50 m., in scrub on limestone rocks, Kerr 18574! (type).

Local Name: *Yai Klang*.

***Justicia oligantha* Imlay**, sp. nov., a *J. vasculosa* (Wall. ex Nees) T. Anders. foliis majoribus, spicis semper paniculatis, floribus remotis 3-natis raro solitariis, medio pedunculo foliis parvis sessilibus instructo differt.

Ramuli erecti, lignei, teretes, supra nodos constricti, primo lineis duobus oppositis pubescentibus ornati, demum glabri. *Folia* aequalia vel subaequalia, suprema sessilia ovata, cetera petiolata, elliptica, ad apicem acutum breviter acuminata, basi attenuata, lineolata, glabra, 8-23 cm. longa, 3.5-9 cm. lata, costa supra conspicua subtus prominente, nervis lateralibus utrinque 6-7 supra conspicuis subtus prominulis, nervis transversis conspicuis, margine subintegro, petiolo 1-3 cm. longo suffulta. *Spicae* terminales et in axillis supremis, paniculatae, ramis ascendentibus, subglabrae,

longe pedunculatae; flores oppositi, 3-nati, raro solitarii, subsessiles; bracteae angustae, lanceolatae, acutae, 2 mm. longae, puberulae; bracteolae minores, ceteroquin similes. *Calyx* 2.5 mm. longus, minute puberulus; lobi subaequales, lineares, acuti. *Corolla* candida, labio inferiore roseo-maculato (ex *Kerr*), 10 mm. longa, extus puberula; labium superius erectum, breviter attenuatum, obtusum, integrum, inferius longius obovatum breviter 3-lobatum. *Stamina* in fauce corollae affixa, 3 mm. longa, glabra; antherae loculi divergentes, inferior conspicue albo-caudatus. *Ovarium* glabrum; stylus 7 mm. longus, sparse pilosus. *Capsula* 1.4 cm. longa, longe stipitata, glabra.

RACHASIMA. Chaiyapum, Nawng Bua Deng, c. 300 m., in evergreen forest, *Kerr* 20311!

***Justicia pallida* Imlay**, sp. nov., a *J. vasculosa* (Wall. ex Nees) T. Anders. foliis angustis usque 8 cm. longis subsessilibus, spicis c. 5 cm. longis glanduloso-pubescentibus, sepalis anguste lineari-acuminatis differt.

Caules c. 30 cm. longi, tenues, erecti, aliquando basi prostrati, teretes, obscure angulares, duobus lineis puberulis exceptis glabri. *Folia* aequalia vel subaequalia, sessilia vel subsessilia, lanceolata, apice acuta, basi obtusa, chartacea, exsiccata subtus pallidissima, lineolata, glabra, 3-8 cm. longa, 1-3 cm. lata, costa subtus puberula nervisque lateralibus utrinque 6 supra conspicuis subtus prominentibus, margine integro subrecurvato, petiolo 0-5 mm. longo suffulta. *Spicae* terminales, basi raro ramosae, c. 5 cm. longae, glanduloso-pubescentes; flores oppositi, solitarii vel bini, sessiles; bracteae angustae, lanceolatae, acutae, 4 mm. longae, glanduloso-pubescentes; bracteolae anguste lineares, ceteroquin similes. *Calyx* 4-5 mm. longus, glanduloso-pubescentis et ciliatus; lobi lineari-acuminati. *Corolla* extus pubescens, 8-10 mm. longa; labium superius erectum, anguste attenuatum, subacutum, emarginatum, inferius patens, breviter 3-lobatum. *Stamina* in fauce corollae affixa, 3 mm. longa, glabra; antherae loculi divergentes, inferior brevissime albo-caudatus. *Ovarium* dense minute pubescens; stylus 6 mm. longus, sparse pilosus. *Capsula* 11 mm. longa, pubescens.

PAYAP. Chiengrai, Muang Pan, c. 450 m., growing in bamboo jungle, *Kerr* 5114! (*type*). Chiengkien, near Chiengrai, 390 m., by roadside, *Kerr* 2484! Lampun, Mè Ta, 340 m., in bamboo jungle, *Kerr* 3629! PITSANULOK. Nakawn Tai, c. 200 m., in bamboo jungle, *Kerr* 5879! SURAT. King Panom, c. 100 m., in evergreen forest, *Kerr* 18342! PUKET. Takuapa, Raichawng, c. 50 m., in evergreen forest, *Kerr* 17030! PATTANI. Banang Sta, c. 100 m., in evergreen forest, *Kerr* 7361! Kao Kalakiri, 600-700 m., in evergreen forest, *Kerr* 14937! (?)

The collections from Peninsular Siam, viz., *Kerr* 18342, 17030, 7361, have slightly longer petioles, and the leaves are more acute at the base. *Kerr* 14937 is included doubtfully.

***Justicia tenuissima* Imlay**, sp. nov., a *J. vasculosa* (Wall. ex Nees) T. Anders, paniculae laxae ramis tenuissimis patentibus minute glanduloso-pubescentibus, floribus remotis oppositis sed altero abortu, bracteis calyce multo minoribus differt.

Caules c. 60 cm. alti, erecti, subteretes, primo lineis duobus pubescentibus ornati. *Folia* subaequalia, ovata, ad apicem acutum acuminata, basi subito attenuata, chartacea, obscure lineolata, supra et subtus nervis pilosa, pilis sparsis appressis pluricellularibus, 7-12 cm. longa, 3.5-7 cm. lata, costa nervisque lateralibus utrinque 6-7 supra conspicuis subtus prominulis, margine integro, suprema sessilia, cetera petiolo 1-4 cm. longo suffulta. *Paniculi* terminales, laxi, c. 13-20 cm. longi, ramis tenuissimis patentibus minute glanduloso-pubescentibus; flores remoti, solitarii, oppositi, altero saepissime sterili, breviter pedicellati; bracteae minutae, lineari-acutae, 1 mm. longae; bracteolae similes. *Calyx* 2 mm. longus, minute glanduloso-pubescentis, lobis acutis. *Corolla* candida, apice purpurea (ex *Kerr*), extus pubescens, 10 mm. longa; tubus limbo multo longior; labium superius subito angustatum, subintegrum, inferius breviter 3-lobatum. *Stamina* in fauce corollae affixa, 2 mm. longa, glabra; antherae loculi divergentes, inferior conspicue albo-caudatus. *Ovarium* subglabrum; stylus 6 mm. longus, sparse pilosus. *Capsula* 10 mm. longa, pubescens.

RACHABURI. Kanburi, Wangka, c. 200 m., in bamboo forest by dry stream, *Kerr* 10495! (*type*). SURAT. Klawng Nam Wing, c. 200 m., common in evergreen forest, *Kerr* 12225! Ban Krut, c. 50 m., by stream in evergreen forest, *Kerr* 18165! Langsuan, Tako, *Put* 1731! PUKET. Takuapa, Nang Yawn, c. 10 m., in scrub, *Kerr* 17046!

***Justicia distincta* Imlay**, sp. nov., *J. candidae* R. Ben. proxima, sed foliis conspicue albo-nervosis basi attenuatis, spicis simplicibus brevibus c. 5 cm. longis compactis pedunculis 1.5 cm. longis suffultis, bracteis minoribus glabris, calyce glanduloso-ciliato recedit.

Frutex c. 0.5 m. altus (ex *Kerr*). *Rami* teretes, glabri, cortice griseo rugoso obtecti. *Folia* subaequalia, breviter petiolata, elliptica, apice acuta, basi attenuata, lineolata, glabrata, 10-17 cm. longa, 2.5-5.5 cm. lata, costa nervisque lateralibus utrinque 7-8 supra conspicuis subtus prominentibus, his superne arcuatis intra marginem subintegrum anastomosantibus, nervulis subtus conspicuis, petiolo 0.5-1.5 cm. longo suffulta. *Spicae* terminales, simplices vel basi ramosae, c. 8 cm. longae, subglabrae; flores oppositi, solitarii, subsessiles; bracteae bracteolaeque 1 mm. longae, lanceolatae, minute ciliolatae. *Calyx* 2.5-3 mm. longus; lobi lanceolati, acuti, minute glanduloso-ciliolati, 3-nerves. *Corolla* candida, labio inferiore rubro-maculato (ex *Kerr*), 1.5 cm. longa, extus glabra; tubus limbo multo longior, intus basi puberulus, vix curvatus; labium superius ovatum, obtusum, erectum, integrum, inferius patens, breviter 3-lobatum. *Stamina* in fauce corollae affixa, 3 mm. longa, glabra; antherae locus inferior albo-caudatus.

Ovarium glabrum; stylus 11 mm. longus. *Capsula* 1.8 cm. longa, glabra. *Semina* glabra, verrucoso-rugosa.

RACHABURI. Kanburi, Kao Ri Yai, c. 1200 m., in evergreen forest, *Kerr* 10369!

Rungia diversibracteata Imlay, sp. nov., a *R. membranacea* Merrill petiolo circiter 3 cm. longo, spicis terminalibus solitariis circiter 6 cm. longis, bracteis posticis sterilibus membranaceis 1.2 cm. latis anticis fertilibus ellipticis 5 mm. latis pubescentibus margine glanduloso-ciliatis facile distinguenda.

Herba (?). *Caules* tenues, teretes, virides, glabri. *Folia* petiolata, parum inaequalia, ovata vel ovato-lanceolata, ad apicem acutum acuminata, basi acuta, lineolata, supra sparse setulosa, chartacea, 8–13.5 cm. longa, 3–5.8 cm. lata, costa supra conspicua subtus compressa et prominula, nervis lateralibus utrinque 6–7 conspicuis, margine integro, petiolo 1.5–3 cm. longo lineolato glabro suffulta. *Spicae* terminales, densae, 2.5–6 cm. longae, breviter pedunculatae; flores solitarii, alterni; bractee quadrifariae, dissimiles, posticae steriles, dense imbricatae, late obovatae, breviter acuminatae, 1.2–1.5 cm. longae, 1–1.2 cm. latae, nervosae, extus pubescentes, margine minute glanduloso-ciliatae, anticae fertilibus alternae, haud dense imbricatae, membranaceae, nervosae, 1–1 cm. longae, 5 mm. latae, ellipticae, obtusae, pubescentes, margine minute glanduloso-ciliatae; bracteolae lineari-lanceolatae, acuminatae, 10 mm. longae, 1 mm. latae, breviter pubescentes, margine glanduloso-ciliatae. *Calyx* 6 mm. longus, pubescens, cum pilis multis glandulosis, lobis lineari-lanceolatis acuminatis scariosis. *Corolla* flavescens, purpureo-maculata (ex *Kerr*), extus glanduloso-pubescentis, 1.7 cm. longa; tubus limbo longior, intus subglaber; labium superius emarginatum, inferius brevius, hujus lobis medio emarginatis. *Stamina* in fauce corollae inserta, 3.5 mm. longa, glabra; antherae loculus inferior conspicue albo-caudatus; connectivum inter lobulos expansum. *Ovarium* glabrum; stylus 1.1 cm. longus, basi sparse pilosus. *Capsula* ignota.

PUKET. Ranawng, Kao Pawta Luang Keo, 1000–1200 m., in evergreen forest, *Kerr* 16941!

In the absence of a mature capsule this plant might equally well be a *Justicia*.

Rungia tenuissima Imlay, sp. nov., a *R. himalayensi* C. B. Clarke foliis subsessilibus, spicis multo latioribus, bracteis alte scarioso-marginatis albo-pilosis et minute glanduloso-pubescentibus 9 mm. latis, capsula apice glanduloso-pubescente differt.

Caules erecti, c. 30 cm. longi, tenues, ramosi, primo pilis deflexis brevibus in lineis duabus ornati. *Folia* subsessilia, aequalia, ovata vel ovato-lanceolata, apice acuta, basi rotundata, pauca ex maturis basi acuta vel breviter attenuata, chartacea, lineolata, subglabra, exsiccata supra brunnea subtus pallidiora, 2–5.5 cm. longa, 1.3–2 cm. lata, costa nervisque lateralibus utrinque 5–6 supra sub-

obscuris subtus prominulis, his arcuatis, nervis transversis obscuris, margine integro breviter piloso, petiolo usque 2 mm. longo pubescente suffulta. *Spicae* densae, c. 1.5–2.5 cm. longae, 1–1.5 cm. latae; pedunculi filiformes, tenuissimi, axillares, aliquando articulati, 2.5–5 cm. longi, minute glanduloso-pubescentes et saepe pilosi; bractee imbricatae, quadrifariae, seriebus 2 posticis sterilibus, ovatae, apiculatae, alte scarioso-marginatae, apice purpureae, 8–9 mm. longae, 8–10 mm. latae, sparse pilosae et apice minute glanduloso-pubescentes, ciliolatae, costa nervisque lateralibus utrinque 3 conjunctis conspicuis; bracteolae lineares, acuminatae, 6 mm. longae, minute glanduloso-pubescentes. *Calyx* 5–6 mm. longus, minute glanduloso-pubescentis, lobis lineari-acuminatis. *Corolla* purpurea (ex *Kerr*), extus pubescens, cum pilis multis glandulosis, 8 mm. longa; tubus limbo parum longior; labium superius subintegrum, inferiore brevius. *Stamina* sub fauce corollae affixa, filamentis glabris corollae labio inferiore brevioribus; antherae loculi inferiores albo-caudati. *Capsula* 3 mm. longa, minute pubescens, apice pilis paucis glandulosis instructa. *Semina* minute verrucosa.

RACHABURI. Kanburi, Ta Kanun, c. 400 m., in mixed forest, *Kerr* 10285! (*type*). Wangka, c. 200 m., in bamboo forest, *Kerr* 10464!

Dicliptera* (?) *siamensis Imlay, sp. nov., a *D. Beddomei* C. B. Clarke foliis saepissime lanceolatis minoribus fere glabris breviter petiolatis, bracteis longioribus haud spatulatis, antherae loculis dissimilibus superiore oblongo inferiore ovoideo minore, et a *Peristrophe bicalyculata* Nees inflorescentia axillari cymosa 3-ramosa pauciflora glanduloso-pubescente nec laxe divaricatum paniculata, bracteis et calyce omnino viridibus, corolla c. 1.8 cm. longa, antherae loculis dissimilibus differt.

Herba erecta, tenuis, basi prostrata, c. 32 cm. alta (ex *Kerr*). *Caules* 6-sulcati, lineolati, primo sparse puberuli, demum glabrescentes. *Folia* subaequalia, lanceolata vel oblongo-lanceolata, ad apicem subacutum breviter acuminata, basi obtusa vel rotundata, lineolata, costa nervisque subtus pubescentibus exceptis fere glabra, 4–7 cm. longa, 2–3.5 cm. lata, costa plana et nervis lateralibus utrinque 6 conspicuis, nervis transversis multis supra obscuris, margine integro, petiolo 0.3–1.5 cm. longo puberulo suffulta. *Inflorescentia* axillaris, cymosa, trichotoma, pauciflora, pilis albis patentibus brevissimis glandulosis pubescens, pedunculo tenui c. 2.5–5 cm. longo suffulta; pedicelli 0.5–1.5 cm. longi; bractee oppositae, inaequales, flores 1–2 includentes, glanduloso-puberulae, omnino virides, posterior minor, c. 10 mm. longa, 0.5 mm. lata, angusta, lineari-acuminata, anterior major, 1.5–1.7 cm. longa, c. 2 mm. lata, oblongo-linearis, apice acuta brevissime apiculata, costa conspicua; bracteolae lineari-acuminatae, 5–7 mm. longae, glanduloso-puberulae. *Calyx* minute glanduloso-pubescentis, 4 mm. longus, lobis lineari-acuminatis basi per 1 mm. connatis. *Corolla*

purpurea (ex Kerr), extus pubescens, 1.8-2.2 cm. longa, tubo 1 cm. longo, labio postico apice subintegro, antico breviter 3-lobato. *Stamina* 1 cm. longa, glabra, exserta; antherae loculi dissimiles, superiore oblongo 1 mm. longo, inferiore ovoideo 0.5 mm. longo. *Ovarium* glabrum; stylus 2.2 cm. longus, glaber. *Capsula* ignota.

RACHABURI. Kanburi, Baw Noi, c. 700 m., on rocks in evergreen forest, Kerr 10261!

The absence of the mature capsule makes the genus of this plant uncertain. The dissimilar anther cells agree neither with *Dicliptera* nor with *Peristrophe*, according to the recognized definitions of those two genera. The presence of ovoid anther cells in *Peristrophe bicalyculata*, and of linear anther cells in *Dicliptera reptans*, makes any distinction between the two genera, based on characters other than that of the mature capsule, very unsatisfactory. The two genera could well be united under the older name of *Dicliptera* Juss., the species being grouped according to the character of the anther cells.

XIV—MASS FRUITING OF ELMS IN RELATION TO THE WEATHER. R. MELVILLE.

The spring of 1938 was notable for the abundance of elm fruit in many areas in southern England. The phenomenon was not limited to one or two species but all forms were alike in their fecundity including the common English elm, *Ulmus procera* Salisb., which had not produced fruit in any quantity for a number of years. Fruit from several trees of this species was examined and an attempt was made to germinate some of the plumper fruits from two trees at Kew and two in different parts of Hertfordshire. Not a single seedling was obtained from these, though three seedlings were raised from fruits of one of six seedling elms presented by the late Prof. Henry to Kew. These seedlings, of which there were originally seven, were grown from the seed of old trees of *U. procera* growing in the gardens of the Royal Palace of Aranjuez in Spain. As they were raised in 1911 they are now 27 years old and have been flowering for some years. Unfortunately the pollen parent is not known for either generation, but it is evident that *U. procera* is not sterile, as has been suggested. Seedlings were also raised this year from the Kew trees of *U. laevis* Pall., *U. laevis* var. *glabra* Schneid., *U. stricta* Lindl. var. *sarniensis* (Loud.) Moss, *U. glabra* Huds. and $\times$ *U. Dauvessei* Henry and from several wild trees including *U. Plotii* Druce. *U. Dauvessei*, a hybrid of *U. glabra* of unknown origin, produced a number of abnormal fruits with a tri-radiate wing. In these a flange, like half of a samara, projected from one side of the samara in the median longitudinal plane. Some of the abnormal fruits appeared to be fertile.

There are few records of widespread and abundant fruiting of elms in England; the last occasion worthy of special notice was in 1909. In this year Prof. Henry sowed seeds from 90 trees,

some being obtained from Kew, and raised a large number of seedlings (1). He failed to obtain seedlings from English seed of *U. procera* although successful with most of the other species and hybrids that he tried. Henry concentrated his attention on the raising of seedlings, mainly with the object of throwing light on the relationships of the different kinds. He gives little information on the weather conditions that led up to the phenomenon of mass fruiting beyond mentioning the mildness of the preceding autumn and stating that "in the months of March, April and May 1909 the amount of sunshine in the South of England was greater than had ever before been recorded by the meteorologists." The widespread nature of the phenomenon and its effect on the trees was discussed in some detail by Miller Christy (2). In his account he mentions the prodigious quantity of seed observed towards the end of April and says that the trees produced little or no foliage. By mid-May trees looked as if killed in full leaf, so thickly were they covered by the brown winged fruits. The foliage was late in its appearance and also there was much less of it than usual. Miller Christy thought the great abundance of fruit was due to an unusual combination of favourable circumstances, notably the mild and genial autumn of 1908 ripening the wood and the exceptionally fine weather of March, April and May 1909. In 1910 scarcely any elm fruits were to be found, the trees having exhausted themselves the preceding year. This explanation of the failure of the elms to fruit in 1910 is probably the correct one, since intermittent fruiting of this type is a well known phenomenon in fruit trees. The causes leading to the abundant fruiting of elms at long and irregular intervals are much more obscure. That this is so was realised by Miller Christy for he remarks that "we have had many such autumns without any such result following." Further, it is common knowledge that in most seasons elms produce an abundance of flower and but little fruit.

The nature of the factors controlling the fruiting of elms has not been investigated. It was considered worth while therefore to make an examination of the available data relating to the flowering and fruiting of elms during the years 1936-38, and 1909 in conjunction with the meteorological records. For this purpose records of daily maximum and minimum screen temperatures and Campbell-Stokes sunshine records for the relevant periods were obtained from the Kew Observatory. Some records of the flowering times of the elms at Kew were available for the years 1936-38 and the herbarium was searched for flowering specimens of elms collected in 1909 to determine if possible the date of flowering of the different species in that year. Unfortunately a single specimen of *Ulmus glabra* Huds. was all that could be found. Neither Henry nor Miller Christy mentions the times of flowering of the elms in 1909 and a search of other botanical literature yielded no further information.

The time of flowering of the elms, as with other trees, is closely dependent on seasonal conditions among which temperature is probably the controlling factor. The seasonal variability of the time of flowering for one locality is indicated by the following dates on which specimens of open flowers of *U. glabra* growing at Kew were collected: April 6th, 1857; March 26th, 1858; March 12th, 1880; April 1st, 1892; March 20th, 1896; April 4th, 1900. These dates are taken from herbarium sheets. It is noteworthy that three out of the six dates fall in April, since *U. glabra* has not flowered as late as April for a number of years. The flowering dates noted at Kew for the stage of development represented by the herbarium material are, for the last three years: 1936, March 10th; 1937, Feb. 25th; 1938, Feb. 10th. In this series two dates fall in February, which is remarkably early for *U. glabra*, and doubtless due to the exceptional mildness of the winters of 1936-37 and 1937-38. Observations extending over the last few years show that elms of different species growing in the same locality usually flower in the same order. This phenomenon is common to other plants and makes it possible to predict the approximate date of flowering of related species in any year if the actual flowering date of one species is known. The order of flowering of the more important of the elms in cultivation at Kew is as follows: *U. procera* Salisb.; *U. carpinifolia* Gleditsch (*U. nitens* Moench.) and hybrids of *U. carpinifolia* with *U. glabra* Huds.; *U. glabra* and *U. stricta* Lindl. var. *sarniensis* (Loud.) Moss; *U. laevis* Pall. and *U. americana* L.

The maximum and minimum daily screen temperatures at Kew Observatory for the months of January to May for the years 1909, 1936, 1937 and 1938 are plotted in Fig. 1. The 32°F. level is marked by a horizontal line for each year so that the dates on which frosts occurred can be picked out readily. It is at once obvious that the early weeks of both 1937 and 1938 were exceptionally mild and in 1938 four degrees of frost was the maximum registered on but a single occasion in February. The weather of 1936 was colder, but the cold weather of January and February was broken by a warm frostless spell at the end of January lasting for ten days. This spell of mild weather evidently was sufficient to break the dormancy of the elm buds since *U. procera* began flowering immediately after the succeeding cold spell ending in mid-February. The records for 1909 show almost continuous night frost from mid-January until the first week of March. The frosts were much more severe than in 1936 with a maximum of 15 degrees on March 5th. In spite of the rigour of the weather it was interrupted by a mild spell of three frostless days in the first week of February. This short period cannot have been sufficient to break the dormancy of the elms for the subsequent hard frosts undoubtedly would have killed the flowers and prevented the abundant fruiting that followed.

The flowering times of four native species of elm for the years 1936-7-8 are indicated in Fig. 1, by lettered arrows. The dates 1936-7-8 are indicated in Fig. 1, by lettered arrows. The dates

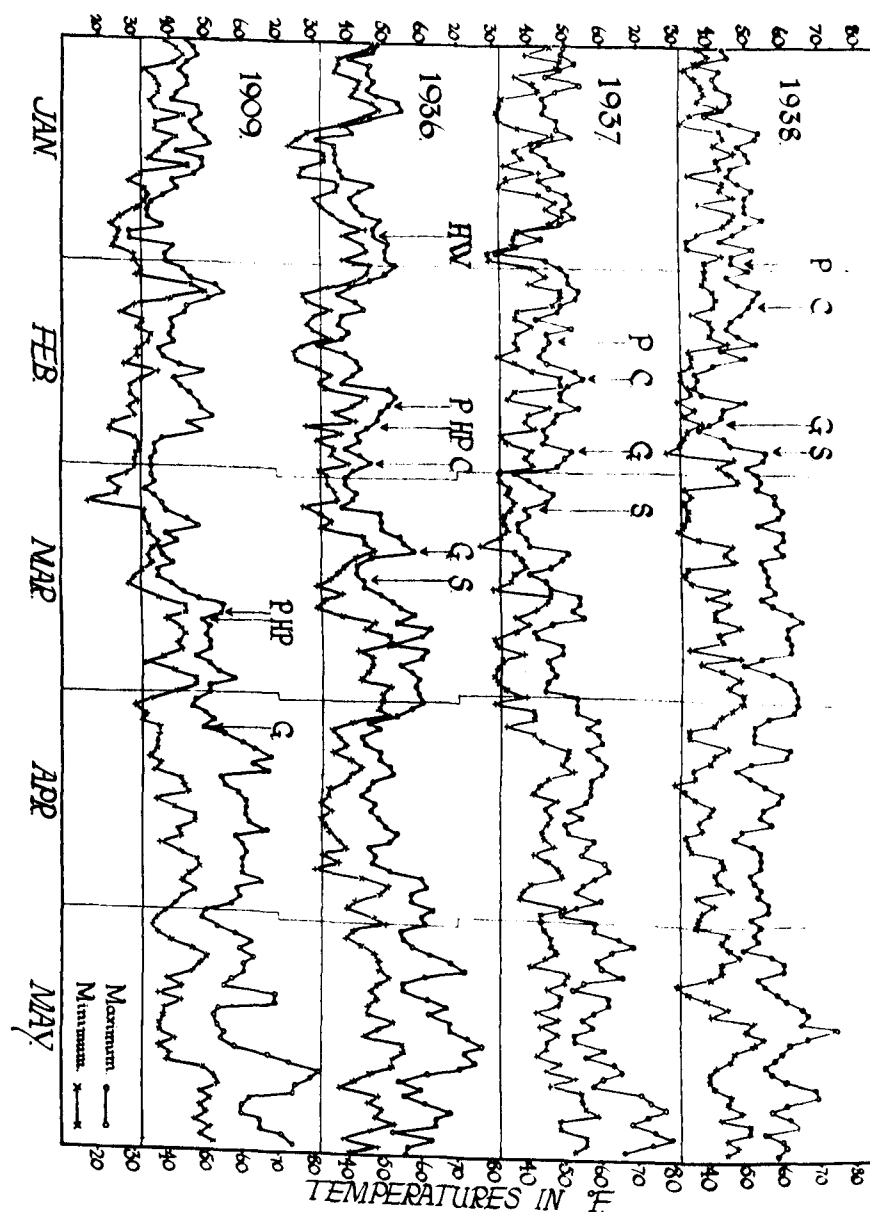


Fig. 1. Maximum and minimum screen temperatures °F. at Kew Observatory and flowering dates of Elms and Common Hazel. Flowering dates are indicated by lettered arrows. P., *Ulmus procera*; C., *U. carpinifolia*; G., *U. glabra*; S., *U. stricta* var. *sarniensis*; H. W., Hazel (*Corylus Avellana* L.) at Wimbledon; H. P., Hazel at Purley. The freezing point, 32°F., is shown by transverse lines.

shown are based on observations made at Kew and represent approximately for each species the times at which about half of the flowers in the majority of inflorescences had exerted stamens. The time of flowering of *U. glabra*, April 5th, indicated for 1909 is based in part on the unsatisfactory evidence of the herbarium sheet referred to above. The specimen was collected in Northants some time in April and it seems probable both from this and from the date on which the severe frosts ended that this species flowered during the first few days of April. This is not unlikely since older records of flowering dates in April have already been quoted for Kew. The date given for *U. procera* is a fortnight after the end of the hard weather and three days after the last severe frost on March 17th. The bulk of its flowers must have opened after March 17th for a frost of the severity of that occurring on this date probably would have killed the open flowers of this species, which actually fruited abundantly in 1909. In 1936 *U. procera* flowered about a fortnight after the end of the warm spell of the last week in January, but later frosts prevented the formation of fruit. Less severe frosts in 1937 killed all the flowers of this species before the end of February. All the evidence therefore favours the view that it could not have flowered before March 17th in 1909. From the records of 1936-38, *U. glabra* opens its flowers about 18 to 25 days after *U. procera*. On this basis, *U. glabra* should have flowered not earlier than April 6th in 1909, a quite satisfactory agreement with the date suggested. Further information favouring the suggested dates is obtainable from the Phenological reports of the Meteorological Society. Although elms are not mentioned, the common hazel, *Corylus Avellana* L., has similar flowering habits, and records of its flowering times are available for 1909 and 1936 for a number of stations. The nearest station to Kew with records for both years is Purley, where the hazel flowered on the 52nd day in 1936 and on the 79th day in 1909. These dates are respectively 3 days later than *U. procera* at Kew in 1936 and one day later than the suggested date for 1909. The actual flowering-date for the hazel at Kew would have been earlier and probably about the same time as that for Wimbledon where it flowered on January 26th in 1936.

If the flowering dates of *U. procera* and *U. glabra* are accepted as probably correct, the effect of the weather on flowering and fruiting in the four years under consideration may be examined further. Both 1938 and 1909 were remarkable for the abundance of the elm fruit on all species, but nevertheless the weather of the first three months differed widely in character. In 1909 almost continuous frosts lasted until March 5th while in 1938 the weather over the same period was unusually mild with only a few light frosts in February. This difference accounts for the great discrepancy in the flowering dates of the elms and makes it obvious that the actual date of flowering has no special significance so far as the setting of the fruit is concerned. Of much greater importance

is the occurrence and severity of night frosts after the flowers have opened. In 1938 the screen minimum reached 32°F. on three nights in the latter half of February and on February 25th four degrees of frost were registered. This frost may have reduced somewhat the total amount of fruit but probably came after the most sensitive stage of the young flowers was over. The year 1909 was comparable in having only a single frost of 2 degrees after the probable flowering date of *U. procera*. Several light frosts occurred during, and one six-degree frost just at the end of the flowering period of the elms in 1937 and there was scarcely a fruit to be found on any tree at Kew. It is probable that the six-degree frost was to a great extent responsible for this. Very little protection is needed however to prevent damage to the flowers by frost. Elm flowers that had been enclosed in paper bags to ensure self-pollination produced a fair number of fruits, a proportion of which were viable. A single layer of thin paper was capable therefore of preventing damage by a frost that probably exceeded six degrees in the open. Several frosts occurred during the flowering period in 1936 and no fruits were formed on *U. procera* and very little on *U. carpinifolia* or its hybrids with *U. glabra*. The only species that produced much fruit was *U. glabra* which flowered after the more severe of the frosts were over. On the evidence here presented, therefore, there appears reason to believe that frosts are in a large measure responsible for the failure of elms to fruit in most seasons. The species fruiting most frequently, *U. glabra*, is one of the latest to flower and is also one of the most hardy as indicated by its northern distribution in Europe.

Although there is little doubt that a single frost may do considerable damage when the flowers are in a sensitive condition, it is probable that continuous low day temperatures, especially if accompanied by dry winds, are of almost equal importance. The delicate tissues of the flowers are unable to withstand the excessive transpiration induced by such conditions. It can be seen from the graphs (Fig. I) that a spell of four days with a maximum day temperature of 36-38°F. occurred in February 1938, whereas in 1909 there was no cold weather at all after the elms began flowering. This may account in part for the somewhat smaller crop of fruit in 1938. Six cold days with maximum temperatures of 37-40°F. culminating with the six-degree night frost of March 10th 1937 probably helped to destroy the expanding ovaries in that year. Similarly, in 1936, the first five days of March with maximum temperatures of 38-42°F. probably added to the destruction wrought by the frosts.

One other factor that may affect the flowering of elms remains to be considered. The earlier observers previously mentioned, believed that the amount of sunshine during the preceding autumn affected the abundance of the flowers and "ripened the wood." The elm belongs to the group of early flowering trees that lay down

their flower initials during the preceding season. It is possible therefore for a bright sunny summer and autumn to affect the next season's flowering. The flower buds can be distinguished from vegetative buds by the end of August. It follows that the flower initials must be formed some time earlier and probably about the end of July or early in August. The weather conditions, especially the light intensity, for about a month preceding this date may also be expected to have some effect by controlling the amount of carbohydrate reserves stored prior to the formation of the flower initials. The only measurement of sunlight available is that of the Campbell-Stokes Sunshine Recorder, which records only the duration of bright sunlight. These records can serve as a rough indication of the conditions of illumination affecting photosynthesis and the accumulation of carbohydrate reserves.

TABLE I. *Bright Sunlight and Temperature.*

Year.	Total Bright Sunlight, hours.		Average Maximum Day Temperature, "F.	
	Weeks 21-40.	Weeks 33-40.	August.	September.
1908 ...	935.0	302.0	67.7	64.0
1935 ...	885.5	268.0	73.3	65.6
1936 ...	720.1	264.4	71.1	65.5
1937 ...	814.0	287.3	74.2	65.2

The total number of hours of bright sunlight for the years concerned for the weeks 21 to 40, approximately May 23rd to October 2nd, and 33 to 40, approximately August 15 to October 2, are given in Table I with the average maximum temperatures for the months of August and September. The temperatures are probably not important as only a slight advantage is shown for August 1937 compared with 1908, while the September figures are nearly alike for all four years. The sunshine records show a definite advantage for 1908 over 1937 for the weeks 21-40, though the 1935 total exceeds that for 1937. These weeks include the whole period likely to affect the development of flower buds. The latter half of this period was also brighter in 1908 than in 1937. There can be no doubt that the total amount of sunlight in each year was quite adequate to produce a good crop of flowers the following spring, but the greater amount of sunlight in 1908 may have resulted in better development of the flower buds. Miller Christy records that the buds were unusually large in the autumn of 1908 and also says that in 1909 many trees did not produce their usual amount of foliage after the fruits had dropped. The principal reason for this was probably not exhaustion of the food reserves as he suggested, but the replacement of a large proportion of vegetative buds by flower buds. The flower buds never develop vegetative shoots after flowering and if the distal bud of a shoot becomes a flower bud as well as the larger laterals the shoot dies after flowering and is shed

in due course. It was noticed in 1938 that certain trees, especially forms of *U. glabra*, had less foliage than usual and on examination this was found to be due to the presence of many dead branchlets of the type here described. Although small lateral buds occur at the base of such shoots, the food reserves appear to be sufficiently exhausted by fruiting to prevent their development. In normal years the distal bud of the smaller branchlets is almost invariably vegetative and continues the growth of the shoot. It appears therefore that the bright weather of both 1908 and 1937 did actually increase the quantity of elm flowers to a slight extent. Also, the carbohydrate reserves in the trees probably were greater than usual, which may have contributed to the abundance of fruit in the following seasons, though no data are available to test this theory.

This examination of conditions under which mass fruiting of elms takes place indicates that frosts constitute the most important single external factor affecting the setting and early development of the fruit. Owing to the seasonal distribution of frosts the later flowering species normally stand the greatest chance of producing viable fruit. Conversely the earliest species, *U. procera*, has the least chance of producing viable fruit and in many seasons does not even develop sterile samaras. Though there were plenty of samaras in 1909 and in 1938, neither Henry nor the writer succeeded in growing seedlings from English seed of *U. procera*. It has been pointed out already that this species is not sterile, but conditions suitable for it to produce viable fruit in this country must occur at extremely rare intervals. Were it not for the freedom with which suckers develop, doubtless it would have become extinct long ago.

The writer is greatly indebted to Dr. F. J. Whipple of the Kew Observatory, Richmond, for the meteorological data used in this paper.

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XV—NOTES ON CAREX: VI.* E. NELMES.

AFRICAN REPRESENTATIVES OF THE SECTION ACUTAE.

The genus *Carex* has been divided by various authors into four subgenera. Kükenthal adopted these divisions, and in the Pflanzenreich he subdivides the fourth and largest of them, *Eucarex*, into 29 Sections (Sections 41-69). One of these is the Section *Acutae* Fries.

There are several points of interest about the *Acutae*. They form the first of the Sections in *Eucarex*; their species invariably bear plane-convex or biconvex utricles with two stigmas, whereas most

* Continued from K.B. 1939, 100.

of the members of all the other 28 Sections have more or less trigonous utricles and three stigmas; and, it may be added, many of the *Acutae* are notoriously difficult to distinguish one from another. Among them is the well-known and polymorphic European and British species, *C. Goodenowii* Gay.

The Section *Acutae* is divided by Kükenthal into seven Subsections. The great majority of their species are plants of the north temperate regions, particularly of the colder parts, and are also numerous in the Himalayas.

Contained in Subsection 6 of Kükenthal's treatment, *Praelongae* Kükenth., are *C. Baronii* Baker and *C. madagascariensis* Boeck., both from Madagascar, and he describes the var. *austro-africana* under *C. cernua* Boott, citing seven gatherings from South Africa. In Durand & Schinz, *Consp. fl. afr.*, and in Fl. cap., C. B. Clarke had identified these plants as *C. phacota* Spreng. They are, however, nearer to *C. cernua* Boott. This represented the known extent to which the *Acutae* had spread into Tropical and South Africa.

It is the main purpose of this note to record additions to the African *Praelongae*. The first of these was the discovery by Mr. Staples in 1936 in the Iringa Province of Tanganyika Territory of a species closely related to *C. madagascariensis*. Its description follows.

Carex papillosissima Nelves, sp. nov.; affinis *C. madagascariensi* Boeck., sed foliis latioribus, squamis oblongo-obovatis, utriculis squamis brevioribus, rostris longioribus crassioribus leviter bidentatis differt.

Culmus circiter 70 cm. altus, gracilis, inferne foliatus, laevis, triqueter, apicem versus scabriusculus. *Folia* 4-5 mm. lata, inflorescentia breviora, superne plana, inferne conduplicata, disticha, culmorum basin versus conferta, subrigida, marginibus superne scabriuscula; vaginae superiores castaneae, inferiores pallidiores. *Spicae* 5, terminalis mascula, 3-5 cm. longa; ceterae femineae, interdum leviter androgynaeceae, tenuiter cylindricae, subdensiflorae, cernuae, 5-6 cm. longae, circiter 4 mm. latae, infima remotiuscula excepta subapproximatae, fastigiatae, superiores pedunculatae, inferiores longipedunculatae; pedunculi filiformes laeves. *Bractae inferiores* foliaceae, inflorescentiam superantes, breviter vaginantes, superiores vix foliaceae, evaginantes. *Squamae femineae* oblongo-obovatae, apice bilobo-emarginatae, 3 mm. longae (arista 1-5 mm. inclusa), lobi albo-hyalini excepta ferrugineae, e vitta mediana pallide trinervi in aristam planiusculam scabro-marginatam excurrentes. *Utriculi* 2-5 mm. longi, late ovato-elliptici, squamis latiores, biconvexi, olivacei, tuberculis albidis vel pallide brunneis dense conspersi, nervii vel 1-3 nervosi non percursi, in rostrum breve albidum ore subintegrum abrupte contracti. *Stigmata* 2.

TANGANYIKA TERRITORY: Iringa Province, Sau, circa 1800 m., 27 October 1936, *Staples* 416.

The second additional African member of the Subsection was discovered by Mr. E. Milne-Redhead in Northern Rhodesia in 1937.

This plant is, in my opinion, specifically distinct from *C. cernua* Boott, a Himalayan sedge to which it appears to be most closely related. The chief differences lie in its terminal spike, which is wholly male instead of gynaeandrous, and in the utricle, which passes abruptly, not gradually, into a short beak.

C. cernua Boott var. *austro-africana* Kükenth. is considered to stand rather nearer to *C. cernua* than to this new Rhodesian plant. The utricle of Kükenthal's variety scarcely differs from that of *C. cernua*, its terminal spike is sometimes wholly male and sometimes gynaeandrous, and its only striking and consistent difference from the species lies in its much longer glumes.

Carex rhodesiaca Nelves, sp. nov.; affinis *C. cernuae* Boott, sed spica terminali mascula, utriculis non marginatis abrupte rostratis differt.

Rhizoma caespitosum et breviter stoloniferum. *Culmi* 47-65 cm. longi, validi, acutanguli, inferne laeves, angulis apicem versus scabridis, foliati. *Folia* 5-7 mm. lata, plana, rigida, pallide flavo-virides, marginibus scabris; vaginae ferrugineae, vix reticulatim fissae. *Spicae* 5-7, 1-5-3-5 cm. longae, terminalis mascula, lineari-cylindrica, pedunculata; ceterae femineae, cylindricae, superiores subapproximatae et breviter pedunculatae, inferiores subdistantes et longius pedunculatae, cernuae; pedunculi tenues, scabri. *Bractae* foliaceae, inferiores inflorescentiam longe superantes, vix vaginantes. *Squamae femineae* oblongo-obovatae, apice truncatae vel emarginatae, tenuiter membranaceae, albiae, ferrugineo-maculatae, e dorso latissime straminei trinervi in aristam longam planam validam parce hispidam excurrentes. *Utriculi* squamas (arista inclusa) plerumque aequantes sed latiores, late elliptici, compresso-biconvexi, 3-3-5 mm. longi, brunneo-olivacei, dense minute papilloso, enerves, basi subtruncata, brevissime obconico-stipitati, in rostrum breve cylindricum laeve ore subintegrum abrupte contracti. *Nux* obovata. *Stigmata* 2.

NORTHERN RHODESIA. Mwinilunga District, by R. Lunga just E. of Mwinilunga, in muddy pockets of rock, full of water, 27 November 1937, *Milne-Redhead* 3422.

XVI—THE CORRECT NAME FOR SESBANIA ACULEATA.

T. A. SPRAGUE and E. MILNE-REDHEAD.

This widely distributed species is best known as *Sesbania aculeata*, the name adopted for it in most floras and monographs, a selection of which follows:—DC. Prodr. 2, 265 (1825); works dealing with Asiatic botany, e.g. Wight and Arn. Prodr. 1, 214 (1834); Hook. f. Fl. Brit. Ind. 2, 114 (1876); Trimen, Handb. Fl. Ceylon, 2, 34 (1894); Prain in Journ. As. Soc. Beng. n.s. 66, pt. 2, 369 (1897); Gagnepain in Lecomte, Fl. Gén. Indo-Chine, 2, 411

(1916); Gamble, Fl. Madras, 1, 323 (1918); Alston in Trimen, l.c. 6, 76 (1931); works on Australian botany, e.g. Benth. Fl. Austral. 2, 213 (1864); Moore and Betche, Handb. Fl. N.S. Wales, 149 (1893); Bailey, Queensl. Fl. 2, 398 (1900); J. M. Black, Fl. S. Austral. 317 (1924); C. A. Gardner, Enum. Pl. Austral. Occ. 64 (1931); works on African botany, e.g. Harv. and Sond. Fl. Cap. 2, 212 (1861-2); Oliv. Fl. Trop. Afr. 2, 134 (1871); Engl. Pflanzenw. Ost-Afr. C, 213 (1895); Phillips and Hutch. in Bothalia, 1, 50 (1921); Hutch. and Dalz. Fl. West Trop. Afr. 1, 387 (1928); E. G. Baker, Legum. Trop. Afr. 262 (1929).

In 1920 Fawcett and Rendle (Fl. Jam. 4, 24) adopted for this species, and thus validly published, the combination *Sesbania bispinosa* (Jacq.)*, attributing it to Steudel, who, however, had merely cited it as a synonym. Rydberg (North Amer. Fl. 24, 203: 1924) made, under *Sesban* Adans., the "new combination" *Sesban bispinosus* (Jacq.) Rydb. This, however, is perhaps best regarded as an orthographic variant of *Sesbania bispinosa*. Urban (Symb. Antill. 9, 450: 1928) adopted *Sesbania bispinosa*, attributing it to Steudel. Other recent authors seem to have overlooked Fawcett and Rendle's adoption and valid publication of the name.

Prain (l.c.) identified *Sesbania aculeata* with *Coronilla cochinchinensis* Lour. (1790), treating *S. cannabina* as a distinct species, whereas Merrill (Trans. Amer. Phil. Soc., n.s. 24, pt. 2, 197: 1935) identified *S. aculeata* with *Aeschynomene cannabina* Retz. (1789), treating *S. cochinchinensis* as a distinct species.

Both epithets, *cannabina* and *cochinchinensis*, antedate *bispinosa*. Hence the correct name of *Sesbania aculeata* depends on taxonomic interpretation.

We consider that *S. aculeata* is not conspecific with *S. cannabina*. The description of *Aeschynomene cannabina* by Retzius includes the words "foliola . . . pilosa," which apply to the species named *Sesbania cannabina* by Prain (l.c. 368) and Gagnepain (l.c. 410). Merrill considered that Jacquin's figure of *Aeschynomene bispinosa* (l.c. Pl. Rar. 3, 13, t. 564: 1793) could not be distinguished from *S. cannabina*, stating that the pods are *non-torulose*. But Jacquin not only described (Coll. 2, 284: 1788, as "*Aeschynomene Sesban*") the pods as torulose, but figured a distinctly torulose mature pod. Furthermore, the length of the pods and that of their beak, and Jacquin's description of the leaves as glabrous, convince us that his plant is conspecific with those described by Prain and Gagnepain under the name *Sesbania aculeata*.

The identification of *Coronilla cochinchinensis* Lour. offers more difficulty. No type-specimens are extant so far as is known, the 37 Loureiro specimens, including *C. cochinchinensis*, formerly in the Museum of the Academy of Sciences at Lisbon, having been destroyed between 1865 and 1874 (Merrill, l.c. 14, 20-22). *Coronilla cochinchinensis* is not included in the list of Loureiro specimens at Paris

(Merrill, l.c. 15-18), and Mr. A. W. Exell informs us that he has not succeeded in tracing a Loureiro specimen of it in the British Museum.

Loureiro's description of his *Coronilla cochinchinensis* is, in our opinion, insufficient to identify the species with certainty. He describes the peduncles as sub-triflorous, the pods as erect, straight, filiform, long and torulose, and the leaflets as provided with a slender cusp. Of the five species of *Sesbania* known from Indo-China (Gagnepain, l.c. 407-412), the first three are excluded by Loureiro's description of the fruits as torulose, so that only no. 4, *S. aegyptiaca* * and no. 5, *S. aculeata*, come into consideration. The erect, straight pods suggest *S. aegyptiaca*, whereas the slender cusp of the leaflets suggests *S. aculeata*. Both species are sometimes few-flowered, and both have long filiform pods. The simplest explanation of these discrepancies is that Loureiro included more than one species under *Coronilla cochinchinensis*. A. P. De Candolle (Prodr. 2, 266: 1825) treated *S. cochinchinensis* as a *species dubia*. The different conclusions reached by Prain and Merrill as to the specific identity of the fine plate and description of *Aeschynomene bispinosa* Jacq. show how difficult it is to identify species of *Sesbania* without herbarium material. In the circumstances we reject the name *Sesbania cochinchinensis* (Lour.) DC. as a *nomen dubium* (Internat. Rules, ed. 3, Art. 63).

The correct name for *Sesbania aculeata* appears to be *Sesbania bispinosa* (Jacq.) Fawc. et Rendle. As pointed out by Alston (Trimen, l.c. 6, 76), the earliest validly published name for the species is *Aeschynomene aculeata* Schreb. (1770), but Schreber's epithet *aculeata* cannot be adopted under *Sesbania*, since the resulting binary combination would be a later homonym of *S. aculeata* (Willd.) Pers., since it was based on a different type (Internat. Rules, Art. 61).

Aeschynomene aculeata Schreb. was a new species based on a plant raised at Halle by Schrader from seed received from Malabar. *Coronilla aculeata* Willd. was merely a new name for *Aeschynomene bispinosa* Jacq. and appears to have no connexion whatsoever with *Aeschynomene aculeata* Schreb. It was illegitimate, since Willdenow ought to have retained the epithet *bispinosa*. *Ae. bispinosa* Jacq. was a new species based on a plant cultivated at Schönbrunn, which Jacquin (Coll. 2, 283: 1788) had previously misidentified with *Ae. Sesban* L. and described in detail under that name.

For purposes of nomenclature, the epithets *aculeata* Schreb. (1770) and *aculeata* Willd. (1803) are different. Although they are regarded as representing the same species, this is merely a matter of taxonomic opinion. *Aeschynomene aculeata* Schreb. is at present treated as a taxonomic synonym of *Sesbania aculeata* (Willd.), but this judgment might be reversed. On the other hand, *Coronilla aculeata* Willd. and *Sesbania aculeata* (Willd.) are absolute, i.e. nomenclatural, synonyms of *Aeschynomene bispinosa* Jacq. and *Sesbania bispinosa* (Jacq.), all four names being based on the same

* Based on *Aeschynomene bispinosa* Jacq. (1793).

* The correct name for *S. aegyptiaca* Pers. is *S. Sesban* (L.) Merr.

type. This distinction between taxonomic and nomenclatural synonyms explains the apparent anomaly of two names being homonyms* although they are applied to the same species by taxonomists.

The case of *Sesbania aculeata* illustrates the vital importance of the "double citation" (Art. 49), in which the original author of an epithet is cited in brackets followed by the name of the transferring author.

The correct name under International Rules and the synonymy of *Sesbania aculeata* are accordingly as follows:—

- Sesbania bispinosa* (Jacq.) Fawcett & Rendle, Fl. Jam. 4, 24 (1920).
Aeschynomene aculeata Schreb. in Nov. Act. Cur. 4, 134 (1770).
Aeschynomene Sesban L. sec. Jacq. Coll. 2, 283 (1788), non L.
Aeschynomene bispinosa Jacq. Ic. Pl. Rar. 3, 13 (1793).
Coronilla aculeata Willd. Sp. Pl. 3, 1147 (1803), nom. illegit.
Sesban aculeatus (Willd.) Poir. Encycl. Meth. 7, 128 (1806) nom. illegit.
Sesbania aculeata (Willd.) Pers. Syn. 2, 316 (1807), nom. illegit.

XVII—MISCELLANEOUS NOTES.

Liaison Officer for the Commonwealth of Australia.
 Mr. C. T. White, Government Botanist, Brisbane, has been appointed Liaison Officer for the Commonwealth of Australia and commenced work in the Herbarium on March 7th. Mr. C. A. Gardner, who has been working in the Herbarium as Liaison Officer since March 11th, 1937, left Kew on January 28th, 1939, to return to his post as Government Botanist, Department of Agriculture, Perth.

CARL SCHRÖTER.—We have to record with deep regret the death at Zürich on 7th February, 1939, at the age of eighty-four, of Professor Carl Schröter, one of the most distinguished European botanists in many fields of work. Professor Schröter was working actively to the end, having taken part, as Honorary President, in the January Session of the Commission of the Scientific Investigation of the Swiss National Parks. His excellent handwriting was as firm and clear as ever in a letter written to Kew on January 10th.

Carl Schröter was born in Esslingen, near Stuttgart, in 1855. His father, Prof. Moritz Schröter, was a native of Austria, and Switzerland became Carl Schröter's adopted country after the family moved to Zürich. Schröter studied under Cramer and Ostwald Heer, and also under Eichler and Schwendener at Berlin. He was appointed Docent in 1878, obtained his doctorate in 1880, and became Professor of Systematic Botany at the Eidgenössische Technische Hochschule in 1883, a post he held until 1925, when he retired at the age of seventy.

Schröter was a brilliant teacher and lecturer. Botanical excursions played a large part in his teaching and he had an intimate

field knowledge of the native Swiss flora. On these excursions he enlivened the proceedings with his songs and keen sense of humour. He was the life and soul of the international phytogeographical excursion to Algeria and Morocco in the spring of 1910, which was attended by Prof. Tansley, Sir Arthur Hill and the late C. E. Moss. His boyish enthusiasm and delight in the beauty of the flowers, especially at Oran, will not be forgotten by those who were with him. At the age of seventy, on his retirement, he went on a voyage to South Africa and the Dutch East Indies.

Schröter's chief field of scientific work was ecological plant geography, which culminated in the publication of "Pflanzenleben der Alpen," a second edition of which appeared in 1926. His many scientific papers included ecological studies of the Swiss grasslands and moors, work on fossil woods, on the flora of the Swiss lakes, and many monographs on single species and areas. He also published a Pocket Flora for Alpine Travellers.

Schröter did much work for the popularisation of botany in Switzerland and was a strong supporter of the Zürich Volkhochschule. One of his chief interests was the preservation of Nature in Switzerland, and he was concerned in the foundation of the "Federation for the Protection of Nature" and the Swiss National Park in the Engadine.

Schröter received many honours from foreign Universities, including an Honorary Doctorate of Science at Cambridge during the International Botanical Congress of 1930, which he highly valued.

H. BROCKMANN-JEROSCH.—We have received with great regret the news of the death of Prof. H. Brockmann-Jerosch as the result of a motor accident on 14th February, 1939. Prof. Brockmann-Jerosch was born on the 23rd May, 1879 at Winterthur and was educated at the Polytechnic and University of Zürich. He became professor of geography in the Oberrealschule of Zürich and Titular-professor of the University. His activities in connexion with the preservation of the Swiss flora and fauna were many and he was also a recognized authority on Swiss folk-lore and peasant houses. His principal botanical publications were: "Die Flora des Puschlavs und ihre Pflanzengesellschaften" (1907), "Die fossilen Pflanzenreste des glazialen Deltas bei Kaltbrunn" (1912), and "Baumgrenze und Klimacharakter" (1919).

Prof. Brockmann-Jerosch attended the International Botanical Congress at Cambridge in 1930. Latterly he had taken an important part in attempts to arrange for the preparation of a vegetation map of Europe. His untimely death results in a great loss to ecological and phytogeographical botany.

W. B. TURRILL.

Wild Flowers of Australia.*—Miss Harris, who is lecturer in biological sciences at the Teachers' College, Sydney, is well known

*By Thistle Y. Harris, B.Sc. (Syd.). Angus & Robertson, Ltd., Sydney. Pp. 198+xix, with 65 coloured plates.

* A homonym is the same name applied to a different type.

in Australia as an enthusiastic field botanist who has done much to encourage the study of wild life, particularly the plants, among the teachers and school children of New South Wales. The illustrations from the brush of the late Adam Forster are pictorial gems and vividly portray 248 Australian wild flowers. The book is divided into two parts; the first gives a brief description, the distribution and the time of flowering of each species depicted; the second is a key, but only covers the flowers illustrated. The title is rather ambitious, as of the 248 plants figured 215 are found in New South Wales, though of these about 170 extend into Queensland and 115 into Victoria; many of the plants, therefore, have a wide range in Eastern Australia, but Tasmania, South Australia and Western Australia are poorly represented. The wild flowers of the last mentioned state, which have a wide reputation for their variety and beauty, are only represented by 33 species. The book, however, can be strongly recommended as a reliable popular guide to the most important wild flowers of extra-tropical eastern Australia. The price of the work is not indicated on the outside wrapper.

C. T. WHITE.

Alpine Flowers.*—This volume provides a most delightful picture gallery of a selection of well-known alpine flowers. The original water-colours of Paul A. Robert have been reproduced on the 10-colour Iris Press of the Polygraphische Gesellschaft of Laupen, Berne, and the result is a very successful combination of natural effect and formal design. The plates are not all of equal merit, and one or two criticisms can be made. For example, some of the greens are poor (notably plates 3 and 14), while many of the pictures lack depth (e.g. plates 10 and 19). On the whole, however, they form one of the most attractive sets of wild flower illustrations that we have seen, and they should have a wide sale at the moderate price of ten shillings. Perhaps the best of the thirty-six plates are *Ranunculus alpestris* (pl. 29), *Carlina acaulis* (pl. 15), and *Papaver alpinum* and *Linaria alpina* (pl. 25). The late Professor Schröter has written notes to each plate and an introduction on the Alpine Flora which he knew and loved so well.

Botanical Magazine.—Part 4, the concluding part of volume 161, was published on 27th March. This is prefaced with a portrait of the late Dr. A. B. Rendle, F.R.S., to whom the volume is dedicated, and contains the following plant portraits: *Rhododendron Elliottii* Watt ex Brandis (t.9546), a fine scarlet-flowered species found on Mount Japvo, Assam; *Dracocephalum Hemsleyanum* (Oliver ex Prain) Prain ex Marquand & Airy Shaw (t.9547), from S.E. Tibet; *Prunus mira* Koehne (t.9548), introduced from western

Szechwan by E. H. Wilson; *Arisaema candidissimum* W. W. Sm. (t.9549), an interesting species with soft pink and green spathe, found by Forrest in N.W. Yunnan; *Callitris oblonga* L. C. Richard (t.9550), native of Tasmania; *Anemone biflora* DC. (t.9551), a beautiful deep-red-flowered species with persistent sepals received from Mr. A. C. Trott from Persia; *Solanum valdiviense* Dun. (t.9552), a shrubby species with sweetly-scented, mauve or whitish flowers, from Chile and the Argentine; *Ania Hookeriana* (King & Pantl.) Tang & Wang (t.9553), native of Sikkim and N. Siam; *Cotoneaster conspicua* Comber ex Marquand (t.9554), collected by Captain Kingdon Ward in S.E. Tibet; *Romulea Requienii* Parl. (t.9555), from Corsica and Sardinia; and *Campanula incurva* Auch. ex A.DC. (t.9556), a fine species with mauve or pale-violet flowers found on the mountains of Thessaly and Euboea.

The Birds of Tropical West Africa.*—This beautiful and very interesting volume, the fifth of the series, describes and figures the second part of the Passeriformes including the warblers, swallows, cuckoo-shrikes, orioles, drongos and true shrikes, illustrated by ten coloured plates each containing a number of birds, many figures in black and white and two maps. Unlike many descriptive ornithological works the author gives the fullest available details of the habits, cries, nesting and food of the birds, derived from his numerous correspondents in Tropical Africa. These observations are of special interest in the case of the numerous summer migrants to this country such as the chiffchaff, garden warbler, blackcap, swallows and martins, as completing the history of the habits of these birds.

The work was written at the Natural History Museum and the expense of these exquisite volumes paid for by the four West African Colonial Governments. Two more volumes are to be brought out, one dealing with the titmice, crows, starlings and whiteeyes, and the other with weavers, buntings, and finches.

Mr. Bannerman is to be heartily congratulated on his laborious and valuable work.

H. N. RIDLEY.

Hardy Bulbs.†—We have recently received a copy of the second and third volumes of Colonel Grey's work on Hardy Bulbs. Vol. 2 covers the families Amaryllidaceae, Commelinaceae, Haemodorraceae, Orchidaceae and Scitamineae, and vol. 3 Liliaceae. The general scope of the work was outlined in a previous notice (Kew Bull. 1938, 170). In vol. 3 the author has had the advantage of

* Vol. V. By David A. Bannerman. Published by the Crown Agents for the Colonies, 4, Millbank, London, S.W.1. 1939. Price 22s. 6d.

† "Hardy bulbs: including Half-hardy Bulbs and Tuberous-rooted plants." By Charles Hervev Grey, Lt.-Col., D.S.O., F.L.S. Vols. II. Amaryllidaceae, Commelinaceae, Haemodorraceae, Orchidaceae, Scitamineae. pp. viii + 368. 47 pls. Price 30s. Vol. III. Liliaceae. Pp. x + 664. 82 pls. Price 45s. London. Williams & Norgate, Ltd., 1938.

* "Alpine Flowers." 36 colour plates from water-colours specially prepared by Paul A. Robert. With an Introductory Text by Prof. Dr. Carl Schröter. B. T. Batsford, Ltd., London, 1938. Pp. 11, 36 coloured plates. Price 10s.

being able to incorporate a considerable amount of recent research on several important garden genera such as *Allium*, *Fritillaria*, *Hosta*, *Lilium*, *Nomocharis* and *Tulipa*, so that an up-to-date treatment of these genera can be presented.

We congratulate Colonel Grey on the completion and successful publication of his great essay, and on his wish to provide a treatise on these delightful plants for the horticultural world. His three volumes on hardy bulbs are likely to prove to be far the most useful general work on Monocotyledonous plants for the garden for very many years.

German without tears.—In the good old days of the middle ages Latin was the usual medium for the recording of scientific work. It is not without significance that taxonomy is the only branch of botany retaining Latin by international agreement for purposes of description, and even in taxonomy its use is becoming more and more restricted to the formal publication of new groups. Most botanical work at the present time is published in the vernacular and more in English and German than in any other two languages. Many of those who write the body of their papers in some other tongue frequently add a summary in English or German, and the best-known journals devoted to abstracts of published work are in one or other of these languages. It follows that every botanist must have a working knowledge of English and German and be able to use works in either. This involves more than a mere knowledge of the grammar and "basic" words. In English, the tendency is for scientific terms to be coined from Greek or Latin. In German, on the other hand, such terms are often built up from pre-existing German words, sometimes making terms which seem to an Englishman rather cumbrous—carbohydrates is bad enough, but Kohlenwasserstoffverbindungen seems worse, though this may be due merely to the inherent laziness of an Englishman.

To know a foreign language so completely as to be able to speak it fluently and to appreciate all its subtleties is possible only for a small number of botanists. Exactly what is the best way of obtaining a sufficient basis for general research is somewhat doubtful, and no doubt varies with the individual. It is probable that the method used in a recently published book* will form a good introduction to German for English readers and to English for German readers within the realm of botany. It has been compiled by two English (Dr. H. and Prof. E. Ashby) and two German (Dr. H. Richter and Dr. J. Bärner) biologists. A wide range of subjects is included—morphology, classification and phylogeny, cytology and genetics, physiology, ecology, and plant pathology. The general method is to print the English text on the left-hand page and the corresponding German text on the right-hand page. How far such

a convenient "crib" is conducive to retention of the foreign tongue may be disputed. The scheme shows some resemblance to certain psychological tests for honesty. It may be suggested that "translation" would be a more appropriate word than "terminology" to use in the title. The selection of material and the translations appear, on the whole, to be excellent. English, Latin and German names of common wild and cultivated plants are given in Appendix I, and of plant diseases in Appendix II. English and German Indexes complete the book.

W. B. TURRILL.

The Vegetation of South Africa.*—Ever since Drege's celebrated pioneer work appeared in 1843 the floral regions of South Africa have engaged the attention of many botanists. Bolus' "Sketch of the Floral Regions of South Africa" summarised the knowledge of the subject in 1905, and since then further accounts have been published by the late Dr. Marloth and by Dr. Pole Evans. All these authors, particularly the last mentioned, travelled extensively and made large herbarium collections, so that Professor Adamson has had an abundance of information for his compilation of this small handbook.

Three chapters, extending over 86 pages, are devoted to accounts of the physiography, climate and weather, and geology and soils. For the well known "Cape bush," "fynbos" or "macchia" of the South Western Region, the term "sclerophyll" is used. It contains very few plants of use to man, the *Proteaceae*, *Bruniaceae*, *Restionaceae* and others peculiar to South Africa, being the principal families represented in the area. The "rhenosterbush," *Elytropappus rhinocerotis* Less., covers wide tracts and is the most arid kind of "sclerophyll."

Forest vegetation occupies only 0.3 per cent. of the whole Union, and Adamson recognises four subdivisions: (1) temperate forest; (2) warm temperate forest; (3) subtropical forest; and (4) montane forest. The highest trees of the temperate forest, such as occurs at Knysna and the Zitzikama, are *Podocarpus* (up to 150 ft.), and in this area is the "stinkwood," *Ocotea bullata* E. Mey. (*Lauraceae*), from which beautiful furniture is made.

The soils of the subtropical forest, which occurs in the eastern part of the Union, are deep and very fertile, and the main crops are maize, Kaffir corn, sugar, tea and cotton, besides bananas, pawpaws, mangoes, pineapples and avocado pears.

Certain floral regions of other authors are classed together under the heading "savanna vegetation." This includes the "Acacia-grassland" of Natal, the "Bush-veld" of the northern half of the Transvaal, and the "Low-veld" of the north-eastern Transvaal. This is perhaps not a very happy association, and embraces very distinct regions, especially the last mentioned.

* "The Vegetation of South Africa." By R. S. Adamson (*Monographs of British Empire Vegetation*). London: British Empire Vegetation Committee, 1938. Pp. xvi + 235 + 9 plates. 10s. net.

* *German-English Botanical Terminology* (Englisch-deutsche botanische Terminologie), Thomas Murby & Co., London, 1938, 10s. net, pp. 195.

BULLETIN OF MISCELLANEOUS INFORMATION No. 4 1939 ROYAL BOTANIC GARDENS, KEW

XVIII—THE OCA AND ITS VARIETIES. A. W. HILL.

Oxalis tuberosa Mol., the Oca of the Bolivian Indians living round about Lake Titicaca, is a staple article of diet on the plateau.

The tubers grow to the size of medium-sized potatoes, some 2 to 3 inches long and 1 to 1½ inches in diameter; they are usually cylindrical or somewhat turbinate in shape. The fleshy, overlapping leaf-scales give the tubers a cone-like appearance and conceal the buds in the deep-set "eyes." In general appearance they are very similar to some of the deep-eyed potatoes grown in the Bolivian Andes.*

The tubers contain large quantities of calcium oxalate, and before they are eaten they are usually dried in the sun and then frozen, and in fact are treated in much the same way as are the potatoes of that region when dried to form "Chuño."

Ocas are grown extensively in fields and on the hillside terraces in Bolivia and are always reproduced from tubers and never from seed. In fact, according to information given me in Bolivia, the plants never set seed, though no doubt it would be possible to induce seed-setting were there anyone there competent to fertilize the flowers, and also to collect the seed. This perpetual vegetative reproduction has given rise to some interesting results, which I believe have no exact parallel in other plants.

The flowers of *Oxalis tuberosa* are trimorphic, and when I was in Bolivia in January and February 1903 I was frequently passing by fields and terraces planted with Ocas which were then in their full vigour and often gay with the conspicuous orange-yellow flowers.

Being interested to see how the proportions of the different types of flowers might work out, I examined numbers of flowers in the various plots and to my surprise found the flowers in any one plot to be all of the same type, either long-, short-, or mid-styled! On enquiry from my Bolivian servant and telling him that all the Ocas in the plot were the same according to their flowers, his rejoinder was that of course they were the same as this field was planted with white Ocas, that with yellow, while in another plot they were all red Ocas. Up till then I had not seen the tubers except in the colourless dried condition as sold in the market at La Paz, but on enquiry from the Corregidor of the village of Escoma, on the N.E. side of Lake Titicaca, I was informed that four kinds of Oca are cultivated—the bitter, the sweet or yellow, the white and

* See Salaman, Journ. Roy. Hort. Soc. 62, 61, 1938.

Chapters devoted to "Grass-land" (High-veld), and "Semi-desert" (Karoo) follow, and the book concludes with a short account of land utilization and natural products, and a most interesting chapter entitled "General Conclusions and Prospects."

The book is remarkable in two respects. It required some skill to compress into less than 150 pages an account of so vast a region with an exceptionally rich flora (probably about 15,000 species), and it is nowhere camouflaged by excessive use of ecological terms which so often render similar accounts difficult and even uninteresting from the general reader's point of view.

J. HUTCHINSON.

The Correct Name of the Common Parsley.—In K.B. 1938, 257, the following statement occurs: "The epithet *crispum* . . . was (as noted by Wolff) employed under this genus [*Petroselinum*] in synonymy, for some unexplained reason, by Nyman, Consp. Fl. Eur. 309 (1879)." My attention has recently been drawn to the explanation of the abbreviations and signs used in the "Conspetus," at the foot of the last page of the introductory remarks. This states that a long dash (—) preceding a name indicates a variety: "varietates [notantur] linea longiori (—) ante nomen." The citation "—*P. crispum* (Mill.)" under *P. sativum* therefore means that Nyman regarded *Petroselinum crispum* (Mill.) as a variety of *P. sativum*. His use of a binary nomenclature for sub-divisions of species is, however, not admissible (Art. 28). The binary combination *P. crispum*, being cited by Nyman under *P. sativum*, was in effect treated by him as a *specific* (though not *varietal*) synonym of the latter and was therefore not validly published. Nyman's "varietal binomial" being therefore ruled out, the first valid use of the combination *Petroselinum crispum* (i.e., for a *species*) is apparently in the Kew Hand-List of Herbaceous Plants, 122 (1925), and the attribution to Nyman may be taken as a validating reference to Nyman's well-known work, where the author of the name-bringing synonym, *Apium crispum* Mill., is cited in brackets. There is clearly no doubt as to the plant intended either by Nyman or by Miller, nor as to the works of those authors intended by the Kew Hand-List and by Nyman respectively.

The article in Kew Bull. l.c. should accordingly be amended as follows:—

Line 13: *delete* "for some unexplained reason".

Line 15: *after* "But the combination" *insert* "*P. crispum*".

Line 24: *for* "pro syn." *read* "pro var."

It is suggested that the species will be conveniently cited as *Petroselinum crispum* (Mill.) Nym. ex. auct. kew.

H. K. AIRY-SHAW.

the red. The names of the three latter varieties refer to the colour of the tubers, the yellow and red ones being well-marked. It is not always easy to say whether the white variety is a very pure one as regards colour as the tubers sometimes have a yellowish tinge, but the white ones can easily be distinguished from the yellow, since the scales of the latter always have a red edge, while those of the white tubers are colourless. Unfortunately I did not ascertain the tuber colour of the "bitter" variety.

From my examination of the cultivated plots, I found that the yellow tuber variety bore only long-styled flowers, the white tuber variety had mid-styled flowers, while the short-styled flowers were borne by the red tuber variety. Thus it would appear in the course of the long cultivation of this edible tuber the selection of colour forms has been accompanied by a segregation of flower types corresponding to the different coloured tubers.

In addition to the association of the three forms of the trimorphic flowers with three distinct types of tuber, there are also some differences in leaf and stem colour, leaf hairiness, and in the petal colour of the varietal forms.

In the white tuber variety the stems and leaves are uniformly green of rather a pale shade, and under cultivation in this country the plants can easily be distinguished by their leaves from the other two varieties.

The stems of the yellow tuber variety are reddish in colour, especially so in the younger shoots, while the leaves are a deep claret-red on their lower surfaces. The red colour is also visible to some extent on the upper surface giving the leaves a darker green tint than those of the "white" variety. The leaves and stems are also more hairy than those of the other two forms.

In the red tuber form the stems are also reddish in colour, but the leaves are green and only a trace of red can be detected occasionally on a few of the leaves.

As to the flowers, those borne by the long-styled variety (yellow tubers), could easily be distinguished in the field by the prominence of the red veins of the petals.

These observations made so long ago I had hoped to be able to confirm by studying the behaviour of the plants under cultivation in England, and tubers of the three colour varieties were brought back for the purpose on my return from Bolivia and Peru in 1903. They grew well at the Cambridge Botanic Garden in the open and formed strong plants, but unfortunately failed to produce any flowers. More recently the experiment has been repeated with tubers sent over from Bolivia by a former Kew student gardener employed on the Bolivian section of the Antofagasta-Bolivia railway. He has confirmed my observations as to the segregation of the types of flower with tuber colour, but again efforts to induce the plants raised from these tubers to flower have not been very successful.

The Bolivian Plateau being situated at some 13,000 to 14,000 feet altitude, between 16° and 17° S. lat., it seemed possible that both altitude and length of day might be directly associated with the flowering of the plants.

In order to test whether these two factors could be in any way imitated in the northern hemisphere, plants have been kindly grown for me under restricted daylight conditions at the Royal Horticultural Society's Gardens, Wisley, by Dr. M. A. Tincker, and also at high altitudes in the Austrian Tyrol, thanks to the kindness of Mr. A. Beer, Curator of the Botanic Gardens, Innsbruck. Both ventures have resulted in some success, but not so good as was hoped might be the case.

Under a twelve-hour day at Wisley, which approximates to the length of day in Bolivia, a few flowers have been produced on the white-tuber bearing varieties, but none on the plants with yellow or red tubers. Dr. R. N. Salaman at Barley, Herts., was more successful and flowered plants from yellow tubers, the flowers being long-styled, and also from white tubers, which bore mid-styled flowers; in both cases according to expectation.

Some of the plants grown in the mountains near Innsbruck, Austria, flowered well, especially those from the yellow and white tubers. The flowers of the white tuber plants were mid-styled, but those of the yellow tuber ones were all short-styled. This result was contrary to expectation, but tubers from plants which flowered have been sent back from Austria, together with pressed flowers, and these prove that the observations were correct. In Bolivia Mr. Wolstenholme, the Kew student gardener who sent over material, has confirmed my own observations that plants from the yellow tubers bear long-styled flowers, but he found that the flowers from red tubers were not always true to expectation, for in some cases the styles were short, while in others they were in the mid-position; the white tubers, however, were consistent in yielding flowers with mid-length styles.

These experiments, as far as they go, suggest that the segregation of flower type in relation to tuber colour is not as fixed as it seemed to be when the plants were examined by me in the field, except that the white tubers do definitely appear to be associated with the mid-styled flowers.

According to my field-notes, plants with short styles were rare in the Oca fields I examined in Bolivia in 1903. At Ancoraimes only long- and mid-styled flowers were found, while at Copacabana the flowers were mid- and short-styled. Near Escoma, long- and mid-styled were found in about equal numbers. The following note is taken from my diary written at Huaycho, N.E. side of Lake Titicaca, (Feb. 15th, 1903): "In a field of Ocas I picked flowers at random and all were mid-styled, they seem in cultivation to have separated up the species into varieties which are characterized by the different forms of flower."

It seems probable that in some cases in Bolivia the farmers had unconsciously selected pure breeding strains of *Ocas*, so that in their fields the yellow tubers all bore long-styled, the white mid-styled, and the red short-styled flowers, while other farmers in the case of the red and yellow tubers had not selected such pure-breeding races; though in all cases the mid-styled flowers appear definitely to be linked with the white tubers.

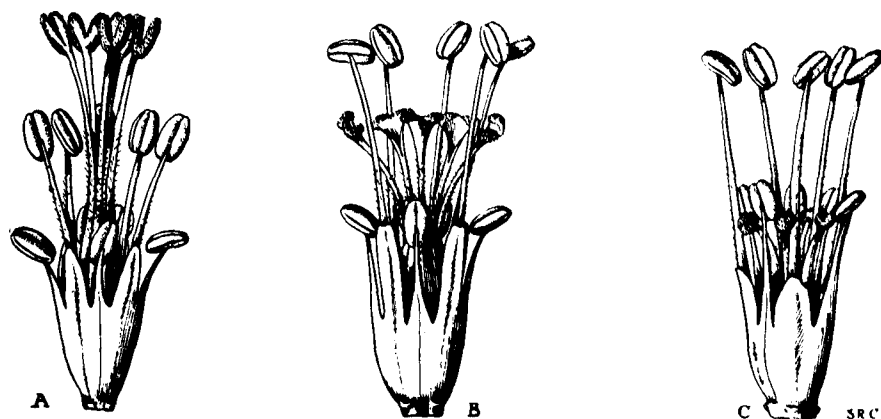


Fig. 1. *Oxalis tuberosa*, androecium and gynoecium. A, from plant with yellow tubers, $\times 6$. B, from plant with white tubers, $\times 6$. C, from plant with red tubers, $\times 6$.

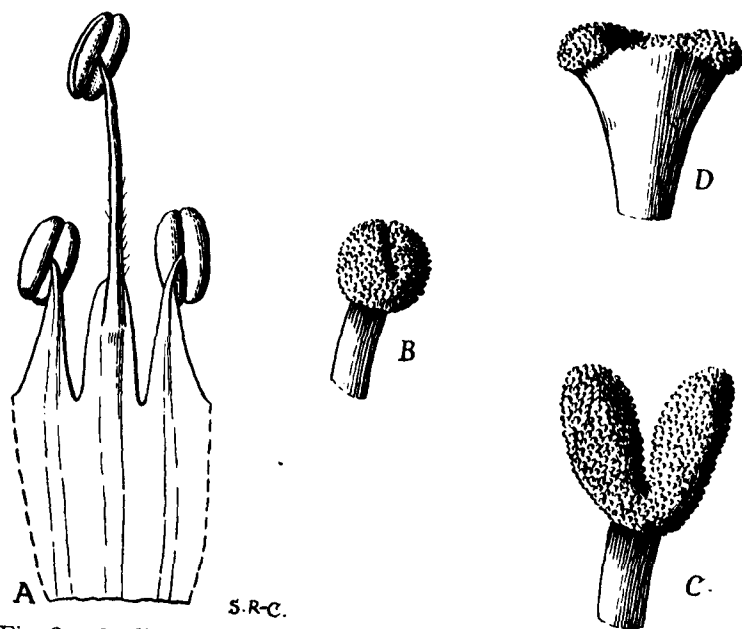


Fig. 2. *Oxalis tuberosa*. A, part of androecium, from inside, $\times 12$. B, stigma from short style, $\times 24$. C, stigma from long style, $\times 24$. D, stigma from medium length style, $\times 24$.

The relative positions of the whorls of stamens and styles is well shown in the accompanying figure (fig. 1). Attention should be drawn to the different character of the processes or broadened filaments between the stamens of the lowest whorl, to which the longer stamens are attached, since they vary considerably both in length and in the bluntness or acuteness of their apices.

The most striking difference between the three forms of flower, however, is shown in the stigmas which in the short-styled flowers are rounded, knob-like organs with a central groove, while in the mid-styled flowers the style broadens at the apex and bears two almost separate stigmatic discs connected together by a slightly stigmatic intermediate zone. In the long-styled flowers the stigma has become much enlarged and consists of two large erect stigmatic lobes which form a U-shaped organ (fig. 2).

It has seemed worth while to record these observations and experiments though, unfortunately, they are inconclusive, nor will it be possible apparently to complete the observations without carrying out further investigations in Bolivia since the plants so rarely flower in this country. It was hoped that they might flower in Kenya, but tubers sent to the Colony have behaved much as they do in England and no flowers have been recorded there.

This long-cultivated economic *Oxalis* would doubtless yield some interesting results could it be studied on genetical lines in its native country.

XIX—THE OCCURRENCE OF *ASTELIA NERVOSA* IN VICTORIA. J. H. WILLIS (Victorian Forests Commission).

Dr. C. Skottsberg of Sweden has recently published a comprehensive monograph* of the genus *Astelia* and its two allies, *Milligania* (confined to Tasmania) and *Collospermum* (New Zealand, Samoa and Fiji). Twenty-three species and four distinct varieties of *Astelia*, comprising seven subgenera, are described and figured in the monograph which includes maps to indicate the circumpolar distribution and probable antarctic origin of this interesting group of lilies. New Zealand with nine species and three varieties has a richer *Astelia* flora than any other region and is a likely centre of development and past migration. The genus also occurs in Tasmania, south-eastern Australia, northern Papua, New Caledonia, the Marquesas Islands, the Society Group, and antarctic America, with at least six species in Hawaii (a northerly outpost) and one isolated representative in the Island of Reunion (east of Africa). Later†, the same author added a new-discovered species from the island of Rapa. It is related to the species from Hawaii and Marquesas Is.

*Kungliga Svenska Vetenskapsakademiens Handlingar, ser. 3, 14, no. 2 (1934).

†B. P. Bishop Mus. Occas. Papers, 13, no. 18 (1937).

Such Australian material of *Astelia* as was preserved in collections at the Victorian National Herbarium was forwarded to Dr. Skottsberg for examination in 1934. The result of his research, embodied in his monograph, discloses that Robert Brown's *Astelia alpina* (the only Australian species hitherto recorded) actually embraced two widely-differing species and a well defined variety. Dr. Skottsberg limits the typical *A. alpina* (subgenus *Euastelia*) to mountain regions in southern and western Tasmania and makes the continental form *A. alpina* var. *novae-hollandiae* (on mountains from the Victorian Baws-Baws to Kosciusko in New South Wales). He restored *A. psychrocharis* F. Muell. from Mt. Kosciusko and the sources of the Murray River. It had erroneously been merged into *A. alpina*, but belongs to subgenus *Tricella*. These forms are all dwarf plants a few inches in height.

In addition there occurs in Australia a large *Astelia*, but no record of this had been published when the monograph was prepared. In December 1929, male and female specimens of this large *Astelia*—up to six feet high—were gathered by the author at the head waters of the Latrobe River (about 3 miles S.E. of Powelltown, Victoria). Five years later, in the head of McCrae's Creek, Beenak (6 miles S.W. of Powelltown), the author found another small colony of similar plants, containing three inflorescences in full berry. Since no male flower-heads were in evidence, it would seem that self-pollination had occurred, especially as the flowers bore stamens with small withered anthers. Subsequently, numerous and larger colonies were found in several fern-gullies along the Bunyip-Latrobe divide, where the annual rainfall is in the vicinity of 50 inches. These *Astelia* colonies usually occur in association with the Myrtle Beech (*Nothofagus Cunninghamii*) and occupy steep granite gullies at elevations of about 2000 feet, but they descend to lower than 1000 feet in the Tomahawk Creek, Beenak (35 miles east of Melbourne) where *Nothofagus* is absent; the habitat is invariably wet or marshy ground at the water's edge.

Recognizing the affinities of this plant with certain species of *Astelia* in New Zealand, material was forwarded to Dr. H. H. Allan of Palmerston, N.Z., who kindly examined it in comparison with the various New Zealand forms. While regarding the Australian plant as distinct from any species occurring in New Zealand, Dr. Allan (*in litt.*) indicated its relationship with *A. nervosa* and *A. Cockaynei*.

Material was also forwarded to the Royal Botanic Gardens at Kew. As no material in the Kew Collections matched the Australian specimens, they were referred to Dr. Skottsberg, who reported that the plant

"Belongs to subgenus *Tricella* and the *nervosa*-group. Stands close to *A. nervosa typica* and must be very like it in size and width of leaves, and the differences between the male plants seem very small, except that the Australian form is odourless, whereas the

other is described as fragrant and sweet-scented. The tube appears to be a little less high in this and the pedicels shorter.

"The differences in the female are more conspicuous. The Australian variety has a much less developed fleshy perianth tube, which is coloured yellowish, not red, within. It is as much as 4–5 or even 6 mm. high in *nervosa* and var. *silvestris*, and campanulate, tightly surrounding the lower half of the fruit, but hardly over 3 mm. in Mr. Willis' plant and more open. The perianth segments are larger in this, and so are the staminodes. The seeds are more numerous and smaller; a great many, from fruits picked out at random, have been carefully measured with a Leitz 0.1 mm. scaled tube.

"It is possible that the closest connexion is with var. *chathamica*, of which, however, the material in herbaria is incomplete, as seen from the table. The perianth tube in this seems as small as in the new variety. The style of *chathamica* is slightly more developed than in *nervosa* and *silvestris* but shorter than in the new one. The leaves, as far as known, are narrower in *chathamica*, and the seeds decidedly fewer and larger.

"As far as I can see, the Australian form should be classified as a distinct variety of *A. nervosa*, not as a new species."

Having personally examined *A. nervosa* Banks & Solander ex Hook. fil. (labelled *A. grandis* Hook. fil. ex T. Kirk) and *A. nervosa* var. *chathamica* (also labelled *A. grandis* in the National Herbarium, Melbourne), the author endorses Dr. Skottsberg's opinion. The type of *A. nervosa* differs from the Victorian form in its much more compressed female inflorescence, in its smaller, more tubular flowers, undeveloped style, and absence of staminodial filaments. The Victorian plant is certainly more like var. *chathamica*, but has wider leaves, a more spreading perianth, a longer style and smaller, more numerous seeds; *chathamica* is described as favouring open places, whereas the Victorian form occurs in dense rain forest.

Following Dr. Skottsberg's suggestion, the author proposes to name this plant *Astelia nervosa* var. *australiana*. Appended is a brief description of the new variety together with a table of comparative measurements of the variety and its allies, kindly supplied by Dr. Skottsberg.

***Astelia nervosa* Banks et Solander ex Hook. fil. var. *australiana* J. H. Willis, var. nov.** a typo floribus inodoris, perianthii feminei tubo breviori, segmentis majoribus differt. A var. *chathamica* foliis latioribus, seminibus minoribus numerosioribus recedit.

Plants dioecious, robust, up to 6 feet (1.8 m.) high. Leaves 50–200 cm. long and 5–10 cm. broad at base, linear-lanceolate, channelled, with drooping ends; mid-rib and two marginal veins prominent, pale green. Male and female inflorescences stout, similar, 20–40 cm. high, covered with a loose, white, silky tomentum. Flowers odourless, olive-green or tinged with red, sub-tomentose outside. Fleshy perianth-tube of female flowers short (about

3 mm. high), yellowish within, not tightly enclosing the berry. Female segments narrow-oblong, spreading, recurved, 5.5-6.5 by 2-3.5 mm. Staminodial anthers 0.8-0.9 mm. broad, on filaments 1-1.2 mm. long. Pistil 5-7 by 3-4 mm. Style definite, 2 mm. long, with three swollen stigmatic apices. Berry bright orange, soon falling, 6-10 mm. long. Seeds 5-12, about 2.5 by 1.4 mm.

TABLE OF COMPARATIVE MEASUREMENTS
(from Dr. C. Skottsberg).

	<i>A. nervosa</i> var. <i>australiana</i>	<i>A. nervosa</i> var. <i>typica</i>	<i>A. nervosa</i> var. <i>silvestris</i>	<i>A. nervosa</i> var. <i>chathamica</i>
<i>Male inflorescence:</i>				
Maximum length of racemes	18 cm.	27 cm.	18 cm.	12 cm.
Length of pedicels	7.5-10 mm.	5-8 mm.	5-7 mm.	6-7 mm.
Height of perianth tube	2-2.5 mm.	1.5-2 mm.	1.5-2 mm.	1 mm.
<i>Female inflorescence:</i>				
Size of lowest spathe	40 by 4 cm.	60-120 by 3.5-5.2 cm.	30-140 by 1.5-3.5 cm.	22 by 4 cm.
Maximum length of racemes	21 cm.	19 cm.	14 cm.	13 cm.
Length of pedicels	3-5 mm.	2-5 mm.	2-4 mm.	4-6 mm.
Height of perianth tube	2.5-3 mm.	3-5 mm.	3-6 mm.	8 mm.
Size of perianth segments	5.5-6.5 by 2-3.5 mm.	3-5.5 by 1-3 mm.	3-5.5 by 1.5-4 mm.	4-6 by 2-3 mm.
Length of staminodes (inc. anther)	1.3-1.4 mm.	1-1.2 mm.	1-1.2 mm.	
Size of pistil ...	5-7 by 3-4 mm.	4-5 by 2.5-3.5 mm.	4-5 by 2.5-3.5 mm.	4-6 by 2.5-4 mm.
Length of style ...	2 mm.	1 mm.	1 mm.	1.2-1.5 mm.
Number of seeds ...	5-12	4-5	4-8	4-7
Average size of seeds	2.5 by 1.4 mm.	3.2 by 1.8 mm.	2.8 by 1.8 mm.	3.5 by 1.75 mm.

The close relationship of the Victorian form to the widespread and variable *A. nervosa* in New Zealand might suggest that it is an introduction and has escaped from cultivation. However, the author is informed by old settlers in the Beenak Parish that the form under discussion was abundant in virgin forest when they settled there. Further, the distinct morphological characters of the Victorian form and its fairly widespread occurrence in isolated colonies in a definite habitat, negative the idea that it is an introduction.

XX—DECADES KEWENSES. PLANTARUM NOVARUM IN HERBARIO HORTI REGII CONSERVATORUM. DECAS CXXXIII.

1321. Frankenia (§ Pubescentes) hispidula Summerhayes [Frankeniaceae]; a ceteris speciebus sectionis ovulis pro placenta pluribus parietalibus differt.

Fruticulus compactus, 25-45 cm. altus; caules lignosi, ± erecti, fastigiatim ramosi, ut rami juventute laxiuscule patentim hispiduli, demum glabrescentes, cortice cinereo vel cinereo-brunneo obtecti, internodiis usque ad 2.5 cm. longis. *Folia* breviter petiolata, ± patentia, oblonga, lanceolato-oblonga vel lineari-oblonga, obtusa, marginibus valde revolutis, usque ad 7 mm. longa et 2.5 mm. lata, utrinque dense hispidulo-pubescentia, glandulis punctata; petiolus circiter 0.5 mm. longus; vagina ciliata, extra pubescens. *Dichasia* pluries furcata, brevia, floribus subglomeratis. *Bractee et bracteolae* longiuscule petiolatae, lanceolatae vel elliptico-ovatae, apice subobtusae vel rotundatae, basi (praesertim bractee) ± cordatae vel rotundatae, petiolis exclusis usque ad 5 mm. longae et 4 mm. latae, supra densiuscule hispidulae vel longe pubescentes, subtus superne et costa sparse hispidulae; petiolus 1-2 mm. longus, hispidulus; vagina communis breviter hispidula. *Calyx* fusiformi-cylindricus, circiter 1 cm. longus, medio 2-3 mm. diametro, valde 5-costatus, extra praesertim costis hispidulus, intus fere glaber; lobi ovato-triangulares, apice subulato-cuspidati, 1.5-2 mm. longi, conduplicati. *Petala* 5, ex ungue sursum sensim dilatato anguste obovato-spathulata, 1.5-1.8 cm. longa; limbus 8-9 mm. longus, 5-6 mm. latus; ligula 7-8 mm. longa, apice obtusa per 1 mm. libera. *Stamina* 6; filamenta linearia, 9-11 mm. longa, inferne circiter 0.5 mm. lata; anthera 1.5 mm. longa. *Ovarium* elongato-ovoideum, 2-2.5 mm. longum, trimerum; styli pars communis circiter 7.5 mm. longa; rami 3, in toto 1.5-2 mm. longi, parte stigmatifera vix vel leviter incrassata 0.5-0.7 mm. longa; ovula parietalia 4-5 pro placenta, 0.5-0.6 mm. longa. *Fructus et semina* non visa.

WESTERN AUSTRALIA. North West Division, Minilya River, on stony flint hills, 31 August, 1931, C. A. Gardner 3273.

This remarkable plant is of considerable interest from two stand-points. Firstly, it is the first member of series *Pubescentes* discovered possessing more than 2 distinctly parietal ovules to each carpel, since in *F. densa* Summerh. there are at the most 2 ovules to each placenta and these arise very near the base of the ovary, although

not truly basal. In indumentum, leaf-shape and other general features the species seems to fit well into series *Pubescentes* and indeed is very similar superficially to *F. serpyllifolia* Lindl. It might perhaps be placed in series *Intermediae* but I do not feel that this is a natural group. *F. hispidula* may indeed be looked upon as the "toichogonial" (or many-ovulate) representative of series *Pubescentes* and its inclusion in this series is paralleled by similar occurrences in several other series of Australian Frankenias.

Secondly, no member of this series has previously been found so far west, *F. densa*, which occurs along the Australian Bight, being the only other Western Australian member. However, there is still much to be discovered about the Frankenias of the interior of Australia and it may be that other representatives of the series will be found to link up the new species with its eastern relatives.

1322. *Elaeocarpus costatus* M. R. F. Taylor [Tiliaceae]; affinis *E. dentatae* Vahl sed foliis minoribus, inflorescentiis paucifloris, petalis apicem versus vix latis, ovario 3-loculari, drupis majoribus suffuso-caeruleis putamine manifeste 6-costato. — *Elaeocarpus* sp. J. H. Maiden in Proc. Linn. Soc. N.S. Wales, **27**, 347. t. 15 (1902).

Arbor circiter 6.5 m. alta. *Ramuli* teretes, juniores leviter adpresse sericeo-villosi, cicatricibus foliorum delapsorum notati; cortex rugosus, brunneus vel ferrugineo-brunneus. *Folia* ad apices ramorum congesta, alterna, juniora leviter adpresse sericeo-villosa; petiolus 1–1.5 cm. longus, canaliculatus, apice inferne turgidus; lamina oblonga vel ovato-lanceolata, basi cuneata, apice obtusa vel acuta, 6–8 cm. longa, 2.5–3.5 cm. lata, utrinque glabra, coriacea, margine apicem versus irregulariter serrata, costa subtus prominente supra plana, nervis lateralibus utrinsecus 4–5 arcuatis domatiis in axillis nonnullis nervorum lateralium instructa. *Racemi* simplices, pauciflori, ad apices ramulorum inter folia juniora inclusis; pedunculi circiter 1.5 cm. longi; pedicelli 3–4 mm. longi, juniores adpresse sericeo-villosi, in statu fructifero crassi, ad 1 cm. longi. *Bracteae* lineari-lanceolatae, 4–5 mm. longae, pubescentes, caducae. *Flores* nutantes, cremeo-albidi. *Sepala* 5, libera, valvata, anguste deltoidea, circiter 5 mm. longa, basi 2 mm. lata, extra plus minusve leviter pubescentia, intus glabra, costa prominente. *Petala* 5, inflexa, crassa, oblonga vel apicem versus aliquanto latiora, 8–9 mm. longa, 2.5–3 mm. lata, quadrante superiore 3–5-lobata, extra sparse adpressequae sericeo-villosa, intus glabra, costa prominente. *Stamina* circiter 20; filamenta 0.5–1 mm. longa, sericeo-tomentosa; antherae lineares, 2–2.5 mm. longae, sparse velutinae, biloculares; valva altera breviter aristata, altera aristo recurvo subulato circiter 1.5 mm. longo instructa. *Discus* hypogynus, circiter 5-glandulosus, glandulis bifidis sericeis. *Ovarium* 3-loculare, conicum vel trigonum, in stylo sensim attenuatum, 2–3 mm. altum, 1.5–2 mm.

diametro, dense adpresse sericeo-villosum; ovula per loculo 6–10; stylus subulatus, circiter 2 mm. longus; stigma simplex. *Drupae* plus minusve anguste ovoideae, uniloculares, 2 cm. longae, 1–1.5 cm. diametro, suffuso-caeruleae, in statu sicco olivaceae; putamen manifeste 6-costatum. *Semen* 1.

LORD HOWE ISLAND. North Hills at about 235 m., 27 Jan. 1937, J. D. McComish 106 (type): tree, 6.5 m. high, not common, flowers creamy-white, with 5 petals deeply and irregularly incised, resembling somewhat those of *E. dentatus*. Summit of Mt. Gower, 946 m., Jan. 1937 J. D. McComish 106 A. Mt. Gower, July 1901, comm. J. H. Maiden (fruits only in Herb. Kew.).

This species of *Elaeocarpus*, the only one recorded from Lord Howe Island, was partially described by Maiden from very meagre fruiting material in Journ. Linn. Soc. N.S. Wales, **27**, 347 (1902). It is closely related to *E. dentatus* Vahl, a fairly common New Zealand plant, but appears to have no close affinities amongst Australian species. Capt. McComish reports that he has seen the tree in a third locality on the island, at about 1000 ft. on the slopes of Mount Lidgebird. A painting by Mrs. McComish kindly supplied by her to Kew shows the brilliant blue fruits of the species, the colour of which is not preserved in the dried specimens.

1323. *Cayratia eurynema* B. L. Burtt [Vitaceae]; filamentis latioribus foliolis acuminatis ab affini *C. japonica* distinguenda.

Planta cirrifer a scandens, caulibus brunneis, siccitate longitudinaliter rugosis sparse lenticellosis prope nodos sparse scabropubescentibus glabrescentibus, internodiis circiter 8 cm. longis. *Cirri* foliis oppositi, glabri, foliis multo longiores, aliquotiens furcati. *Stipulae* parvae, brunneae, membranaceae, mox caducae. *Folia* pedatim composita, 5-foliololata; petiolus 3.5–5.5 cm. longus, supra leviter canaliculatus, primum pilis pluricellularibus sparse indutus, demum glabratus; petiolulus medius 1.5–2.3 cm. longus; laterales 7 mm. longi, in duos ramos 4 mm. longi furcati; foliolium medium obovatum vel elliptico-obovatum, 5.5–7.5 cm. longum, 3–4 cm. latum, apice breviter acuminatum, basi cuneatum; foliola lateralia late elliptica, superiora 7 cm. longa et 3.5 cm. lata, inferiora paullo minora 5.5 cm. longa 3 cm. lata leviter inaequilateralia. *Inflorescentia* paniculata, in ramo axillari ut videtur terminaliter edita, folio parvo suffulta: pedunculo eramoso 4–4.5 cm. longo. *Flores* in alabastro tantum visi; pedicelli circiter 2 mm. longi dense pubescenti. *Calyx* minutus, lobis obsoletis, ut pedicelli pubescens. *Petala* 4, oblonga, circiter 3.5 mm. longa et 1 mm. lata, apice incrassata, extra pubescentia. *Stamina* 4; filamenta medio dilatata, 0.75 mm. longa, 5 mm. lata; antherae 1 mm. longae, 0.75 mm. latae, thecis basi leviter divergentibus. *Discus* ovario connatus et id leviter superans, obtuse cruciformis. *Ovarium* glabrum 4-loculare, ovulis in loculis solitariis basilaribus; stylus 1 mm. longus, indivisus. *Fructus* (maturus?) siccitate suborbicularis, 5 mm. longus et 5 mm. latus, leviter compressus, monospermus, semine rugoso.

NEW SOUTH WALES. Comboyne, May, 1935 (in young fruit), Dr. E. C. Chisholm (comm. Miss L. Fraser: type). Dorrigo, 26 January 1936 (in bud) Miss L. Fraser.

Cayratia eurynema is clearly distinguished from the other members of the genus by its small inflorescences, broad filaments and more southerly distribution. To discuss its affinity with the other species is, however, by no means easy, as their limits are in many cases ill-defined. For instance, it is questionable if many of the Malayan specimens referred to *C. japonica* (Thunb.) Gagnep. really belong to that species at all. The true *C. japonica* differs from *C. eurynema* in its thinner leaves the crenations of which are rather rounded but conspicuously mucronate, as well as in its narrow filament. *C. clematidea* (F. Muell.) Domin, which also occurs in New South Wales, may be at once distinguished from *C. eurynema* by its more coarsely and acutely serrate leaves.

In Gagnepain's classification (see Lecomte, *Notulae Systematicae*, 1, 339: 1911) *C. eurynema* would rank as a species with "geniculate peduncle" (actually the axis below the articulation can scarcely be called part of the peduncle in strict morphology), but this character is of doubtful importance as I have seen specimens with and without this articulation on the same sheet.

1324. *Erythrophloeum unijugum* Airy-Shaw [Leguminosae-Caesalpinioideae-Dimorphandreae]; *E. densifloro* (Elm.) Merr. affinis, foliis tantum 1-jugatis pinnis valde divaricatis petiolo 2-5 cm. longo, inflorescentiis magis elongatis ramosisque parcissime puberulis, calyce glabro, ovulis plerumque 5 distincta. —*Sympetalandra borneense* [sic!] Stapf sec. Merr. in Univ. Calif. Publ. Bot. 15, 98 (1929), non Stapf.

Arbor 4.5 m. alta, trunco 15 cm. diametro (usque 30 cm. teste Elmer). *Ramuli* 3-6 mm. diametro, teretes, leviter striati, cortice cinereo subtiliter reticulato-fisso lenticellis parvis rotundatis sat numerosis notato, juniores tomento velutino ferrugineo subtilissimo vestiti. *Folia* abrupte bipinnata: petioli teretes, 2-5 cm. longi, vetustiores cinerei, glabri, juniores ferrugineo-tomentelli; pinnae 1-jugae, rhachi usque 11 cm. longa (petiolulo usque 3.5 cm. incluso), valde divaricatae, rectae, rhacheos internodiis 2-3 cm. longis; foliola 4-juga, ovato-oblonga usque ovato-elliptica, 6-10 cm. longa, 2-4 cm. lata, basi rotundata saepe obliqua, apice breviter acuminata acumine obtuso, glabra, modice coriacea, siccitate supra brunnescentia, nitidula, infra pallidiora, obscura; nervi laterales 5-8-jugi, patuli, inarcurati, intra marginem anastomosantes; petioluli foliorum circiter 3 mm. longi, supra alte sulcati, siccitate nigri. *Inflorescentiae* late paniculatae (foliis racemos suffulgentibus suppressis), usque 30 cm. longae et latae; singuli racemi valde elongati, usque 18 cm. longi, saepe 2 seriatim ex eodem nodo orti, parcissime puberuli (juniores densius) vel glabrescentes, plus minus complanati, striati; bracteae minutissimae, triangulares, puberulae; pedicelli vix 1 mm. longi, patentes, glaberrimi, apice articulati;

bracteolae nullae. *Calyx* campanulatus, fere 2 mm. longus, rugulosus, glaber, breviter 5-lobus, lobis late triangularibus rotundatis. *Corollae* tubus breviter ovoideus, incrassatus, 1.5 mm. longus, apice constrictus, extra longitudinaliter 5-gibbosus; segmenta oblonga, 3-4 mm. longa, 1.5-2 mm. lata, imbricata, apice rotundata, glabra, dorso leviter carinata, viridia. *Stamina* 10, perfecta, 2 cuique petalo opposita: filamenta filiformia, 7-10 mm. longa; antherae ovoideo-oblongae, fere 1 mm. longae, applanatae, dorsaliter basifixae, versatiles, introrsae, apice decidue apiculatae. *Ovarium* ellipsoideum, 2-3 mm. longum, 1 mm. diametro, crispule pubescens, stipite glabro 2 mm. longo suffultum, in stylum glabrum 2-3 mm. longum attenuatum, stigmate punctiformi; ovula 5, uniseriata. *Fructus* ignotus.

BRITISH NORTH BORNEO. Forested saline flats near Tawao, Oct. 1922-March 1923, Elmer 20923: "A tree, trunk 30 cm. in diameter, the inflorescences yellowish green." Tawau, along the bank of the Marutai River, alt. 3 m., 14 April, 1932, Agullana in For. Dept. 1780 (typus, Herb. Kew.): "Tree, 15 ft. high, 6 in. diam.; flower green."

This is the first definite record of the genus *Erythrophloeum* for Borneo. Elmer's collection, erroneously identified by Merrill as *Sympetalandra borneensis* Stapf, is in very young bud, but the characteristic bipinnate leaves with only one pair of pinnae are quite unlike the simply pinnate leaves of Stapf's plant, and its identity with the excellent flowering material recently received from the Forestry Department is beyond doubt. I have not seen the sterile specimen (Villamil 52) referred to by Merrill, l.c.

Merrill queries whether *Sympetalandra* be really generically distinct from *Erythrophloeum*. The discovery of *E. unijugum* suggests an answer in the negative. The only distinctions (few ovules and simply pinnate leaves in *Sympetalandra*) are quantitative only, and are approached by the four ovules and sometimes solitary seed of *E. densiflorum*, and by the reduction to one pair of pinnae in *E. unijugum*. I am unable to agree with Stapf (in Hook. Ic. Pl. 28, t. 2721: 1901) that *Sympetalandra* "can . . . not be said to be closely allied to" any of the genera of the tribe *Dimorphandreae*. Even if no further links are discovered, it will at most constitute a section of *Erythrophloeum*.

1325. *Hoffmanseggia stipulata* Sandwith [Leguminosae-Caesalpinioideae-Eucaesalpineae]; ab omnibus speciebus forma stipularum secus ramulos insigniter congestarum sese saepius imbricantium valde distincta; praeterea ab *H. miranda* Sandwith locos similes habitante atque manifeste affini indumento eglanduloso foliolis magis coriaceis glaucis fere semper glabris legumine glabro differt.

Frutex nanus, ad 0.6 m. altus, radice subterranea lignosa fere 1.5 cm. diametro; rami inferne lignosi, superne ramulos multos annotinos graciles flexuosos defoliatos brunneos glabros emittentes; ramuli hornotini ut tota planta hornotina griseo-glauci, glabri;

internodia permulta, brevia vel brevissima, saepe stipulis obtecta, 0.2–1 cm. longa. *Stipulae* pro genere egregiae, valde conspicuae, persistentes, secus ramulos permultae atque sese saepius imbricantes, ovatae, basi rotundatae atque ramulo late affixae, 5–8.5 mm. longae, 2.75–5 mm. latae, regulariter profunde lacerae, dentibus lanceolatis acutissimis porrectis superioribus terminalique saepe 2–3 mm. longis, e basi crasse subparallele nervosae, nervis ramulosi, coriaceae, glaucae vel senectute purpurascens, glabrae vel dentibus sparse pilosis. *Folia* ascendunt, griseo-glaucula, eglandulosa, petiolo rhachi pinnisque subtus plus minusve pilosis ceterum fere semper glabra; petiolus 2–4.8 cm. longus; pinnae imparipinnatae, 1–4-jugae, 1–2.5 cm. longae, internodiis rhacheos 2.5–10 mm. longis; foliola 5–9-juga, suborbicularia usque obovato-oblonga, apice rotundata obtusa, basi rotundata brevissime cordata atque petiolulata, 2–6.5 mm. longa, 1.5–4.5 mm. lata, rigide coriacea, saepius plus minusve concava, glauca vel pruinosa, fere semper omnino glabra, rarissime parce ciliata, nervis supra omnino impressis subtus cum ramulis suis crasse prominentibus. *Inflorescentia* unica visa fere 8.5 cm. longa, fere glabra, parcissime pilosa; pars florifera 3.5 cm. longa; bractae stipulis similes, pilosae, caducae; pedicelli glabri, 2–3.5 mm. longi, ascendentes. *Flores* aurantiaci. *Calycis* tubus turbinatus, 2 mm. longus, apice excepto glaber; lobi obovato-oblongi vel oblongi, rotundati obtusi, 5–5.5 mm. longi, 2.75–3.3 mm. lati, dorso copiose molliter albo-pilosi atque ciliati. *Petala* 4 subaequalia, lamina ovoideo-suborbiculari 6.5–7 mm. longa 5–5.75 mm. lata, ungue 3–4 mm. longo marginibus (laminae inferne) basi excepta processibus filiformibus eglandulosis albis ad 2 mm. longis ornato; petalum quintum lamina ovoidea 5.75 mm. longa 4.2 mm. lata, ungue 5.5 mm. longo supra canaliculato glabro. *Stamina* filamentis 9.5–10.3 mm. longis inferne dilatatis trientibus duobus inferioribus praecipue prope basin conspicue pilosis eglandulosis apicem versus glabris; antherae oblongae, 1.4 mm. longae, 0.8 mm. latae. *Ovarium* brevissime stipitatum, glabrum, obovoideo-lineare, 3 mm. longum, 1 mm. latum; stylus glaber, 9.5 mm. longus; ovula 4. *Leguminis valvae* lineari-oblongae, fere 2.7 cm. longae, 7 mm. latae, glabrae, reticulato-venosae; semina non visa.

PERU. Dept. Arequipa: Mejia, south of Mollendo, in sandy dips on open hillside, c. 90–180 m., 17 Sept. 1937, *D. Stafford* 899. "Dwarf shrub, 1–2 ft. high. Flowers orange."

This very interesting plant is clearly allied to *H. miranda* which inhabits the same region and has very narrow and inconspicuous fimbriate stipules with gland-tipped teeth, less rigid and scarcely glaucous more pubescent leaflets, densely glandular branchlets and inflorescence, and tomentose pods. The curious processes on the claws of the petals are similar in both species, but in *H. miranda* they are blackish in colour. Only a single flower of the present species has been available for dissection, so that modification of some of the measurements may be expected.

1326. *Dryandra* (*Eudryandra*) *Ashbyi* B. L. Burt [Proteaceae-Banksieae]; *D. Fraseri* R. Br. affinis, sed ramulis glabris, foliis brevioribus segmentis paucioribus longioribus, perianthii tubo glabrescente, fructu minus piloso distinguenda.—*D. Fraseri* R. Br. sec. Diels & Pritzel in Engl. Bot. Jahrb. 35, 173, fig. 18 (1904)—non R. Br.

Frutex nanus ramulis brunneis glabris. *Folia* rigida, circiter 4–6 cm. longa, pinnatipartita, supra glabra subtus brevissime albo-tomentosa; segmenta maxima circiter 1.5 cm. longa, pungentia, marginibus revolutis, basi decurrentia, ea folii apicem et basin versus minora; costa et nervi segmentorum supra leviter impressa, subtus valde prominentia. *Capitula* lateralialia vel terminalia, foliis circumcinctis, 2–3 cm. diametro. *Involucri bractae* circiter 5-seriatae; exteriores e basi ovato 2 mm. longo et 2 mm. lato apice in acumen setiforme 6 mm. longum productae, in interiores lineari-lanceolatas apice dense rubro-furfuraceas basin versus glabras sed basi ipso pilis paucis albis comosas 11 mm. longas et 1 mm. latas sensim transeuntes. *Squamae receptaculi* spatulatae, 2.5 mm. longae, basi pilis fere aequilongis circumcinctae, sub fructu ad 1.2 cm. elongatae. *Perianthium* 1.9 cm. longum, tube 1.4 cm. longo glabrescente, limbis anguste spatulatis extra sparse pilosis 5 mm. longis. *Squamae hypogynae* 4, 1.75 mm. longae, apice truncatae, emarginatae. *Antherae* in limbis perianthii subsessiles, 2 mm. longae. *Ovarium* 3 mm. longum, apice pilosum. *Stylus* 2.4 cm. longus, leviter curvatus, rigidus, stramineus, stigmate 3 mm. longo cylindrico leviter crassiore terminatus. *Fructus* 1.6 longus, 1 cm. latus, primum brunneo-pilosus, glabrescens. *Semina* nigra, 1.3 cm. longa et 1 cm. lata (ala inclusa).

W. AUSTRALIA. Yuna, 30–40 miles N.E. of Geraldton; cultivated at Blackwood, S. Australia, *Ashby* 39 (type). Victoria near Geraldton, c. 20 m., 27 June 1901, *Diels* 3567 (Herb. Berol.) Victoria, near Minginew, c. 170 m., blue-green dwarf shrub, very thorny, *Diels* 3081 (Herb. Berol.).

Dryandra Ashbyi has been cultivated by Mr. Edwin Ashby in his garden at Blackwood, S. Australia. He obtained it at Yuna, near Geraldton in W. Australia and it has also been collected in the same district by Dr. L. Diels, whose specimens are in the Berlin Herbarium and have been kindly sent on loan to Kew.

Dryandra Ashbyi is most nearly allied to *D. Fraseri* R. Br., and was not distinguished from that species by Diels and Pritzel. *D. Fraseri* may be readily distinguished however by its densely pubescent branchlets, more pilose perianth tube and longer leaves, which have much shorter narrower more regular segments. These differences in the leaves give the two species a very dissimilar appearance. *D. Ashbyi* is a stiff rigid plant, but *D. Fraseri*, on account of its longer leaves, appears graceful by comparison. The perianth is rose-pink in *D. Fraseri* but greenish in *D. Ashbyi*.

Diels 3081 is not quite typical of *D. Ashbyi*, having more glaucous leaves with narrower segments. It is, however, very much closer to *D. Ashbyi* than to *D. Fraseri* or any other species so far described and for the present it is best referred to our new species.

It may be noted that in *D. Ashbyi* the leaves on the main shoots possess small prickly teeth at their bases, but these are absent from the leaves surrounding the capitulum.

1327. *Carex cranaocarpa* Nelmes [Cyperaceae]; affinis *C. hirtellae* Drejer, sed spicis crassioribus, utriculis majoribus in rostrum magis sensim desinentibus, rostro breviori praecipue differt.

Culmi alti, obtuse triquetri, laeves, graciles, inferne foliati. *Folia* culmorum 2-3 mm. lata, planiuscula, longe attenuata. *Spicae* 4-6; superiores 3 congestae, masculae, conicae, sessiles, terminalis longior; ceterae cylindricae vel ellipsoideo-cylindricae, 2-3 cm. longae, circiter 7-8 mm. latae, superiores 2 androgynaeceae, infima feminea, pedunculatae, pedunculis scabriusculis gracilibus. *Bracteae* inferiores foliaceae, culmo breviores, vaginantes, superiores squamiformes, vix vaginantes. *Squamae femineae* late ovato-ellipticae, breviter acuminatae, vitta mediana pallida excepta castaneae, marginibus late albo-hyalinae, tenuiter carinatae, carina scabriuscula vix excurrente. *Utriculi* squamas multo superantes et iis latiores, 7-8 mm. longi, elliptico-lanceolati, suberecti, membranacei, compresso-trigoni, inferne pallidi, superne castanei, adpresso-hispiduli, dorso tenuiter plurinerves, facie obsolete nerves, in stipitem brevissimum contracti, in rostrum breve albo-hyalinum oblique sectum obscure bidentatum sensim attenuati. *Nux* laxe inclusa, anguste oblonga, trigona, faciebus concavis, vix stipitata vel rostrata. *Stigmata* 3.

CHINA. Chihli (Hopei): Tientsin, 9 August, 1929, *Licent* 9002.

1328. *Carex diplodon* Nelmes [Cyperaceae]; affinis *C. simulanti* C. B. Cl., sed culmis brevioribus, foliis latioribus, spicis femineis magis approximatis, utriculis parce hispidulis, rostris brevioribus differt.

Culmi 15-20 cm. alti, subvalidi, rigidi, laeves, basi excepta efoliati. *Folia* inflorescentia longiora, subcurvata, circiter 5 mm. lata, plana, marginibus scabriuscula, rigidiuscula, vaginis fuscis. *Spicae* 4-5, subapproximatae vel infima interdum remota, terminalis mascula, pallide castanea, gracilis, longipedunculata; laterales femineae, viridulae, subdensiflorae, cylindricae, erectae, plerumque 3 cm. longae, inferiores breviter exserte pedunculatae, pedunculis subvalidis. *Bracteae femineae* breviter foliaceae, spicis breviores, longivaginant. *Squamae femineae* oblongo-lanceolatae, albae, valde carinatae, carina scabriuscula in mucronem excurrente. *Utriculi* squamis sublongiores et latiores, 4.5-5 mm. longi, ellipsoideo-ventricosi, furfuracei, parce hispiduli, multinerves, brunneo-olivacei, basi oblique contracti et truncati, in rostrum sublongum validum conico-cylindricum saepe excurvum sublaeve ore grosse

bidentatum (dentibus interdum divergentibus) subsensim desinentes. *Nux* arcte inclusa, late ellipsoidea, trigona, vix stipitata, lateribus inferne concavis, in collum latum apice annulatum abrupte abeuntes. *Stigmata* 3.

CHINA. Southeast Kansu: Koan-hia-ho, 16 April, 1919, *Licent* 5035.

1329. *Carex Licentii* Nelmes [Cyperaceae]; affinis *C. Karoi* Freyn, sed utriculis obovato-subglobosis brevissime rostratis praecipue differt.

Rhizoma dense caespitosum. *Culmi* 8-17 cm. alti, gracillimi, glabri, obtuse triquetri, basi excepta efoliati. *Folia* circiter 1 mm. lata, plerumque involuta vel conduplicata, inferne scabra, acuminata, apice duriuscula, culmis breviora vel eos subaequantia, vaginis inferioribus fuscis dissolutis. *Spicae* 3, superiores 2 subfastigiatae, infima remotiuscula; terminalis mascula, clavata, 5-6 mm. longa, straminea; ceterae femineae, 6-10 mm. longae, circiter 3 mm. latae, cylindricae, subdensiflorae, sublonge exserte pedunculatae, pedunculis capillaribus scabris. *Bracteae* femineae foliaceae, inflorescentiam subaequant. *Utriculi* plerumque squamis multo longiores et eis aequilati, vix 2 mm. longi, obovato-subglobosi, pallide albido-virides, glabri, enerves, dense punctulati, basi breviter contracti, apice abrupte brevissime rostrati, rostro ciliolato bidentulo. *Stigmata* 3.

CHINA. South Shansi: Ya t'eu, 6 June, 1916, *Licent* 2007.

1330. *Carex persica* Nelmes [Cyperaceae]; affinis *C. foliosae* D. Don, sed foliis angustioribus, bracteis brevissimis et squamiformibus, utriculis nervatis et laevirostratis differt.

Rhizoma caespitosum. *Culmi* circiter 30-40 cm. alti, stricti, subvalidi, striati, angulis apicem versus scabridis, inferne foliati, basi vaginis aphyllis brunneis vestiti. *Folia* inflorescentia multo breviora, 2-2.5 mm. lata, plana vel conduplicata, marginibus superne scabriuscula, longe acuminata. *Inflorescentia* 5-6 cm. longa, e spicis circiter 12 composita; spicae superiores approximatae et simplices, ovatae vel globosae, inferiores plus minusve interruptae et compositae, omnes androgynaeceae, parte mascula brevi et inconspicua, parte feminea pauciflora. *Bracteae* brevissimae et squamiformes. *Squamae femineae* ovato-acuminatae, mucronatae, pallide brunneae, viridi-carinatae. *Utriculi* squamas superantes, oblique patentes, ovati, plano-convexi, 3.5-4 mm. longi, olivacei, glabri, dorso ad basin et apicem plurinerves, ventre enerves, in basin spongiosam contracti, in rostrum mediocre et sublatum laeve ore bidentatum (dentibus strictis) sensim desinentes. *Nux* ovato-quadrata, erostrata, plano-biconvexa. *Stigmata* 2.

NORTH PERSIA. Guilan, Lahijan, common in meadows, June, 1937, *Miss N. Lindsay* 945.

THREE NEW SPECIES AND ONE NEW VARIETY.

R. A. Blakelock.

Isatis eriocarpa Blakelock, sp. nov. (§*Apterolobus*); ab *I. iberica* Stev. habitu perenne, foliis minus dentatis, siliculis dense albo-lanatis; ab *I. Buschiana* Schischk. (e descr.) siliculis majoribus (c. 15 cm. longis nec 8 mm.) distinguitur.

Planta perennis vel biennis. *Caules* robusti, plus minusve erecti, 25–35 cm. alti, basin versus praecipue dense longe et patule pilosi (pilis usque 2 mm. longis). *Folia* integra vel parce dentata, utrinque sub-dense patule pilosa; radicalia oblonga vel oblongo-ovata, 3–7 cm. longa, 0.6–1 cm. lata, in petiolum attenuata; caulina oblonga vel lineari-oblonga, basi valde auriculata, 2–7 cm. longa, 0.3–1 cm. lata. *Pedicelli* glabri vel sparse pilosi, c. 7 mm. longi, floriferi filiformes, fructiferi apice sensim valde incrassati. *Sepala* glabra, luteo-virescentia, oblonga, 3 mm. longa, 1 mm. lata. *Petala* alba vel ochroleuca (?), 4–5 mm. longa, 2 mm. lata (ungue c. 2 mm. longo); lamina obovata. *Antherae* 1 mm. longae. *Filamenta* 2–2.5 mm. longa. *Ovarium* minute pubescens, 2 mm. longum, 1.5 mm. latum. *Silicula* linguiformis, cuneata, dense longeque albolanata, 15 mm. longa; ala terminalis 6 mm. longa, 5 mm. lata, apice truncata, retusa; loculus c. 4 mm. latus. *Semina* oblongo-elliptica.

ASIA MINOR: Marash, Akker Dag, c. 1000 m., 30.4.34, E. K. Balls and W. B. Gurlay 912.

This species of *Isatis* is unusual in having densely lanate siliculae, which give it a marked superficial resemblance to *I. Aucheri* Boiss. var. *vellifera* (Boiss. et Noë) Boiss. The fruit-shape, however, places it in the section *Apterolobus* Boiss. In the general robustness of its growth, *I. eriocarpa* resembles *I. iberica* Stev., from which it differs in the densely lanate siliculae, the denser tomentum on all parts, and the less dentate leaves. The scars of dead radical leaves and a thick much-branched root show it to be perennial or biennial, although the other known species of the section *Apterolobus* are annuals, except *I. pyramidata* Stapf, in Denkschr. Mat-Nat. Akad. Wien. 19 (1886), which is described as "biennis (?)". Our specimen also possesses a few flowers larger than all the rest, but these are clearly abnormal and hypertrophied.

Isatis Guestii Blakelock sp. nov. (§*Apterolobus*); ab *I. iberica* Stev., habitu perenne vel bienn, siliculis dense albo-lanatis differt; ab *I. eriocarpa* Blakelock foliis majoribus valde dentatis minus pilosis, fructus forma recedit.

Planta perennis vel biennis. *Caules* robusti, erecti, c. 60 cm. alti, basin versus patule pilosi, superne glabrescentes vel glabri.

Folia valde dentata vel interdum subpinnatifida, utrinque patule pilosa vel glabrescentia; radicalia oblonga, dentata vel subpinnatifida, c. 6–15 cm. longa, 1.3–5 cm. lata; caulina oblonga vel lineari-oblonga, basi valde auriculata, dentata, usque c. 12 cm. longa, c. 3 cm. lata. *Pedicelli* glabri (raro sparse pilosi), 7–12 mm. longi; floriferi filiformes; fructiferi apice sensim valde incrassati. *Sepala* glabra, luteo-virescentia, oblonga, 2–2.5 mm. longa, 1–1.5 mm. lata. *Petala* alba vel ochroleuca (?), 4 mm. longa, 1.5–2 mm. lata (ungue c. 1 mm. longo); lamina oblongo-obovata. *Antherae* 1 mm. longae. *Filamenta* 1–2 mm. longa. *Ovarium* pubescens. *Silicula* immatura linguiformis, biconstricta, dense albo-lanata, 13 cm. longa, inferne incrassata et c. 2 mm. lata; ala terminalis 7 mm. longa, 3 mm. lata, apice minus dense lanata, basi cuneata, apice obtusa; loculus c. 2 mm. latus, basi angustatus. *Semina* oblongo-elliptica.

N. IRAQ: Dohuk Gorge, 500 m., on a rocky cliff, 21.4.32, E. R. Guest 2171 (type).

ASIA MINOR: Cilicia [no precise loc.], 1895, W. Siehe 488.

Isatis Guestii differs from *I. eriocarpa* in the larger more dentate leaves, and the less dense tomentum. On comparing fruits of the same age in the two species, it is seen that the silicules of *I. Guestii* are constricted above and below the loculus and have the apex obtuse (as in *I. iberica* Stev.), while in *I. eriocarpa* the silicules are unconstricted and have the apex truncate and retuse (as in *I. minima* Bge.). In Siehe's specimen (No. 488) the fruits are too young to show this character.

Isatis glabrisiliqua Blakelock, sp. nov. (§*Apterolobus*); ab *I. stenocarpa* et *I. pyramidata* Stapf (e descr.) siliculis glabris; ab *I. iberica* Stev. siliculis glabris, bracteis et foliis caulinis superioribus majoribus; et ab *I. minima* Bge. bracteis et foliis majoribus et siliculis glabris apice obtusis differt.

Radix ignota. *Caules* ramosi, supra 40 cm. alti, glabri. *Folia* radicalia ignota; caulina superiora integra vel remote dentata, glabra, costa in pagina inferiore parce patule pilosa excepta, oblonga vel lineari-oblonga, basi valde auriculata, usque 9 cm. longa, 3 cm. lata, in bracteis transeuntia. *Bractee summae* foliis similes sed minores, 2.5–4.5 cm. longae (nec 1–2 cm. longae ut in *I. iberica*). *Pedicelli* glabri, 10–15 mm. longi, floriferi filiformes, fructiferi apice sensim valde incrassati. *Sepala* glabra, luteo-virescentia, oblonga, 2.5 mm. longa, 1 mm. lata. *Petala* ochroleuca vel alba (?), 3.5–4.5 mm. longa, 1.5 mm. lata (ungue 1–2 mm. longo); lamina oblongo-obovata. *Antherae* 1 mm. longae. *Filamenta* 1–2.5 mm. longa. *Ovarium* glabrum. *Silicula* immatura linguiformis, biconstricta, glabra, c. 15 mm. longa, inferne incrassata; ala terminalis 8 mm. longa, 3 mm. lata, basi cuneata, apice obtusa; loculus c. 2 mm. latus, basi parce angustatus. *Semina* oblongo-elliptica.

N. IRAQ: Rowanduz Gorge, 500 m. on ledges on rocky cliffs on the gorge sides, large bushy plant, 20.4.32, E. R. Guest 2144.

* Continued from K.B. 1938, 468.

This plant is distinguished from all the other species of the section *Apterolobus* by the glabrous fruits. The large bracts give the inflorescence a more leafy appearance than in the material of *I. iberica* Stev. in Herb. Kew., but I am doubtful of the value of this character.

***Silene odontopetala* Fenzl. var. *glabrifolia* Blakelock, var. nov. ; a typo differt habitu nano, caule subscapiforme, foliis glabris.**

Planta caespitosa ; caules subscapiformes, 2-12 cm. alti, basin versus glabri, 1-3-flori. *Folia* radicalia lineari-lanceolata, glabra, glaucescentia, majora in petiolum attenuata, laminis 5-18 mm. longis, 1.5-3 mm. latis ; folia caulina linearia, glabra, glaucescentia, sessilia, usque ad 14 mm. longa, 2 mm. lata. *Inflorescentia* glanduloso-pubescent. *Calyx* glanduloso-pubescent, ruber vel rubro-venosus.

N. IRAQ : Chia-i-Mandali, 2500 m., on a cliff, 19.7.32, E. R. Guest 2803 ; Arl Gird Dagh, 3100 m., on the rocky mountain side, fls. white-yellow, 22.7.32, E. R. Guest 2859 (type) ; do., pinkish fls., E. R. Guest 2860.

This variety of the polymorphic *S. odontopetala* is distinguished by having glabrous leaves. Var. *physocalyx* (Ledeb.) Rohrt. (var. *latifolia* Boiss.) was originally described as "pubescens" (Ledebour, Fl. Ross. 1, 321), although in some specimens included by Boissier (Kotschy 295 in Fl. Or. 1, 626) the leaves are glabrous. The wider leaves of var. *physocalyx* separate it from our plant. The flower colour appears to vary from white to yellow to pinkish.

TWO NEW SPECIES AND NEW OR IMPORTANT RECORDS.

W. B. Turrill.

***Saponaria glutinosa* M. Bieb. Flor. Taur. 1, 322 (1808).**

The following specimens from Albania extend the known range of this species : Grown in the Herbarium Ground, Kew, 1938, as K.1713, from seeds collected in Albania : Dardhë, near Korçë, c. 1400 m., 25.8.1935, *Alston and Sandwith*, in flower at Kew 9.6.38 and 23.6.38, in fruit 8.8.38 ; Albania : Dardhë beechwood, 15.8.38, *Ian Hepburn* 167 ; Thrace : Xanthi-Shahin Rd., c. 100 m., 11.6.1930, rocky hill slope *H. G. Todd* 413.

The species was originally described from "in Tauriae montosis, ad sylvarum margines locisque sterilibus. Circa pagum Temirdschii frequens." Simmler [Monogr. Gatt. *Saponaria*, in Denkschr. Math.-Naturwiss. Kl. K. Akad. Wiss. Wien, 85, 467 (35) : 1910] places the species in the section *Kabylia*, § *Glutinosae*, and records it from : Morocco, Algeria, Spain, France, Hungary, Crete, Greece, Thessaly, South Macedonia, South Bulgaria, Serbia, Dalmatia, Crimea, Caucasus, Asia Minor, and Syria. To these have to be added records from North Macedonia, North Bulgaria, the Rodope Massif, and Roumania.

This species is very striking. On all its vegetative parts and on the calyces it bears a dense strongly glandular indumentum yielding an abundant very sticky excretion. This catches and holds

fast numerous insects, including honey bees and bumble bees. Since the flowers emit a strong and sickly sweet odour large numbers of insects visit the plant, which is soon covered with the dead bodies of its victims. It acts as a very efficient "fly-paper" and in good journalese might be termed "the stickiest plant in the world." How it is pollinated is still a mystery. At Kew it has behaved as a biennial.

***Anthyllis aegaea* Turrill, sp. nov., a *A. Barba-jovis* L. foliolis angustioribus, floribus majoribus, legumine majore recedit.**

Frutex ramosissimus, dense foliosus, usque ad 6 dm. altus, ramis lignosis cinereis, novellis dense argenteo-sericeis. *Folia* 1.5-3.5 cm. longa, 7-14-juga, fere sessilia, foliolis linearibus apice subacutis basem versus leviter angustatis 0.6-1.5 cm. longis 1-2 mm. latis in pagina superiore glabris vel leviter pilosis in pagina inferiore dense adpressequae argenteo-sericeis ; rhachis dense argenteo-sericea interdum subpersistens, basi latissima, amplexicaulis ; bractae (vel folia suprema) breviter pinnatae vel 3-7-digitatae, capitula multo brevioribus. *Capitula* terminalia, 5-15-flora, sphaeroidea, 2-3 cm. diam. ; pedicelli 2-3 mm. longi. *Calyx* breviter subcylindricus, abaxialiter leviter ventricosus, dense adpressequae argenteo-sericeus ; tubus 5-6 mm. longus, 2.5-3 mm. diam. ; dentes anguste lineares, leviter inaequales, dente abaxiale 2.5-3 mm. longo, dentibus adaxialibus lateralibusque 1.5-2 mm. longis. *Vexilli* lamina oblongo-obovata apice rotundata 6 mm. longa 5 mm. lata, ungue tenue 6 mm. longo ; alae 11 mm. longae, lamina anguste oblonga 5 mm. longa 1 mm. lata ; carina 10 mm. longa, ungue tenuissimo 6 mm. longo. *Stamina* monadelphia, 9.5 mm. longa, partibus liberis circiter 1.5 mm. longis apicem versus dilatatis deinde abrupte angustatis, antherae post dehiscentiam 0.5 mm. longae. *Ovarium* multiovulatum. *Legumen* immaturum leviter lateraliter compressum, 11 mm. longum (style persistente gracile circiter 4 mm. longo incluso), monospermum.

CYCLADES : Pholégandros, cliffs, 6.6.1938, *P. Davis* 224 (typus in Herb. Kew.).

Amongst the interesting specimens collected by Mr. Peter Davis from the Aegean area is a fine shrubby species of *Anthyllis* which in many ways resembles *A. Barba-jovis* L., but appears to be sufficiently distinct to justify describing as a new species. *A. Barba-jovis* L. (Sp. Pl. 720 : 1753, "Habitat in Helvetia") is known from a wide area in the western Mediterranean Basin, in the south of Europe and in North Africa. In the Balkan Peninsula it is known definitely only from Dalmatia, where it is a not uncommon constituent of the open vegetation of rocky places within range of the coast. The record of M. L. Rodriguez from Albania : Mali Thate 1900 m. (in Bull. Mus. Nat. Hist. Nat. 1923, 618) is very doubtful. Willdenow (Sp. Pl. 3, 1018 : 1803) described a species under the name *A. splendens*, giving the "habitat" as "in Creta." This was reduced by Boissier (Flor. Or. 2, 157 : 1872) to a variety of *A. Barba-jovis*, as var. *pauciflora*. The flowers

are said to number 5 to 10 in a capitulum, the subtending bracts to be longer than the capitula, and the calyces to be ovate. It remains a doubtful plant, which has not since been recorded from Crete.

A. aegaea has probably to be classified near *A. Barba-jovis* on the sum of its characters. The narrower leaflets are on the whole rather more numerous, the larger flowers are less densely arranged and project more from the capitula, and the immature legumes are larger than those of *A. Barba-jovis*. Grisebach (Spic. Flor. Rumel 1, 13-15: 1843) divides the species of the genus dealt with by him into three sections. Boissier (l.c.) accepts these sections (though retaining a name of De Candolle's for one of them) and places *A. Barba-jovis* in Grisebach's section *Oreanthyllis* together with *A. aurea* Vis. and *A. montana* L. Grisebach himself did not (in loc. cit.) deal with *A. Barba-jovis*, and the only species he records for his section *Oreanthyllis* is *A. montana*. Boissier's classification is not entirely satisfactory and it may eventually be desirable to make a new section for *A. Barba-jovis* and *A. aegaea*. Unfortunately all the material of the latter at present available is past full anthesis, the ovaries having been fertilized and being in the condition of young fruits. It is thus impossible, in this species, to check Boissier's character of "ovarium . . . sessile." Grisebach actually says "legumen sessile," and *A. aegaea* has the immature legumes with a short but distinct stalk 1 mm. long, formed by the very abrupt narrowing of the legume proper. In *A. Barba-jovis* a very considerable change in shape occurs in the gynoecium between anthesis and the full ripening of the fruit. There may well be a corresponding change in *A. aegaea*, but this can only be determined when flowering material becomes available.

***Galatella cretica* Gandoger** in 'Flor. Cret. 59 (1916) et Bull. Soc. Bot. Fr. 63, 235 (1916).

Hayek, Prod. flor. penins. balc. 2, 584, footnote (1931), under *Aster*, says "*Galatella cretica* Gandgr. Fl. Cret. 59 incomplete nota est et dubium videtur, num ad hoc genus pertineat." It is, therefore, of particular interest to record two sheets of this species recently received at Kew: Creta or.: in rupestribus siccis ad radices montis Aphendi Kavatsi (Hierapetra), alt. 150 m., 13.9.38, *H. D. Ripley et R. C. Barneby* 1942; in fissuris rupium calcar. pr. Margasà (Siteia), 17.9.38, *H. D. Ripley et R. C. Barneby* 1988. The second sheet has capitula in full flower and at various early stages of development. The species is quite distinct from *Galatella cana* Nees (*Aster canus* W. et K.).

***Acantholimon Echinus* (L.) Boiss.** This species has been recorded in the Balkan Peninsula (and islands), from Crete (including from here the var. *creticum* Boiss.), Greece (including Cephalonia), and Epirus. It has a wide distribution in Asia Minor, eastwards to Armenia and possibly the Caucasus and "Kurdistan." Specimens

have now been received from southern Albania, an extension of its known northern distribution in Europe.

ALBANIA: district of Gjinokastrë (Argirokastron), Mali Lunxheriës range, c. 1540 m., occasionally down to 1400 m., on limestone slopes, plentiful on Strakavec, 11-12.7.33, *Alston and Sandwith* 2182; serpentine rocks between Dardha and Korçë, 17.8.38, *Ian Hepburn* 140.

The distribution of the variations of the species as a whole is interesting. In Europe there is a suggestion of a rather irregular cline. Available Cretan material is entirely dwarf, very compact, with low few-flowered inflorescences, and the leaves glabrous or puberulous. Material from Taygetos shows a mixture of plants, some of which are taxonomically indistinguishable from some Cretan plants, while others link on to the taller, less compact, on the average slightly more- and larger-flowered plants of northern Greece and Albania. Boissier, Diagnoses I, 7, 73 (1846), divided the species into four varieties, placing all the Cretan material known to him in the var. *creticum* Boiss. and all the Greek (and much of the Asia Minor) material in var. *majus* Boiss. Actually this represents a much sharper distinction and a higher degree of correlation of characters than, as we now know, occurs.

The occurrence and distribution of indumentum and of plants with and without indumentum in this species is also worth notice. There is considerable variation in the degree of development of hairs (quantity and length) and in their distribution on inflorescence axis, bracts, and foliage leaves. Puberulous and glabrous or almost glabrous plants occur in Crete and may be found in one collecting (e.g. *F. Lemperg* 591, Hag. Preuma). On the Greek mainland the plants have quite or almost glabrous leaves (except for marginal ciliations). In Asia Minor, also, there is a mixture of variations in indumentum characters, for example, in collections from Tmolus (*Boissier*) and Taurus (*Kotschy*).

***Gentiana ciliata* L.** This well known Central European species has been previously recorded from Macedonia, North Bulgaria, Rodope Massif, Serbia, Montenegro, Bosnia, Hercegovina, Dalmatia, South Croatia, and Istria, in the Balkan Peninsula. A specimen has now been received at Kew collected in ALBANIA: serpentine rocks between Dardha and Korçë 17.8.1938, *Ian Hepburn* 146.

***Cerinth retorta* S. et S. and C. purpurea Vis.**

C. retorta was described (Sibth. et Sm. Prodr. 1, 120: 1806 et Flor. Graec. 2, 60, t.171: 1813) from material stated to have been collected in the Peloponnese and in Caria. The corolla is described as having a yellow tube and a violet limb. The figure in the Flora Graeca shows the tube very pale yellow in the lower part, deeper yellow above the middle and then deep violet, the five expanded lobes being (on the upper surface) paler violet. So far as can be judged from dried material this is the flower colour for all specimens

seen from Crete and Greece (south of Thessaly). Sibthorp (l.c.) records the species from Caria. The occurrence in Asia Minor has not been definitely substantiated. Specimens have also not been seen from South or North Macedonia.

Visiani (in Flora 12, Ergb. 1, 8: 1829) described *Cerinth purpurea* from "in sylvaticis Boraja inter Sibericum et Tragurium," in Dalmatia. In his Flora Dalmatica 2, 242 (1847) he reduces *C. purpurea* to *C. retorta* S. et S. but very accurately describes the corolla (from Dalmatian material) as follows: "Corollae tubus basi angustus albidus, dein sensim crassior violaceus, faucem versus zona ochroleuca acute flexuosa cinctus et deorsum gibbosus, apice subincurvus, limbo violaceo constricto, dentibus brevissimis triangularibus obtusis reflexis pallidis." This description agrees with type material at Kew. The following specimens from Albania also agree with the Dalmatian material: Sarandë (Santi Quaranta), near sea-level, rocky limestone slope, 30.5.1933, *Alston and Sandwith* 1228; Ajyrocaster, 250 m., limestone, rocky ground, 21.4.36, R. V. Pennington 156. *Alston and Sandwith* describe the colours as: leaves white-spotted; bracts blue-violet; corolla blue-violet, but with a narrow yellow band towards the apex. One specimen from Thessaly, Guvelzi, ad rupes, 6.6.1896, *Sintensis* 507, has, so far as can be ascertained from the dried material, the corolla tube blue-violet with a yellow band below the apex and a ring or blotches of blue-violet above this. A sheet from the Troas, Thymbra: in rupibus ad ripas Scamandri, 4.5.1883, *Sintensis* 118, has been named *C. rotorta* by P. Ascherson. The material at Kew of this number has larger and more condensed inflorescences than is usual in the species and the determination remains doubtful. So far as can be seen the corollas have blue-violet tubes with an incomplete yellowish band near the apex.

Authors subsequent to Visiani (e.g. DC. Prodr. 10, 4: 1846; Halácsy, Consp. Flor. Graec. 2, 318: 1902; Hayek, Prod. flor. penins. balcan. 2, 92: 1928) accept the reduction of *C. purpurea* to *C. retorta* with little or no comment and do not even make varieties. No other differences that can be considered other than slight fluctuations can be found between any of the specimens from Thessaly, Albania, and Dalmatia mentioned above and those from Crete and Greece, except that the very unequal sepals may be on the whole shorter and relatively broader at the same stage in the more southern plants. It appears, therefore, that there may here be an interesting single character difference (corolla colour) which has a clear-cut geographical distribution, and is associated with few or no other differences. The mainly yellow tube to the south of a line to be drawn somewhere across northern (Old) Greece and the mainly blue-violet tube to the north of this line. It is much to be desired that further collecting of *Cerinth* be done, especially to the immediate north and north-west of Attica, to determine if the change from *C. retorta* to *C. purpurea* be abrupt or whether there be a cline which

might perhaps be of the nature of a "taxonomic ecotone." Additional material to allow of a comparison of fair samples for details of flower structure (involving dissection of material) and ripe fruits is also needed.

Odontites glutinosa (M. Bieb.) Benth. This species has a general distribution from the central parts of the Balkan Peninsula, eastwards to the Caucasus. In the Balkan Peninsula it is recorded from Greece (Taygetos), North Macedonia, North Bulgaria, Rodope Massif, Serbia, and Montenegro. It has recently been collected in southern Albania and the following specimens from Albania are at Kew: District of Korçë: mountains above Dardhë, 1700-1800 m., locally abundant on bare sandy ground, 25.8.1935 *Alston and Sandwith* 2674. Flowers pale yellow; back of upper lip brownish purple; throat with a few purplish spots. Dardhë (Dardha), 1850 m., limestone rocks, 15.8.1938, *Ian Hepburn* 126.

Colchicum creticum Turrill, sp. nov.; a *C. Cupani* Guss. tuberis tunicis membranaceis castaneis superne haud elongatis distinguitur.

Cormus irregulariter ovoideus, 3-3.5 cm. altus, 2 cm. diametro, tunicis membranaceis in collum haud productis castaneis venis longitudinalibus numerosis conspicuis instructis. *Cataphyllum* vaginatum, tubulosum, superne pallide viride, inferne luteo-album, 4 cm. longum. *Folia* synanthia, 2-3, anguste lanceolato-lineararia vel linearia, acuta, 6-9 cm. longa, usque ad 9 mm. lata, glabra, plus minusve canaliculata, multinervia. *Flores* 1-3, autumnales, parvi, pallide purpureo-rosei; perianthii tubus anguste cylindricus, usque ad 7 cm. longus, 2.5 mm. diametro; limbi segmenta linear-oblongata, apice subacuta vel obtusa interdum leviter cucullata, 1.9 cm. longa, 4 mm. lata, staminis circiter duplo longiora, quinquennervia. *Stamina* 9 mm. longa, filamentis subulatis basem versus incrassatis inferne luteis apicem versus purpureis, antheris versatilibus post dehiscentiam 2 mm. longis atropurpureis. *Carpella* usque ad medium libera, anguste cylindrica, 5 mm. longa; styli 6 mm. longi, apice punctiformes.

CRETE: Onalo Plain, coll. P. Davis, 1938, and grown at St. Vincent, East Grinstead, Sussex.

The only species of *Colchicum* recorded from Crete and maintained as species by recent authorities are *C. latifolium* S. et S. and *C. pusillum* Sieb. The former is so very different from *C. creticum* that it is superfluous to discuss it comparatively. *C. pusillum*, however, is nearer, but differs in having the outer "tunic" of the corms elongated at the apex above the corms proper. It also has 3-4 leaves and is most often said to have yellow anthers. Stefanoff, Monogr. Colchicum 55 (1926) says, however, for *C. pusillum*, "antheris . . . flavis vel fuscis." The average number of leaves for *C. creticum* is uncertain, but is probably two or three.

XXII—CONTRIBUTIONS TO THE FLORA OF TROPICAL AMERICA: XLI.*

PLANTAE HINTONIANAE: XI.*

THE GENUS DALEA JUSS.: NEW COMBINATIONS AND NOTES.
A. A. BULLOCK.

The generic name *Dalea* Juss. (1789) is a later homonym of *Dalea* Mill. (1754), but has now been placed on the list of *nomina conservanda*. But for its conservation the correct name for the genus would be *Parosela* Cav. (1802), which was adopted by Rose and by Rydberg, who have described most of the species discovered during the last forty years. These consequently require new binary names under *Dalea* Juss.

In the following list some of them are supplied, in order that the material of this genus collected in Mexico by Mr. G. B. Hinton may be named in accordance with the International Rules. Some new records, based on Mr. Hinton's collections, are also included, together with some necessary new binomials not directly concerned with his plants.

Dalea abietifolia (Rose ex Rydb.) Bullock comb. nov.—*Parosela abietifolia* Rose ex Rydb. in N. Amer. Fl. **24**, 92 (1920); Standl. in Contrib. U.S. Nat. Herb. **23**, 462 (1922).

A very distinct species, known only from Etzatlán, Jalisco, where it has been collected twice (Pringle 8774 and Barnes and Land 295).

Dalea acutifolia DC. in DC. Prodr. **2**, 245 (1825).—*Parosela acutifolia* (DC.) Rose in Bot. Gaz. **40**, 144 (1905); Rydb. l.c. 86; Standl. l.c. 460.

STATE OF MEXICO. District of Temascaltepec: Bejucos, 610 m., Oct. 1932 (fl.), Hinton 2001; Chorrera, 1230 m., Nov. 1932 (fl.) Hinton 2636, "1 stalk 3 m. high"; Palmar, 650 m., on the llano, Nov. 1933 (fl., fr.), Hinton 5184, "shrub 1.5 m. [high]"; Tejupilco, 1400 m., Dec. 1933 (fr.), Hinton 5292, "1 m. high."

STATE OF MICHOACAN. Mal Paso-Chumbitaro, District of Huetamo, on a hill, Nov. 1934 (fl., fr.), Hinton 6968, "stalks 1.5 m." Previously known only from Morelos and Guerrero.

Dalea alamosana (Rose ex Rydb.) Bullock, comb. nov.—*Parosela alamosana* Rose ex Rydb. l.c. 63 (1919).

Represented at Kew by a sheet of the type collection (Palmer 711 of 1890) from Alamos, State of Sonora. It has the general appearance of *D. calycosa* A. Gray, but differs strikingly in its smaller, unequally toothed calyx.

Dalea Barberi (Rose ex Rydb.) Bullock, comb. nov.—*Parosela Barberi* Rose ex Rydb. l.c. 74 (1920).

Represented at Kew by a sheet of the type collection (Townsend and Barber 275) from the Sierra Madre near Colonia Garcia, Chihuahua.

Dalea Brandegei (Rose) Bullock, comb. nov.—*D. ramosissima* Benth. Bot. Voy. Sulph. **11** (1844), non Martens et Gal. (1843).—*Parosela ramosissima* (Benth.) A. Heller, Cat. N. Amer. Pl. ed. II. **6** (1900).—*P. Brandegei* Rose in Contrib. U.S. Nat. Herb. **10**, 106 (1906); Rydb. l.c. 107; Standl. l.c. 458.

The original material of this species consists of four sheets from Magdalena Bay, Baja California (*Hinds* in herb. Benth., *Hinds* in herb. Hook., and *Hinds and Barclay* in herb. Hook., the first consisting of two sheets); these were collected about 1841, and only one other specimen has reached Kew since then. This is *Mason* 1896, collected at the same locality in May, 1925.

Dalea carnescens (Rydb.) Bullock, comb. nov.—*Dalea rubescens* S. Wats. in Proc. Amer. Acad. **20**, 360 (1885), non S. Wats. (1882).—*Parosela rubescens* A. Nels. in Coult. et Nels. Man. **298** (1909), non Vail (1894).—*P. carnescens* Rydb. Fl. Rocky Mts. **483** (1917), et in N. Amer. Fl. **24**, 99 (1920).

Rydberg selected a Chihuahua specimen (Pringle 196) as the type of this species, but it is known also from southern Colorado to Arizona, and from Coahuila.

Dalea caudata (Rydb.) Bullock, comb. nov.—*Parosela caudata* Rydb. in N. Amer. Fl. **24**, 112 (1920); Standl. l.c. 456.

This species was, until recently, unrepresented at Kew. It is apparently confined to the State of San Luis Potosi, and the Kew sheet is from Charcas, where it was collected in 1934 by Dr. C. L. Lundell; it was identified by Dr. P. C. Standley.

Dalea citrina (Rydb.) Bullock, comb. nov.—*Parosela citrina* Rydb. l.c. 81.

STATE OF MEXICO. Ixtapan, District of Temascaltepec, 1000 m., on a hill, Oct. 1932 (fl.) Hinton 2257.

STATE OF MICHOACAN. Tacupa, District of Huetamo, "in ripa fluminis Balsas" April 1935 (fr.), Hinton 7580.

STATE OF GUERRERO. District of Mina: Placeres, 340 m., on the llano, Sept. 1936 (fl., fr.), Hinton 9530, "up to 1 m. high, flower blue"; Manchon, on the llano, Sept. 1936 (fl.) Hinton 9586, "1 m. [high], flower blue."

This is also represented at Kew by a sheet of the type collection (Pringle 8860), from near Tuxpan, Jalisco.

Dalea delicata (Rose) Greenm. in Publ. Field Mus. Nat. Hist. Chicago; Bot. Ser. **2**, 331 (1912).—*Marina gracilis* Liebm. in Vidensk. Meddel. **1853**, 103 (1854), nec *Dalea gracilis* Kunth, Mimoses, **166**, t. 48 (1824), nec *Parosela gracilis* (Kunth) Rose in Contrib. U.S. Nat. Herb. **10**, 105 (1906).—*Parosela delicata* Rose in Contrib. U.S. Nat. Herb. **8**, 304 (1905); Rydb. l.c. 51 (1919).

* Continued from K.B. 1939, 95.

STATE OF MEXICO. District of Temascaltepec: Calera, 770 m., Aug. 1932 (fl.), *Hinton* 1462; Plaza de Gallos, about 950 m., on a hill, Sept. 1932 (fl.), *Hinton* 1750; Bejucos, 610 m., parasitized by *Cuscuta* sp. (*Hinton* 4776 B), Sept. 1933 (fl.) *Hinton* 4776 A, "flower blue."

STATE OF GUERRERO. Coyuca-Chacamero, District of Coyuca, Sept. 1934 (fl., fr.), *Hinton* 6665. Parotas-Filo, District of Mina, on the llano, Aug. 1936 (fl.), *Hinton* 9409. Iguala (near), 780 m., on dry hills, Sept. 1900 (fl.), *Pringle* 8442.

This is now a very well known species; it is included here merely to draw attention to the preoccupation of its earliest effectively published specific epithet.

Dalea elongata (Rose) Bullock, comb. nov.—*Parosela elongata* Rose in Contrib. U.S. Nat. Herb. **8**, 306 (1905); Rydb. *l.c.* 60.

STATE OF GUERRERO. Coyuca-Tinajas, District of Coyuca, "in ripa fluminis Balsas"; March 1934 (fl.), *Hinton* 5846.

This is a comparatively poor specimen, but it seems to belong to *D. elongata* which was previously unrepresented at Kew.

Dalea gigantea (Rose ex Rydb.) Bullock, comb. nov.—*Parosela gigantea* Rose ex Rydb. *l.c.* 110 (1920); Standl. *l.c.* 457.

STATE OF MEXICO. District of Temascaltepec: Comunidad, 2510 m., in forest of mixed *Pinus* and *Quercus*, July 1932 (fl.), *Hinton* 975, "shrub 2.5 m. high"; Carboneras, 2030 m., on a hill, Sept. 1932 (fl.), *Hinton* 1846.

This is also represented at Kew by a sheet of the type collection (*Pringle* 8848), from Tarascon, Michoacan.

Dalea glabrescens (Rydb.) Bullock, comb. nov.—*Parosela glabrescens* Rydb. *l.c.* 106; Standl. *l.c.* 458.

Known only from San Luis Potosi. It is represented at Kew by a sheet of the type collection, *Parry and Palmer* 150, and a small part of the same collectors' number 149.

Dalea Hemsleyana (Rose) Bullock, comb. nov.—*D. ramosissima* Hemsl. Biol. Centr.-Amer. Bot. **1**, 245 (1880), nec Martens et Gal. (1843), nec Benth. (1844).—*Parosela Hemsleyana* Rose in Contrib. U.S. Nat. Herb. **10**, 104 (1906); Rydb. *l.c.* 86; Standl. *l.c.* 463.

A very distinct-looking species, represented at Kew by two sheets (*Parry and Palmer* 154, and *Schaffner* 285) from San Luis Potosi.

Dalea hospes (Rose) Bullock, comb. nov.—*Parosela hospes* Rose in Contrib. U.S. Nat. Herb. **12**, 272 (1909); Rydb. *l.c.* 85.

Represented at Kew by three sheets from Nuevo Leon (including a sheet of the type collection),—*Palmer* (1880) 210, *Pringle* 1904 and *Pringle* 11417.

Dalea leporina (Ait.) Bullock, comb. nov.—*Psoralea leporina* Ait. Hort. Kew. **3**, 81 (1789).—*Parosela leporina* (Ait.) Rydb. *l.c.* 78,

cum syn.—*Dalea alopecuroides* Hemsl. Biol. Centr.-Amer. Bot. **1**, 237 (1880), non Willd. (1803). *D. leporina* Ait. ex Hemsl. *l.c.* in syn.

STATE OF MEXICO. District of Temascaltepec: Cajones, 2480 m., Sept. 1932 (fl.), *Hinton* 1686, "herb 1.5 m. high"; Mesón Viejo, 2830 m., on a hill, near oaks, Oct. 1932 (fl.), *Hinton* 1888; San Lucas, May 1935 (fr.), *Hinton* 7786.

Dalea minutiflora (Rose) Bullock, comb. nov.—*Parosela minutiflora* Rose in Contrib. U.S. Nat. Herb. **8**, 306 (1905); Rydb. *l.c.* 58 (1919).

Represented at Kew by a sheet of the type collection, *Pringle* 8721, from Yautepec, State of Morelos.

Dalea oaxacana (Rose) Bullock, comb. nov.—*Parosela oaxacana* Rose in Contrib. U.S. Nat. Herb. **10**, 104 (1906); Rydb. *l.c.* 101 (1920); Standl. *l.c.* 459.

Represented at Kew by a sheet of the type collection (*Pringle* 4961), from Sierra de San Felipe, Oaxaca.

Dalea Painteri (Rose) Bullock, comb. nov.—*Parosela Painteri* Rose in Contrib. U.S. Nat. Herb. **10**, 105 (1906); Rydb. *l.c.* 111; Standl. *l.c.* 456.

Represented at Kew by a sheet of the type collection (*Pringle* 10027), from the hills near San Juan del Rio in the State of Queretaro.

Dalea peninsularis (Rose) Bullock, comb. nov.—*Parosela peninsularis* Rose in Contrib. U.S. Nat. Herb. **8**, 304 (1905).—*P. peninsularis* Rose; Rydb. *l.c.* 53 (1919).—*Dalea canescens* Benth. Bot. Voy. Sulph. **12** (1844), non Martens et Gal (1843).

BAJA CALIFORNIA. Magdalena Bay (fl.), *Barclay*. Topo, Oct. 1882 (fl.), *Orcutt* 637.

Dalea pilifera (Rydb.) Bullock, comb. nov.—*Parosela pilifera* Rydb. *l.c.* 75 (1920).

STATE OF MEXICO. Comunidad, District of Temascaltepec, 2440 m., on the llano, Oct. 1933 (fl.), *Hinton* 4880, "flower purple."

The type of this species (*Purpus* 1741, from Pachuca, Hidalgo) is not represented at Kew. The above identification is based on *Rose and Painter* 7143, 7220 and 7850, all of which were distributed from the U.S. National Herbarium as *Parosela pilifera* Rydb.

Dalea pilosissima (Rydb.) Bullock, comb. nov.—*Parosela pilosissima* Rydb. *l.c.* 91; Standl. *l.c.* 461.

A very distinct species, probably forming low cushions, and bearing short capituliform racemes on almost leafless simple or sparingly branched peduncles. It is represented at Kew by a sheet of the type collection, *Palmer* (1896) 880, from Durango.

Dalea polycephala (Rydb.) Bullock, comb. nov.—*Parosela polycephala* Rydb. *l.c.* 90; Standl. *l.c.* 464.—*Dalea polycephala* Benth. ex Hemsl. Biol. Centr.-Amer. **1**, 244 (1880), nomen nudum; Rydb. *l.c.* in syn.; Standl. *l.c.* in syn.

A species apparently confined to San Luis Potosi. *Hartmann* 634, from Chihuahua, distributed as "*Dalea polycephala* Benth." certainly belongs to some other species.

***Dalea roseiflora* (Rydb.) Riley** in Kew Bull. 1923, 337.—*Parosela roseiflora* Rydb. l.c. 105; Standl. l.c. 457.

STATE OF MEXICO. Nanchititla, District of Temascaltepec, in oak woods, Dec. 1933 (fl.), *Hinton* 5340.

This species was known previously only from the type collection (*Seemann* s.n. in Gray Herb., dupl. in Kew Herb.) from the Sierra Madre. *Rydb.* (l.c.) places the *locus classicus* in Sinaloa or Durango, but Mr. Hinton's rediscovery of the species indicates that it may be further south.

***Dalea Saffordii* (Rose) Bullock**, comb. nov.—*Parosela Saffordii* Rose in Contrib. U.S. Nat. Herb. 12, 273 (1909); *Rydb.* l.c. 107; Standl. l.c. 457.

Represented at Kew by a small portion of the type collection (*Palmer* (1880) 208), from the Sierra Madre. The *locus classicus* is said to be in Coahuila, and the species occurs in that State and in Durango.

***Dalea spiciformis* (Rose) Bullock**, comb. nov.—*Parosela spiciformis* Rose in Contrib. U.S. Nat. Herb. 8, 303 (1905); *Rydb.* l.c. 51 (1919).

STATE OF MEXICO. District of Temascaltepec; Plaza de Gallos, about 950 m., in water, Sept. 1932 (fl.), *Hinton* 1755; Rincón del Carmen, 1340 m., Oct. 1932 (fl.), *Hinton* 1938.

The name *Dalea spiciformis* Rose appeared on the label of *Pringle* 10059, collected on the hills near Los Amates Station, Guerrero in September, 1905. The label also bears the legend "type locality." The *locus classicus*, however, is Iguala, and the type collection, *Pringle* 9255, is not at Kew. Mr. Hinton's specimens represent an extension of range.

***Dalea submontana* (Rose) Bullock**, comb. nov.—*Parosela submontana* Rose in Contrib. U.S. Nat. Herb. 8, 306 (1905); *Rydb.* l.c. 59 (1919); Standl. l.c. 454.

STATE OF MEXICO. District of Temascaltepec: Rincón, Dec. 1931 (fl.), *Hinton* 124; Temascaltepec, Nov. 1932 (fl.), *Hinton* 2354, "plant 1.5 m. high"; Rincón del Carmen, 1340 m., in woods, Nov. 1932 (fl.), *Hinton* 2692, "2 m. high"; Cajones, in the lower oak belt, Nov. 1935 (fl.), *Hinton* 8658.

***Dalea tehuacana* (Rydb.) Bullock**, comb. nov.—*Parosela tehuacana* Rydb. l.c. 113 (1920); Standl. l.c. 455.

STATE OF MEXICO. Villa Neda, District of Temascaltepec, March 1935 (fl., fr.), *Hinton* 7564, "shrub 1.5 m. high."

No other material of this species has been seen. Mr. Hinton's specimen, however, agrees well with *Rydb.*'s description.

***Dalea unifoliolata* Robins. et Greenm.** in Proc. Amer. Acad. 29, 383 (1894).—*Parosela unifoliolata* (Robins. et Greenm.) Rose in Contrib. U.S. Nat. Herb. 8, 303 (1905); *Rydb.* l.c. 60 (1919).

STATE OF GUERRERO. Coyuca, "in ripa fluminis Balsas," May 1934 (fl.), *Hinton* 6035. Zihuagio, District of Mina, in oak woods, Oct. 1936 (fl.), *Hinton* 9719.

This species was previously represented at Kew by a sheet of the type collection from Tegula, State of Jalisco (*Pringle* 4585). It is one of the most easily recognizable species of *Dalea*, on account of its rounded, unifoliolate leaves.

XXIII—NOTES ON CAREX: VII.* E. NELMES.

C. ATRATA L. AND ITS ALLIES.

Carex atrata L., as interpreted by *Kükenthal* in Engler's Pflanzenreich, 1909, 396-98, is a subarctic and alpine plant of Europe, Asia and America, with its southern limits in the Pyrenees and the Balkan mountains, the high lands of Armenia and Turkestan, and the Rocky Mountain States of America.

Kükenthal attaches to *C. atrata* three subspecies and a considerable number of varieties and forms. Some of these are discussed in this Note.

C. atrata L. var. *aterrima* (Hoppe) *Kükenth.*

This plant was described by Hoppe in 1815 as a species from the "höchsten Alpen von Salzburg und Kärnthen." It appears to form a link between *C. atrata* itself and certain Asiatic representatives, including one from India and two from China which are described farther on in this paper.

Kreczetowicz, the leading Russian specialist in the *Cyperaceae*, has described three new relatives of *C. aterrima* Hoppe in his recently published account of the family in the Flora URSS, 3 (1935). One of these is *C. perfusca*, with which its author associates some of the Siberian plants included by *Kükenthal* under var. *aterrima*. Another is *C. aequivoca*, a Caucasian plant with smaller spikes and utricles than the others. The third, *C. decaulescens*, from western Thian Shan, is placed near *C. caucasica* Stev., a species discussed below. *Kükenthal*'s Caucasian citations under var. *aterrima* had already been abstracted into *C. Medwedii* Lesk. in Journ. Bot. Russ. 16, 70 (1931).

This modern treatment of these *Atratae*, therefore, appears to restrict *C. aterrima* Hoppe to Europe.

C. atrata L. subsp. *B. atratiformis* Britton.

Kükenthal's first subspecies under *C. atrata* is Britton's *C. atratiformis*, a plant of the eastern American States. Mackenzie, in his recent revision of the North American Carices (North American Flora, 18, 372, 1931-35) gives it specific rank.

* Continued from K.B. 1939, 159.

C. atrata L. subsp. *C. caucasica* Stev.

In this second subspecies Kükenthal includes plants from the Caucasus, the Urals, Thian Shan, Turkestan and Kashmir.

I have not seen the type specimen of *C. caucasica*, but two sheets of recent gatherings in the Caucasus, determined as that species by Kreczetowicz, have recently come to Kew from Leningrad. These plants are specifically distinct from those collected by C. B. Clarke in Kashmir and cited by Kükenthal. The utricles of *C. caucasica* have a shining, punctulate surface, and a very short but distinctly bidentate beak. Those of the Kashmir plant have an opaque, papillose surface, and a longer, truncate, scarcely bidentate beak. This plant appears to me to have a closer affinity with *C. atrata* than with either *C. atrata* or *C. caucasica*.

Carex nigerrima Nelm., sp. nov.; affinis *C. atterratae* Hoppe, sed culmis longioribus, foliis angustioribus, squamis angustioribus magis acuminatis, utriculis obovatis stramineis, rostratis brevioribus differt.

Rhizoma breviter stoloniferum. *Culmi* 60-70 cm. longi, superne scabridi, triquetri, inferne foliati, basi vaginis aphyllis purpureo-brunneis circumdati. *Folia* 3-4 mm. lata, culmus breviora, plana, attenuata. *Spicae* 5, suprema gynaeceandra, ceterae plerumque omnino femineae, interdum basi breviter ramosae, subfastigiatæ, cylindricæ, 1.5-2.5 cm. longae, crassae, densiflorae, cernuae, superiores subsessiles vel breviter pedunculatae, inferiores longe vel longissime pedunculatae, angulis valde scabridis. *Bracteae* inferiores foliaceae, inflorescentiam multo superantes, superiores breves et squamiformes, vix vaginantes. *Squamae* femineae oblongo-lanceolatae, carinatae, acuminatae, inferne atropurpureo-rubrae marginibus albo-hyalinae, superne atropurpureae. *Utriculi* inferiores squamis breviores, superiores squamas superantes, plerumque multo latiores, circiter 4 mm. longi, 2-2.5 mm. lati, obovati, tenuiter plurinerves, dense papilloso, anguste marginati, subcompressi-trigoni, straminei, vix stipitati, in rostrum brevissimum teres atropurpureum ore truncatum integrum abrupte contracti. *Stigmata* 3.

INDIA. Kashmir: Barzil, 3200 m., 28 July 1876, Clarke 20,722 (type); Sind Valley, 3000-3500 m., August 1895, Ward ex Herb. Duthie 17,825.

C. atrata L. subsp. *C. pullata* (Boott) Kükenth.

The third of Kükenthal's subspecies is based on *C. atrata* var. *pullata* Boott, and he places in it plants from the Himalayas, eastern Tibet, and China. Ohwi (Cyperaceae japonicae, 1906) records it from Formosa.

There is no doubt in my mind that the Himalayan plants cited by Kükenthal are specifically distinct from other members of the *Atratae*. They were raised to specific rank by C. B. Clarke in 1898 as *C. Duthiei*.

Some of the more eastern plants may belong to *Carex Schneideri*, a new species described below. The utricles of this species have no trace of the dark colouring which tinges those of *C. Duthiei*. They also differ in being very distinctly beaked, and their peduncled spikes contrast strongly with the subsessile contiguous ones of the other plant.

One of my citations under *C. Schneideri* is Pratt 556, the Kew and Herb. Boiss. representatives of which Kükenthal places under his subsp. *pullata*, var. *glacialis* (Boott) (he points out that the Pratt 556 at Paris is *C. melanantha* var. *Moorcroftii*, and the one at Brit. Mus. *C. atro-fusca*).

Pratt's plant at Kew is a fairly robust one of about 80 cm. in height; very different from *C. atrata* var. *glacialis* Boott, which Kükenthal himself describes as "Culmus humilis. Spiculae abbreviatae." C. B. Clarke wrote up Pratt's plant as "*C. Duthiei* C. B. Cl. forma 'pedunculosa'."

Carex Schneideri Nelm., sp. nov.; affinis *C. Duthiei* C. B. Cl., sed spicis majoribus pluribus et longius pedunculatis, utriculis pallidioribus et rostratis differt.

Culmi 60-80 cm. longi, subvalidi, subrigidi, angulis scabridis, foliati, triquetri, basi vaginis aphyllis nitidis atropurpureis circumdati. *Folia* 5-6 mm. lata, culmis breviora, plana, attenuata. *Spicae* 4-6, fastigiatæ, cylindricæ, cernuae, 2-3 cm. longae, densiflorae, superiores 3-4 gynaeceandrae, inferiores femineae, superiores breviter inferiores longe vel longissime pedunculatae, pedunculis scabridis. *Bracteae* inferiores subfoliaceae, inflorescentiam aequantes vel superantes, superiores breves et squamiformes, vix vaginantes. *Squamae* atropurpureae, anguste oblongo-lanceolatae, acuminatae, acumine pallido. *Utriculi* squamis aequilongi vel eo paullo breviores et latiores, 3-4 mm. longi, anguste oblongo-elliptici, subinflato-trigoni, indistincte plurinerves, punctulati, glabri, clare pallide flavo-virides, vix stipitati, in rostrum breve teres laeve atropurpureum ore integrum subabrupte desinentes. *Stigmata* 3.

CHINA. Yunnan: near Lichiang, in alpine meadows of the snow mountains, c. 3800 m., 6 August 1914, Schneider 2138 (type).

Szechwan: west Szechwan and Tibetan Frontier, chiefly near Tachienlu, at 2700-4050 m., Pratt 556; Sungpan Hsien, in thickets, 8 August 1928, Fang 4053; north Szechwan, Dongrergo, in an alpine meadow, 7300-7700 m., 20 July 1922, H. Smith 3818.

Finally is described a species from China which, though having close affinities with the *Atratae* discussed in this paper, bears also some relationship to *C. nivalis* Boott and *C. atro-fusca* Schkuhr, species belonging to the Section *Frigidae* Fries.

Carex kansuensis Nelm., sp. nov.; affinis *C. atterratae* Hoppe, sed culmis longioribus, squamis atropurpureis et acuminatis, utriculorum rostris oblique sectis et inaequaliter bilobis differt.

Rhizoma caespitosum. Culmi 70–108 cm. longi, validi, superne scaberuli et curvati, triquetri, inferne foliati, basi vaginis aphyllis purpureo-brunneis circumdati. Folia 5–7 mm. lata, culmis multo breviora, plana, rigidula, longe attenuata. Spicae 4–6, superiores gynaeandreae, inferiores femineae, subfastigiatae, oblongo-cylindricae, 1.5–2.5 cm. longae, crassae, densiflorae, cernuae, superiores subsessiles vel breviter pedunculatae, inferiores longius pedunculatae, pedunculis laevibus. Bractae inferiores breviter subfoliaceae, culmis breviores, superiores breves et squamiformes, vix vaginantes. Squamae femineae anguste oblongo-lanceolatae, atro-purpureae, marginibus anguste albo-hyalinae, tenuiter carinatae, acuminatae, acumine pallido; masculae marginibus late albo-hyalinae. Utriculi squamis plerumque aequilongi sed iis multo latiores, 4 mm. longi, circa 2.5 mm. lati, late ovato-elliptici vel suborbiculati, valde compressi, leviter concavi, tenuiter membranacei, albido-ferruginei, enerves, superne dense papilloso marginibusque parce ciliata, vix stipitati, in rostrum breve tenue atro-purpureum oblique sectum et inaequaliter bilobum ore albo-hyalinum acutum abrupte contracti. Nux oblongo-elliptica vel oblongo-obovata, obscure trigona, rostrata. Stigmata 3, leviter inclusa.

CHINA. Kansu: western Kansu, 10 July 1918, *Licent* 4232 (type); southwestern Kansu, October 1925, *Rock* 13,726.

Szechwan: northwestern Szechwan, about 50 km. towards the south-west from Merge, in a wet meadow, c. 3500 m., 3 September 1922, *H. Smith* 4312.

XXIV—MISCELLANEOUS NOTES.

Cockayne Memorial Garden.—A memorial garden to the late Dr. Leonard Cockayne, F.R.S., has been created in the Botanic Garden, Christchurch, New Zealand, and was opened by Prof. Carl Skottsberg on 4th November, 1938, in the presence of Mr. H. Kitson, Chairman of the Domains Board, Dr. F. W. Hilgendorf, President of the Canterbury branch of the Royal Society of New Zealand, and a large gathering.

In the course of his address Prof. Skottsberg paid the following very apposite tribute to Cockayne's work:—

"What Cockayne means to New Zealand botany and horticulture cannot, I am afraid, be adequately expressed in few words, because his activities were so manifold and so wide-ranging, but I shall venture to emphasise one side which is, in my opinion, of supreme importance. In these young dominions beyond the seas, created by a marvellously enterprising nation, the greatest modern history has known, science has, in the beginning and as a rule for a considerable length of time, been, as it were, administered from the mother country, and travellers from many lands have come to harvest and have returned laden with Nature's treasures, whereas few have stayed to become faithful servants to the new country. I believe this is a fairly true picture of what happened here. Cockayne was

one of those who shifted the management of New Zealand botany from the old countries over to New Zealand itself, and he became the man who definitely made it a national science. To him, botany did not mean simply listing species and tagging Latin names to them. He went to the living thing; he introduced modern plant ecology; the science of the plant in relation to its surroundings, past and present, into New Zealand, not to become an inanimate copy of other people's views, forced upon a new and strange world, but as an original structure, enriched and flavoured by his masterly mind. This work of his made him famous here and naturally so, and we, who work in other countries, soon came to look upon him not only as the outstanding figure in New Zealand botany, but also as a master whose influence on the progress in ecology was felt far and wide."

Diseases of Fruit and Hops.*—In 1920 Mr. P. J. Fryer published a work for practical growers entitled "Insect Pests and Fungus Diseases of Fruit and Hops." Since then new diseases have been recognized and much additional knowledge has accumulated. Dr. A. M. Massee recently dealt with insect troubles in "The Pests of Fruit and Hops" and now Dr. Wormald has produced a valuable companion volume in which the diseases caused by fungi, bacteria, and viruses are described, as well as so-called "physiological" disorders. With these two works the grower is well equipped with means to identify the pests and diseases which he may encounter and with information as to how to deal with them.

The various diseases are grouped according to host-plants, and then under the various organs attacked, as roots, stems, leaves, flowers and fruit. In each of these categories the arrangement of the diseases described appears to follow no particular order. There are two introductory chapters, the first giving a brief but clear exposition of the factors conducive to health and disease in plants, and the second an account of fungicides and their application. A third chapter deals with diseases which affect a number of different plants, such as Armillaria root rot, silver leaf, and coral spot (*Nectria cinnabarina*). Two chapters are devoted to diseases of the apple, one to pear, quince and medlar, two to stone fruits, and four to diseases of soft fruit. Then follows a chapter on diseases of the grape-vine, fig, mulberry and walnut, and one on diseases of hops. Finally there is a short chapter giving notes on some serious diseases not yet recorded in Britain.

Full descriptions of the symptoms of the various diseases are given, and the book is well provided with clear figures from photographs showing characteristic appearances. The photographs of apple and pear scab on the fruit for instance are particularly good and recognisable by even the least experienced of growers.

* "Diseases of Fruit and Hops." By H. Wormald. Crosby Lockwood & Son, Ltd., 1939. Pp. 290, 40 plates uncol., 24 text-figures. Price 17s. 6d. net.

Since the book is intended primarily for growers the author has not given long or detailed accounts of the life-history of the pathogenic fungi concerned. In the case of the more common diseases there is, however, sufficient information, together with occasional text-figures showing spores, etc., to enable the reader who is possessed of a microscope to confirm the diagnosis he may have made from symptoms. In addition the most up-to-date methods of control are explained, and the work will certainly be most useful to students and advisers in horticulture as well to growers. References are given to other important literature for those who wish to read further.

The format is attractive, with clear print and easily picked out headlines. It is obvious that the proof-reading has been done with Dr. Wormald's well-known care and thoroughness, for the only error the writer has found is one which seems to be due to a misconception of the author, since it occurs both on p. 10 and in the index—namely, the spelling of Mr. Carleton Rea's name as Rae.

Both author and publishers are to be congratulated on the appearance of this attractive and useful volume.

E. M. WAKEFIELD.

BULLETIN OF MISCELLANEOUS INFORMATION No. 5 1939 ROYAL BOTANIC GARDENS, KEW

XXV—THE SECRETION OF A BITTER SUBSTANCE IN THE GENUS *INULA*. J. POLITIS (Athens University).

In a previous paper (Politis, 1932) I have reported the presence of glands in *Cynara Scolymus* Pers. (artichoke) and *Cynara Cardunculus* L., which secrete a bitter substance and an essential oil at the same time. The glands arise among the hairs and consist of a round head of 4-5 two-celled stories attached directly to the epidermis. The bitter substance is secreted by the two terminal stories and collects under the cuticle. If treated with osmic acid it turns black, with tincture of alkanna it becomes red, and with Sudan III brick-red. The secretion dissolves completely in acetic acid, alcohol or ether.

Continuing my study of the secretion of bitter substances in the *Compositae*, I have observed the presence of certain glands in *Inula graveolens* Desf., *I. attica* Hal., and *I. viscosa* L., which differ morphologically from those that Tschirsh (1889) and Tunmann (1900) reported from other species of this family.

In *Inula graveolens* the glands occur on the stem, leaves, sepals and pedicels, making the plant sticky, fragrant and bitter. The roots, petals and seeds, as well as the tissues underneath the epidermis, where these glands are lacking, are devoid of the above characteristics.

An examination of material gathered about the middle of June revealed the presence of long, septate hairs on the stem, on both sides of the young and mature leaves and on the outer surface of the bracts. These hairs consist of a few-celled conical support bearing a row of three or four thick-walled cells, of which the terminal one is long and pointed, whilst those nearer to the support are shorter and broader. These thick-walled cells bulge at their points of attachment, and may easily be detached. The cells of the stalk remain short and are filled with protoplasm, whilst those of the hair proper become elongated, thick-walled and filled with air.

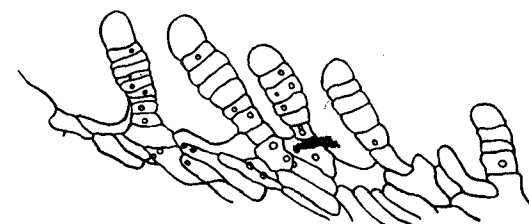


Fig. 1. Young leaf glands of *Inula graveolens*, $\times 380$.

Glands, consisting of a stalk and a head, are situated amongst the hairs. The gland stalks are built up of one or two rows of thin-walled cells, the lower of which are broad and long whilst those close to the head attachment are relatively short. The heads are ellipsoidal in shape and consist of four to six many-celled stories; the terminal secretory story is built up of two or four cells sharply differentiated by the nature of their contents.

The secretion collected under the cuticle of the secreting cells of the mature glands strongly refracts the light; it is colourless to begin with but later becomes yellowish and then brown-yellow. This colour is retained when the secretion spreads on the surface of old leaves after rupture of the cuticle.

The development of the gland starts with the protrusion of an epidermal cell, which, after elongating somewhat, becomes divided transversely into a number of cells. The lower of these constitute the stalk but the upper are destined by enlargement and perpendicular divisions to become the many-celled glandular head, the terminal cell forming the secreting storey by dividing into two by a perpendicular wall, or into four by two perpendicular walls at right angles to each other.

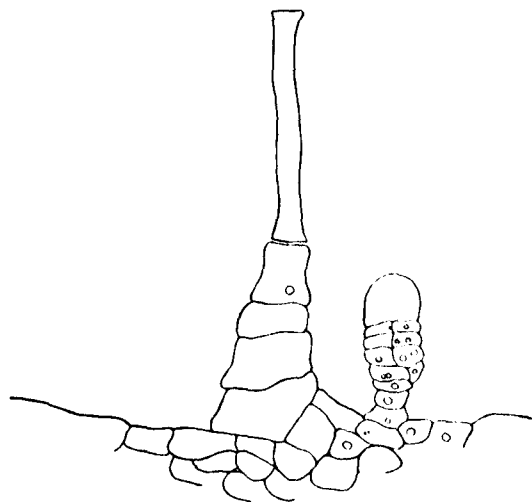


Fig. 2. Leaf gland of *Inula graveolens* situated close to a portion of a hair, $\times 380$.

The glands of the leaf margin have uniseriate stalks; those on the upper and lower surfaces of the leaf are biseriate. Not all of the cells of the gland have the same contents. Thus, besides the usual inclusions, the cells of the stalk contain spherical bodies which strongly refract the light and are devoid of chlorophyll; the secreting cells are also devoid of chlorophyll but contain particles and rods which are darkly stained if treated with iodine solution. The remaining cells of the head contain chlorophyll and spherical bodies.

Microchemical examination shows that the secretion dissolves in alcohol, ether or chloroform; with tincture of alkanna it is coloured red, with Sudan III it becomes brick-red and with osmic acid blackish. These reactions indicate the presence in the gland secretion of an essential oil which is the cause of the characteristic fragrance of the aerial parts of the plant. The addition of concentrated sulphuric acid causes the secretion to become yellow, and the cuticle to rupture quickly. If treated with sulphuric acid the cell sap of the head cells also becomes yellow.

Concentrated hydrochloric acid colours the sap of the head cells yellow, causing them later on to turn brown-yellow and then brown. If 20 per cent. potassium hydroxide is allowed to react on a freehand section under the coverglass, the sap of the gland cells, the epidermis and the hair with its support assume a dark-yellow colour. If an aqueous solution of iron trichloride is used instead, the sap of all the above cells becomes green. The last two reactions with potassium hydroxide and iron trichloride are due to flavonic compounds whose presence can also be determined by applying the reducing method of Shibata (1915) to leaf extracts.

As already stated, I have observed certain spherical bodies in the cells of the gland. Similar bodies are also present in the epidermal and mesophyll cells. These become red with alkanna tincture, brown with osmic acid and brick-red with Sudan III. If the sections are left for 24 hours in a 20 per cent. aqueous solution of potassium hydroxide the bodies remain insoluble, but ether or chloroform dissolves them completely.

In *Inula attica* I have also observed that those parts such as the flowers or young shoots and leaves which are covered with glands and hairs have a bitter taste, which, however, is lacking from tissues such as those of the fleshy receptacle or from beneath those parts of the epidermis on which glands are absent.

Among the hairs, which are 3-4-celled, we find glands with a large head and usually a short stalk. The stalk, however, is sometimes absent and other glands composed of a long stalk and a small ellipsoidal head also occur.

The glands with a short stalk and a large head produce a large amount of secretion which is at first colourless but later turns yellowish and then brown. The glands with a small head and a long neck either produce a very little colourless secretion or none at all. Of the glands found in the ray florets, the greatest number are situated on the outer portion of the rays. On the outer surface of the corolla of the unopened disc florets there is another kind of club-shaped gland consisting of several two-celled stories; the two terminal secreting cells, which are devoid of chlorophyll, are longer and filled with protoplasm.

As in the previous species, *I. attica* not only tastes bitter but is also fragrant; this is due to an essential oil secreted under the cuticle at the same time as the bitter substance.

The glands of the third species I have studied, *I. viscosa*, are similar to those of *Inula graveolens* except that they do not produce a bitter secretion. They are found on the stem, leaves and flowers. An examination of these parts reveals the presence of a great number of hairs with the same structure as those of *I. graveolens* and among them glands which consist of a head attached to the epidermis by means of a one- or two-rowed conical stalk. The head is ellipsoidal in shape and is built up of 5 few-celled stories, the last being the secreting storey and usually consisting of four cells which, unlike the other head cells which have already been described,

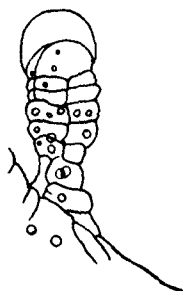


Fig. 3. Leaf gland of *Inula viscosa*, $\times 380$.

do not contain chlorophyll and droplets of oil. The cells of the stalk are also devoid of chlorophyll but contain tiny oil droplets. The secretion from young glands found on young leaves and stems, which is collected under the raised cuticle of the secreting storey, is at first colourless but becomes yellow and finally brown. It dissolves in alcohol, chloroform or ether; it is stained red with Sudan III and in general possesses the microchemical reactions of the essential oils.

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XXVI—PRINCIPLES OF PLANT GEOGRAPHY.*

W. B. TURRILL.

INTRODUCTION.

Plant-life, so far as we know, is limited, with few exceptions, to what is usually termed the surface of the earth, that is, to the narrow layer where atmosphere and lithosphere or atmosphere and hydrosphere meet. Roots and soil organisms penetrate some feet into

* The basis of three lectures given at Westfield College, University of London, February 1939.

the subsoil, the tallest trees grow upwards a few hundred feet, while spores and some bacteria may float at higher levels, but beyond a few thousand feet at most probably never again function. Even in the ocean, holophytic plants are limited to the depth of penetration of sunlight (that is, to the photic region which is said to extend to a depth of 40 m.), and in the lower depths only parasitic or saprophytic bacteria and fungi can live. The biosphere is thus very shallow but it is practically co-extensive with the surface of the earth. To say that the study of the distribution of organisms over this area is biogeography and that of plants is plant geography, phytogeography, or geobotany provides a definition which may leave a wrong impression because of its conciseness. The plant geographer is not content merely with knowing the existing ranges of the different kinds of plants: he wants to know the underlying causes and particularly the history behind the existing distribution. His outlook is as dynamic as that of the student of ecological succession or of taxonomic evolution. Facts have, of course, to be collected, analyzed, classified, and understood statically, i.e., in themselves, before they can be explained (in a scientific sense) but such labour is a preliminary to obtaining an insight into geological succession and even into the processes of evolution, and is not an end in itself.

The aims of the student of plant geography can be stated briefly as:

1. The determination of the geographical distribution of taxonomic units, of which the species is the most generally important.
2. The determination of the geographical distribution of plant communities.
3. The relating of such distributions to the environmental factors, past and present, and to the evolutionary history of the taxonomic unit or plant community.
4. The correlation one with another of all the facts thus obtained and their expression in the form of a description of the flora and vegetation of the earth on a geographical basis.

Complaint may be made that this is a programme of too wide a scope. It is true that a very wide range of facts has to be considered in phytogeographical studies. For many of these, however, the phytogeographer has to rely on specialists. Thus, outside the realm of biology, geological, physiographic, meteorological, and historical effects may be phytogeographical causes. Within the realm of biology, the results of many detailed ecological and genetical researches have to be incorporated and taxonomy is the very foundation of plant geography.

There have been various attempts made to summarize our knowledge of the distribution of the plant-life of the whole earth and some of these will be discussed later. Most phytogeographical research, however, is concerned either with a limited area, larger or smaller, or with a taxonomic unit. The methods used may be concisely stated thus:

1. An examination of the physical features of the area and of their possible influence in extending or limiting distribution.
2. A study of the geology and soils and of the geological history of the area.
3. A consideration of all meteorological data of the area, including palaeometeorology.
4. An analysis of the human history in the area and its effect in modifying the flora and vegetation.
5. A listing of all the species known for the area, with their exact distribution in the area, and the following particulars concerning them: their duration, life-form, flowering period, habitat range, altitudinal range, and distribution outside the area (if any).
6. An investigation of the plant communities, including their floristic composition and their distribution.
7. A summary of what is known regarding the plant succession.
8. A review of the cultivated crops and methods of agriculture, horticulture, and forestry.

When data have been accumulated under these heads it should be possible to tabulate, map, and synthesize the general floristic and vegetational features of the area. The actual range of the species is the best unit to use in this synthesis, though the intermediate steps and possible types of classification are numerous. In the course of grouping the data together it is possible, within limits, to determine the probable lines of migration, the centres of species formation, the relative importance of external factors controlling the flora and vegetation, and the outstanding features of the plant-life and its history, and finally to make a well-established phytogeographical division of the area into regions, provinces, etc. On the applied side such a completed survey is invaluable as a guide to the development of agriculture, horticulture, and forestry.

In practice, the data are not collected in the above, or any other, definite sequence. A system of card-indexing and loose-leaf filing has to be gradually evolved to meet the needs of the research. It is most important to remember that no fact bearing even indirectly on the plant-life must be neglected and that pre-conceived notions of how the species or vegetation ought to behave must be rigidly suppressed. Thus, in filing the preliminary data of distribution the exact localities must be listed on a purely positional basis and not on any classification of the area into supposed biogeographical, climatic, or even physiographic divisions. The geographical ideal is to use the lines of latitude and longitude. This is sometimes possible but unfortunately the shape of some areas makes the land content relative to the water content of divisions so bounded extremely unequal. Again, in a large area stretching a considerable distance in a north to south direction, such divisions decrease significantly in size in a north or south direction from the equator. Another disadvantage of lines of latitude and longitude is that the exact areas they enclose are

difficult to memorize and it is easy to make errors in placing localities in them. Usually some compromise with political divisions, from the size of countries or departments to that of vice-counties, is found most practicable for the preliminary arrangement of the facts.

FACTORS INFLUENCING THE DISTRIBUTION OF PLANTS.

A. *Factors influencing the distribution of plant communities (vegetation).*

The relationship between phytogeography and ecology is so close that no sharp line can be drawn between them. In general terms, one may say that phytogeography is extensive and ecology intensive, though each can use many of the data provided by the other. From our present standpoint we must be prepared to profit by the conclusions of ecologists, whenever they are available, for an area to be studied phytogeographically. A convenient, but never absolute, division of ecology is into autecology, the household affairs of one species, and synecology, the grouping of species into communities. Autecology is naturally a floristic factor to the student of plant geography and we shall consider its importance later. For the moment we are concerned with synecology, *i.e.*, with the study of plant communities.

Ecology is, in its modern form, a young and rapidly growing branch of biology. It follows that not only is our knowledge of plant communities very unequal for different countries but also that the time has not yet arrived when a relatively final nomenclature and classification of communities on a world-wide basis can be accepted by general agreement. Two main tendencies can be recognized in the attempts of ecologists to classify communities: the first involves the use of what may be termed general physiognomy and existing analytical characters, and the second the use of succession as the basis. The former is exemplified by Rübél's work on "*Pflanzengesellschaften der Erde*," and the latter by Clements's "*Plant Succession*."

Rübél, in his presumably final scheme, 1930, has nine primary, twenty-seven secondary, and a very large number of subordinate classes. To the primary and secondary classes Latin names are given, and the primary classes are:—

- Pluvilignosa* (rain-forest and rain-brushwood).
- Laurilignosa* (laurel-leaved forest and laurel-leaved brushwood).
- Durilignosa* (hard-leaved forest and hard-leaved brushwood).
- Ericilignosa* (heath-brushwood).
- Aestilignosa* (summer-green forest and summer-green brushwood).
- Hiemilignosa* (forests and brushwoods green in the rainy, often monsoon, periods).
- Aciculilignosa* (coniferous forests and brushwoods).
- Herbosa* (a very diverse agglomeration of more or less closed communities dominated by non-woody species).

Deserta (used in a wide sense to include all open communities with low water supply).

Phytoplankton is scarcely more than mentioned, but, strangely, is classified under *Deserta*, possibly by error.

Rübel's work is an enlargement, with some modifications, of an earlier publication by Brockmann-Jerosch and Rübel. An excellent critical review and summary of this by A. G. Tansley will be found in *Journ. Ecol.* **1**, 27 (1913).

Clements's scheme of plant succession is now so well known that only a brief reference to it will be necessary. It is based on development, compared closely with the development of an organism, and thus takes up a dynamic standpoint resulting in some respects in a classification very different from that based on a single static character, such as physiognomy, or a small number of such characters. The vegetation is divided into "climax" and "seral" units, a climax community itself the adult organism is called the "formation," while the entire successional series leading up to a climax is termed a "sere." A very adequate summary of Clements's book "Plant Succession" is given by Tansley in *Journ. Ecol.* **4**, 198 (1916).

It is interesting to note that since both physiognomy, in Rübel's sense, and the climax, in Clements's sense, depend on the basic cause of climate, there is a considerable amount of agreement in the actual delimitation of certain communities, especially those dominated by woody vegetation. The greatest disagreement is in the classification of herbaceous communities relative to one another and to the woody communities.

The classification adopted by the plant-geographer must partly depend on the amount and nature of ecological research done in the area with which he is concerned. For many areas, he must, at present, use more than one system adapted to his own needs, but there is an increasing tendency to place emphasis on succession whenever possible, without, however, accepting Clements's extreme theoretical conception of vegetation being an "organism."

There have been, perhaps, more disputes about the definition and classification of habitats than about most other matters of ecological concern. The concept of habitat is critically and analytically examined by Yapp in *Journ. Ecol.* **10**, 1 (1922). Here, again, the phytogeographer must follow the ecologist and, for any given area, must base the scheme he uses for habitat classification on results obtained by detailed research, to the extent that this is available. He can, however, sometimes simplify or otherwise modify a purely ecological classification to suit his own needs. Often he has to combine the results of several authors, and such a synthesis may be no easy task.

In the broader view taken by the phytogeographer, as compared with the more intensive research of the ecologist, climatic factors are more important than edaphic or biotic. The zonation of the earth as

given in elementary text-books of geography into tropical, temperate, and frigid zones, is based on temperature, and, since it ignores the precipitation factor, is only roughly correlated with the distribution of plant communities. The phytogeographer soon realizes that no factor acts independently in controlling the distribution of either communities or species. Brockmann-Jerosch (*Engl. Bot. Jahrb.* **49**, Beibl. 109, 19: 1923), has emphasized the importance of considering all climatic factors as forming a "Klimacharakter." I have however, pointed out (Turrill, 1931), that it is necessary to extend this conception of interaction of factors to include not only all climatic factors, but also edaphic, biotic, and historic factors. Moreover, Liebig's law of the minimum for plant growth can be extended to survival or flourishing in an ecological or phytogeographical sense. Yet plant distribution depends more on temperature and precipitation than on all other factors of the environmental group (i.e., factors external to the plant itself), and more so if one includes the relict effects of past climates and the effects of climate on soil development.

To illustrate the predominating influence of climate on the distribution of plant communities we may consider their distribution in the Balkan Peninsula. In this area two main climatic regions meet. These are the Mediterranean and the Central European. The former has relatively hot dry summers and maximum rainfall in a mild winter; the latter has much colder winters and rainfall distributed with greater equality through all the seasons. It is particularly the seasonal distribution of rainfall, i.e., its distribution relative to mean monthly temperatures which is so striking and which obviously has a predominant effect on the distribution of both communities and species. In the Mediterranean Region the summer is too dry for the full development of perennial summer "soft-leaved" plants, unless these have special internal adaptations or are limited to very local and specifically favourable habitats. Drought is the limiting factor and, in general, only xerophytic types of vegetation can be summer-green. Hence the predominance in the climax communities of evergreen sclerophylls such as *Pinus halepensis*, *P. Pinea*, *Quercus Ilex*, *Q. coccifera*, *Arbutus Unedo*, *A. Andrachne*, *Myrtus communis*, *Olea europaea* var. *oleaster*, *Rhamnus Alaternus*, *Smilax aspera*, *Calycotome* spp., *Juniperus Oxycedrus*, etc. (see Turrill 1929 and 1937). In the seral communities similarly the constituent plants are xeromorphic, wilt-surviving, or drought-avoiding. Thus many species have dense hairy or waxy coverings, exhale ethereal oils, or have small and often rolled leaves, or they limit their vegetative period to coincide with the rains and are geophytic in the summer. The lush vegetative growth and abundant florifery of the macchie in the spring (with a secondary development in the autumn) contrasts with its period of relative rest from July to September inclusive. On the other hand, in the Central European

Botanical Region it is winter cold, and not drought at any season, that is the limiting factor—the main sieve that determines what shall naturally survive. We find therefore in this region that deciduous forests are the normal climax and that the plants associated with the summer-green trees and also those of the seral communities are for the most part mesophytes. Vegetation commences its annual growth in the spring and usually continues to develop till the lowering of night temperatures causes a slowing down. There are, of course, local (especially altitudinal) or temporal exceptions to these generalizations but in the long run they have little effect on the characteristic vegetational types.

It is interesting to refer here to another phenomenon which shows the influence of climate on the distribution of vegetational types. Reference has been made to the Mediterranean climate and its close correlation with marked types of vegetation. It is significant that wherever a similar type of climate occurs, in any part of the world, plant communities with a similar physiognomy, and sometimes with the same genera, also form the vegetational climaxes. Thus, sclerophyllous forests and brushwoods occur in the Mediterranean Basin (macchie), in California (broad-sclerophyll forest and chaparral), in Chile, in south-west Australia, and in south-west Africa. At Kew, some years ago, a rather striking exhibit illustrating these communities was prepared and an account of it will be found in *Journ. Ecol.* **16**, 178 (1928). The closest comparison can be drawn between the sclerophyllous woods and the macchie of the Mediterranean Basin and the corresponding communities in California (see Cooper 1922). It is particularly interesting that in both areas species of *Quercus*, *Myrtus*, *Arbutus*, *Rhamnus*, and *Cercis* occur, while *Laurus nobilis* L. of the Mediterranean is represented in California by *Umbellularia californica* Nutt. of the same family. There are important floristic differences as well as these resemblances but in what may be termed "ecological characters" the communities are strikingly alike.

The distribution of tropical rain-forests, of coniferous woods, of desert communities, of tundra, of steppes, and of many other types of vegetation could similarly be shown to be dependent in the main on climate. Yet edaphic, biotic, and what may be termed historic factors, can, as has been well shown by Salisbury (1926), modify and cause variations in both climax and seral communities within one climatic region. The converse also holds, and, for example, under different climates we may find in Europe certain plant communities at their north-western limits definitely calcicolous, while at their south-eastern limits they are either indifferent to calcareous and non-calcareous soils or prefer the non-calcareous.

It is desirable here to emphasize one important group of factors, loosely called the historic, which are frequently ignored by ecologists. We saw above that in parts of the world widely separated in latitude and longitude similar climatic conditions, in our example

that of the Mediterranean type of climate, control the development of types of vegetation having a generally similar facies. These sometimes show a limited number of floristic resemblances, but for the most part the species composing the communities are different in the different areas. The floristic difference between two such communities gives a measure of the historic difference between them. Species can only be selected by climate, or by any other factor, if the species are there to be selected and from this standpoint the composition and distribution of communities depends on the distribution of species for which, as we shall see later, the historic factors are of great importance.

Zonation on a small scale has been much studied ecologically. One can see examples at the margins of ponds, lakes, and rivers, on the sea-coast, at the edge of woodlands, and so on. On a large scale there are climatic zonations, and usually on an intermediate scale there is altitudinal zonation. Altitude is neither a simple factor nor a factor in itself. With increasing altitude one finds such factors as temperature, precipitation, insolation, and exposure change and it is changes in the climatic factors especially which can be correlated with changes in the vegetation. We find, therefore, lowland, hill, and high mountain climaxes and seres, arranged in a series of belts, narrow where the altitude increases rapidly and broader where the contours are wider apart. There are mountain masses where altitudinal zonation is not only very clear and obvious but relatively regular, though most often it is irregular because of the interference of such factors as great physiographic irregularity, great variations in rock outcrop, natural denudation, and interference by man. For temperate and tropical regions the general sequence of plant communities is from broad-leaved climax forests of the lowlands, through various forest belts of the hill and lower high mountain zones, to high mountain brushwood, to high mountain herbaceous communities, and finally to permanent ice and snow. Such a sequence may be truncated at any stage according to the altitude reached by the mountains. There is, ecologically, an undoubted general resemblance between altitudinal zonation and that shown in progression from the tropics polewards, but the details show great differences, especially because of differences in the floristic composition of the communities.

Brockmann-Jerosch (1919) has published an important account of the limits of tree growth both at high altitudes and at high latitudes. He rightly emphasizes the complex sum total of factorial and especially of climatic action and the control exercised by any factor which is at or near a minimal value for any life function. He finds there is no single extreme factor causing the tree limit; it is caused by one or another of the sum total of factors attaining, at any one altitude or latitude, a value below that at which trees can exist. There is here, then, an interesting example of the same effect having at different places

different causes. The factors interacting include mountain mass, temperature, precipitation, duration of snow-free period, wind, and, locally, soil conditions. On the whole, the higher the mountain massif the higher is the tree limit, in approximately the same latitude. Exposure, especially north contrasted with south exposure as on two sides of an east-and-west orientated valley, also influences not only the tree-limit but also that of most altitudinal zones. Thus in the Balkan Peninsula the forest limit is higher in the larger and higher Rodope Massif than it is on the Suva Planina, on the Stara Planina, or on the Vitoša. Again, the forest is more luxuriant, and closed forest ascends higher, on the northern than on the southern slopes of the Stara Planina and the Rodope Massif. In South America, the east and west sides of the Andes differ most strikingly in climate and vegetation.

High altitudes have another important phytogeographical feature. Migration of both communities and species may take place on approximately the same level, north, south, east, and west, but it may also be up and down to the limits of tolerance. Frequently there may be a combination of change in latitude or longitude coupled with a change in altitude. Thus we find in the Balkan Peninsula a Central European type of vegetation comes farther south in the mountains of the Pindus and Rodope than it would if the country were entirely plain and hill-land. On the other hand, the Mediterranean flora and even plant communities push northwards along the flat or low coasts and inland up such river valleys as those of the Vardar, Narenta, and Maritsa.

Reference must be made to the use of cultivated crops in phytogeographical surveys. These are often valuable indicators of the natural conditions. In highly cultivated countries they usually occupy a considerable proportion of the ground surface as fields, gardens, or plantations. Further, the most important crop plants have been cultivated in such countries often for long periods. There has, therefore, been a selection which, though artificial and different in many ways from, has been as rigid in action as natural selection. Man has, in the long run, to depend on his crops for maintenance and therefore he soon discards those that do not flourish under conditions which, though modified by the human activities summed up in the word "cultivation," are still mainly controlled by nature. The cultivation of the olive is quite a good criterion of a typical Mediterranean climate. Even within the British Isles wheat does better in the east than in the west and will not ripen on a commercial scale in the north (see Messer, 1932).

The important Russian work on the origin, dispersal, and present distribution of cultivated crops is well worth the attention of the student primarily interested in the distribution of wild species and vegetation. Vavilov (1926) sums up the enormous amount of detailed research carried out largely by himself and his Russian colleagues and reaches conclusions of wide general interest. He points out that

methods similar to those used by phytogeographers are applicable to cultivated plants. Thus, in order to establish the place or places of origin of cultispecies, the geographical ranges of all their varieties and the areas of concentration of varieties, what is known directly of their history in earlier times, the cytogenetics of the varieties, the range of related species (wild and cultivated), and the relationship of the species and varieties to parasites must be ascertained. In general, Vavilov holds that regions showing maximum diversity, and generally having a series of endemic varieties and characters, will usually be the centres of origin. He recognizes five principal centres of origin for the most important field and garden crops: 1. S.W. Asia; 2. S.E. Asia; 3. The Mediterranean Basin; 4. Abyssinia; 5. Mexico and Peru with the adjoining mountainous countries.

Space will not allow of more than a very brief mention of the more important of the most clearly defined plant communities. In the tropics we have: the tropical rain-forest, the most lush and highly developed of all plant communities, developed under the most favourable conditions for plant growth—constant high temperature and a plentiful supply of moisture at all seasons of the year; the monsoon forests, with periodic growth periods and intermittent periods of complete or relative rest; savannah types with an open tree community and mixed shrubby and herbaceous vegetation between. In the subtropics we have the great desert regions of very low rainfall and high day temperatures. In the warm temperate regions there are local developments of temperate rain-forest and extensive areas of evergreen sclerophyllous forests and brushwoods. In the temperate regions summer-green, winter-deciduous forests, prairie and steppe grasslands, and moor and heath communities in the broadest sense are the chief types of vegetation. In the cooler temperate areas coniferous forests often form the climax. In the Arctic, Subarctic, and Subantarctic various forms of tundra predominate.

In such a list only a few of the communities have been named and those in the broadest terms. It is, however, clear that the general structure of these communities and their distribution depends on climate.

B. *Factors influencing the distribution of taxonomic units (flora).*

In utilizing ecological data the plant geographer has either to adopt ecological methods, terminology, etc., or to accept data, when these are available, provided by the ecologist. In the floristic analysis of an area, however, he is on his own ground. This is the more evident when it is acknowledged that a phytogeographer should be his own taxonomist and decide for himself the limits he accepts for the taxonomic units he uses. The species, in spite of all the difficulties of "species problems," must, for practical reasons, form the starting point of floristic studies. Taxonomy

is the very basis of all biological studies and though this is rather more obvious in phytogeography than in other branches of biology it is also true for morphology, ecology, genetics, cytology, and even physiology. Unless the organisms investigated are known so that their kind can be not only recognized again and again but can also be determined and preserved in such a way that the information can be passed on to contemporary and future biologists, published research work on any phase of their life-history may be not only useless but even misleading. A taxonomist sometimes wonders just what value to place on, say, some cytological research when he finds that there has been no checking of determinations or filing of herbarium specimens. This is not to slur over the difficulties of taxonomic research but to emphasize its very great importance. Modern taxonomy is attracting an increasing attention partly because it is widening its own basis to include a much greater range of both observational and experimental research and partly because taxonomists themselves are realizing the need of explaining the value of their results to their biological colleagues. The recently formed Association for the Study of Systematics in Relation to General Biology is proving of great value in both these respects.

With all its faults the hierarchical system of classifying organisms into families, genera, species, etc., has greater general practical value than any other so far proposed. Other systems for special purposes are not only desirable but often essential and an indefinite number of such can be made and used to advantage more or less within the framework of orthodox taxonomy. These are, however, nearly always either based on the species concept or refer to this as a *standard*. To explain adequately the species concept and to discuss fully the problems of species would take us too far from our central subject. The following criteria have been found to work well in practice: a species is morphologically definable in that it has a sum-total of characters, and every individual within it has constant resemblances with every other individual within it, and constant differences from every individual of other species, even when the individuals are grown under diverse conditions; species are more or less isolated one from another, sometimes geographically, sometimes by habitat preferences, sometimes by having different flowering periods, usually by not crossing naturally to produce completely fertile offspring; species may show differences in chromosome morphology and behaviour. A species is an isolated group of individuals whose sum of characters tends to keep constant by natural in-breeding. In applying these criteria it has to be remembered that there is nothing absolute about them. The taxonomist, not nature, decides what groupings of individuals shall be called species and in this sense species are artificial scientific conveniences. Abstracting on the basis of the above criteria the taxonomist finds that he can learn, and enable his colleagues in other branches of biology to learn,

more about organisms than would be possible by any other known method. Isolation is very diverse in kind, degree, and cause. The emphasis on morphological resemblances and differences is justifiable because of the relative ease with which they are determinable and with which they can be preserved in type or standard specimens and also because they are nearly always correlated with physiological differences. The actual delimitation given to species is frequently a matter solely of scientific convenience, possibly more so in plants than in animals, because in the plant kingdom isolation is less complete and less permanent, owing to such barriers among animals as psychological preferences in mating. With taxonomic groups higher than species, morphological criteria are usually the only ones used, though again, these often have a high degree of correlation with physiological characters. Yet even for genera and families it is often found that there is both a high degree of coherence of a number of characters and a limitation of "tendencies" within the group. The possibility of explaining these by phylogenetic theories is, within limits, taxonomically legitimate.

One word of warning must be given. No taxonomic classification must be based on criteria which it is intended later to deduce from an analysis of such a classification. This is a particular danger in phytogeographical studies and it is essential always to guard against it by a rigid application of the principles of morphological resemblances and differences and the coherence of attributes (see Turrill 1925, 1938).

The above interpolation has been necessary because of the complete dependence of phytogeography on taxonomy. Before the range of a species, genus, or family can be investigated the unit itself must be defined. This being done its exact geographical distribution must be listed. For graphic representation the range may be mapped in such a manner that it can be compared with the range of other species and with the distribution of the environmental factors. There are many methods of mapping distribution. Localities must be first listed, one by one. If, on the scale used, distribution is "discontinuous" dots, circles, or crosses can be put on the map, if "continuous" then shading, ringing round or blacking out can be used to indicate the range. The nature of the "blank" map must depend on scale, size, and aims. Usually only such physiographic details should be present as are necessary to determine localities with accuracy and ease. Separate maps must be used for correlation of range with physiographic, geological, meteorological, and other features of the area. The use of transparent paper for range map reproduction has much in its favour since opaque maps can be placed underneath and numerous correlations easily seen (compare Messer, 1932).

When listing and mapping of ranges are completed they form the basis for determination of the relative importance of factors

as causes of existing distribution and also the floristic basis for phytogeographical divisions. Examples may now be given under a number of convenient headings.

Physiographic. Distribution is limited by the occurrence of such physiographic barriers as seas, high mountain ranges, and extensive plains. While it is true that by seed dispersal mechanisms such barriers may sometimes be crossed they are none the less effective in limiting range in proportion to their size or area; their past effectiveness also depending on their age and history. Thus in spite of climatic similarities resulting in tropical rain-forest in the Congo and Amazon basins, the floras are totally distinct. Even the proportion of common genera is low and common species are almost non-existent. Islands like St. Helena, the Hawaiian Islands, and even the Canaries or Crete have very many endemic species. Mountain ranges are highways for the migration of mountain species but barriers for lowland species. The nature of the altitudinal barrier is, as mentioned earlier, largely analyzable into climatic factors but it is usually convenient to consider it additional to climate. The Pyrenees form a very effective barrier to Spanish species, many of which would presumably have a much more extensive northern range did the mountain barrier not exist. The Dinaric Alps limit the eastern spread of Mediterranean species in the western parts of the Balkan Peninsula to a narrow coastal belt. On the other hand, the plain of the south of France prevents many Pyrenean species extending into the Alps, and the physical discontinuities of many of the Cretan and Greek mountains has led to the isolated distributions of many species, valleys and plains acting as barriers to their spread.

Climatic. As with plant communities so with plant species, climate is the major factor in the limitation of their ranges, at least for the seed-bearing plants. Temperature, precipitation, and length of day are the most important climatic factors. Tropical species cannot stand frost, and many temperate species do not flourish and reproduce under tropical temperatures, even apart from competition. Even for the British Isles, the Southern, Mediterranean, Atlantic, Northern, and other elements show, on the whole, a definite correlation with climate as the work of Stapf, Salisbury, and Matthews has demonstrated. Striking examples of climatic limitations may be found on contrasting species of the Central European with species of the Mediterranean flora. Thus *Isopyrum thalictroides* L. is typically Central European, while *Arbutus Unedo* L. is Mediterranean. Deserts may be regarded as essentially both climatic barriers and highways of the most striking and effective kind and the factor in them controlling plant distribution is absence or lowness of rainfall. Irrigate a desert and it will generally "blossom like a rose." Desert species all show adaptations, morphological and/or physiological, to the extreme external conditions. On the negative side

they are often species which do not like competition with closed vegetation. The distributions of species of *Cactaceae* in the semi-desert regions of America or of succulent species of *Euphorbia* in those of southern Africa illustrate the limitation of species by this combination of factors with drought as the basic cause. The limitation of species in Western Australia is largely accounted for by the boundaries of the desert belt. The occurrence of Mediterranean species and genera in the Sahara is only possible by the occurrence of oases and mountain ranges with water supply. Recent research, however, shows that this penetration or relict survival is much more extensive than was formerly supposed and extends farther to the south than had been realized.

The relative length of daylight has been shown by Garner and Allard and by many others to be an important factor in controlling flowering and since this is naturally dependent on latitude it is one factor controlling plant distribution since it sets barriers to spread north or south (see Allard, 1932 and Garner, 1937).

Edaphic. Soil factors, in the broadest sense, limit species, within a climatic zone. It should also be remembered that, according to the now widely accepted conclusions of the Russian school of pedologists, climate is a major factor in the evolution of the climax type of soil. This should obviously be best demonstrated in extensive continental areas which are subjected to the effects of markedly regular weather conditions and which have had a long unchanged geological history. For such areas as the British Isles, for mountainous regions, and locally probably for all districts, the nature of the parent rock must play an important part sufficient to disturb or modify soil zonation on a climatic basis, if only because the climax type of soil cannot be found *in situ* continuously over wide areas.

It has frequently been pointed out that soil factors, in the widest sense, act as limitations to species distribution through either their physical or their chemical effects on plants. Even the character pair calcareous and non-calcareous may have this dual action as shown by Salisbury (1920). The relatively local extent of soil distribution is the reason why a considerable number of species pairs can be listed whose relative distributional differences are correlated with different soil preferences. Examples are:—

Calciholes: *Gentiana Clusii* Perr. et Song., *Primula Auricula* L., *Anemone alpina* L., *Lithospermum purpureocaeruleum* L., *Rhododendron hirsutum* L., and *Achillea atrata* L.

Calcifuges: *Gentiana Kochiana* Perr. et Song., *Primula viscosa* Wulf., *Anemone sulphurea* L., *Lithospermum diffusum* Lag., *L. prostratum* (Lois.), *Rhododendron ferrugineum* L., and *Achillea moschata* Wulf.

Higher water-content: *Alopecurus geniculatus* L., *Stachys palustris* L., *Lotus major* Scop., and *Geum rivale* L.

Lower water-content: *Alopecurus pratensis* L., *Stachys sylvatica* L., *Lotus corniculatus* L., and *Geum urbanum* L.

Triglochin maritimum L. of salt marshes and *T. palustre* L. of fresh-water marshes, in this country, and *Scirpus lacustris* L. of hard waters and *S. Tabernaemontani* Gmel. of brackish waters are other interesting species pairs. *Silene maritima* L. and *S. Cucubalus* Wib. [*S. vulgaris* (Moench) Garcke] are also ecologically separated species in England, with the nature of the substratum as a basically determining factor. Numerous species are limited in south-eastern Europe to serpentine soils (see Turrill 1938).

Biotic. Probably the most important natural biotic "factor," phytogeographically speaking, that limits or aids distribution is competition. It is also the most complicated since it involves the action of a group of factors and is thus difficult to measure. Extensive closed communities, such as a tropical rain-forest or a wide belt of coniferous forest, form a barrier to all species which cannot compete with or survive with the dominants and such a barrier may be as complete as an equal area of sea or high mountains, though it will only be shown on vegetational maps. Again, we know that the stages of succession depend on competition between the dominant species of one stage with those of the preceding and succeeding stages. So that the distribution of seral stages is a factor in the distribution of species. The typical weeds of cultivated, and particularly arable, land are largely early colonizers able to exist only in the absence of close competition with species of a stage nearer the climax. Their often very wide present distribution is due to man providing and maintaining secondary seres only a little above the nudation stage (see above, p. 216).

Whether extensive grassland areas are mainly formed and maintained by herds of animals destroying tree seedlings or whether the herds of animals exist because of the pre-existence of prairies, steppes, and similar communities may be a nice point to argue. Probably cause and effect are here often inextricably mixed and a natural equilibrium occurs only through long continued reciprocal interaction of all the factors of natural selection. To the extent that herbivores maintain grassland (or better, hermland) against forest, they act as biotic factors limiting the distribution of species of forest communities and allowing full extension to those of the herbaceous communities that can withstand grazing. The herds of wild bison of the American prairies have gone, but at least they did not, as man is doing, destroy not only the vegetation but also the very soil. The wild fauna of Africa and of other parts of the world will follow the bison to extinction, unless extensive natural parks be promoted in time and be maintained. A majority of mammals, at least, seemed doomed to extinction or to such reduction in numbers that they cease to be a biogeographical factor, excepting only such as man domesticates or allows to be, or cannot prevent being, parasitic upon his crops or ruderal to him.

Man, indeed, is, with his domestic animals, already the most important of all biotic factors. His influence on vegetation and on

species distribution has been enormous and has increased with increasing human population and scientific invention. I quote from a work published in 1929 (Turrill, 1929, p. 236): "It has been shown that man has influenced the natural flora of the Balkan Peninsula from very early historic or even prehistoric times, chiefly in a destructive manner. This has been accomplished at the expense of the high woody vegetation and has led to a great extension of brushwood communities and those of stony and rocky ground. This has resulted in the expansion, both in species numbers and in distribution, of many genera suited to such habitats, and a corresponding reduction in the abundance of woodland plants. By draining marshes the marsh and aquatic vegetation has been reduced. New habitats have been provided by agriculture and by the more or less permanent occupation of sites for habitation. Species new to the flora have been introduced by commercial and military activities and some have spread far and wide." How far nature could cure the scars left by civilized man on her fair face, if man were suddenly exterminated, it is difficult to say. Flahault (1937), for the south of France, suggests that it both could and would be done in a relatively short time. I think that, for some areas, it would take thousands of years and might never be absolutely complete.

Historical. Under this heading we may consider all such previous distributions of land and sea, and all such changes of the surface features, including climate, as have occurred in geological time. The subject is a huge one and very controversial. Some of the theories put forward by geologists, such as that of Wegener's movement of the continents and later modifications of the original theory, are undoubtedly important but sometimes raise as many phytogeographical questions as they solve, or leave important ones quite unanswered. On the other hand, such happenings as the Ice Age or the formation of the Aegean Sea are beyond dispute as having occurred so recently that they explain many features of existing distribution of species and communities. The influence of the Ice Age on the British Flora has been discussed a great deal in recent times and it may be well to let the subject rest for a while till more evidence is obtained by the intensive study of single species. We will therefore take the Aegean area as an example of the action of historical factors on species distribution. The geological evidence is conclusive that there was land connexion between Asia Minor and Greece (in the sense of the modern kingdom) from early till geologically recent times. Suess, indeed, suggested that early man may have witnessed the break-up of the Aegean continent and the inrush of the sea over all except the horst-like islands. The break-up occurred earlier in the south and extended northwards. Such a geological history explains the very close floristic connexions between the Balkan Peninsula and Asia Minor. Two main directions of migration may be traced: the one northwards from Asia Minor

to Thrace, South Bulgaria, and Macedonia; the other westwards from Asia Minor across the Aegean to Crete and Greece. Figures always need careful interpretation or they may give a wrong impression. Excluding widely-spread Mediterranean Basin or Mediterranean Regional species, and also ignoring vicarious endemics, about 700 species of seed-plants show directly this trans-Aegean connexion. Evidence from centres of maximum variation (generic and specific) and from range limitations suggests strongly that the main migration has been westwards though there was certainly some also in the opposite direction. Reference should be made to Turrill (1929), pp. 373-388, for a fuller discussion.

In considering the external factors concerned with the distribution of species it must have become evident that our division under such headings as physiographic, climatic, and so on is largely one of convenience. Though it is possible to pick out one factor as having or having had a predominant influence on existing distribution, that factor is rarely simple in itself and still more rarely unrelated to other factors. As examples of the interaction of factors we may consider the distribution of the common box and of the common beech. In this country both plants are limited to or flourish best in natural communities on calcareous soils. Yet near the south-eastern limits of its range, the box avoids calcareous soils and is an indicator of serpentine outcrops, while the beech is either largely indifferent to the calcareous nature of the soil or prefers not to grow on limestones. Or again, in England the yew likes well drained calcareous slopes, in Bulgaria it prefers damp, even waterlogged, habitats. There are many other examples, most of which require detailed investigation and that before it is too late and man has destroyed the evidence in his exploitation of nature's wealth.

C. *Inherent and miscellaneous factors.*

The endogenous or internal factors which play a part in the distribution of plants are, with few exceptions, either not well understood or their full effect is difficult to estimate with our present knowledge. Nevertheless they open up a fascinating realm for research.

The selective and limiting effects of environmental factors have clearly a very great importance as links in the causal chains of geographical distribution and, combined with what have been called historical factors, have till recently been considered as setting the most important limits to phytogeographical explanation. The rise of cytogenetics has, however, opened up a new field of distributional studies. It is generally recognized that all characters (including distribution) are based on interaction between the genome and the environment (in the widest sense). Research on chromosome numbers, morphology, and behaviour shows that these are, through their gene content and the relative and absolute position of the genes, in the main, the basic endogenous controllers of morphological and physiological characters. Polyploidy, the occurrence of extra

sets of chromosomes, often modifies such characters as compared with those of the normal diploid (Müntzing 1936). As might, therefore, be expected, polyploids sometimes show distributions different from those of the corresponding (presumably ancestral) diploids. The subject is rather in its infancy and generalizations must at present be vague. Tischler (1935) showed that for the two-thirds of the species of Schleswig-Holstein whose chromosome number is known, 60 per cent. of those with a distribution towards the north show polyploidy, while only 27 per cent. of the species with a general southern distribution are polyploid. Rohweder (1936) has shown for the same area that polyploid species rise to as much as 95 per cent. in areas flooded by waters with a high calcium content. Fischer and Schwanitz (1936) have discussed the question in general terms. Hagerup (1932, 1933, 1938) has shown, for a wide range of genera and a variety of localities and habitats, that polyploidy tends to be relatively commoner in extreme than in mesophytic environments and that "with polyploidy there may follow a change in the ecological and plant-geographical value of the plant."

None can dispute that dispersal occurs by means of disseminules, i.e., by spores, fruits, seeds, and organs of vegetative multiplication. Many facts and observations have been recorded (see Ridley, 1930). Unfortunately, for most floras the mechanism of dispersal has been observed in action for only a very low proportion of the species and the relative value of supposed structural adaptations has rarely been determined. Instead there has been a general tendency to describe morphological characters in terms of shape and measurement and to assume that they function effectively in water, wind, or animal dispersal. Certainly the data at present available make any attempt to treat the subject statistically of doubtful value. Many of the widespread species of the European flora, for example, the oaks and the common beech, have no obvious dispersal mechanism and a general study of the subject has convinced me that dispersal mechanisms, though important, can easily have their value overestimated. Always evaluation must be in relation to all the other factors of the environment and of the plant. Widespread dispersal, as by wind, is extremely wasteful and it is difficult sometimes to see how wind dispersal mechanisms could have been selected by the accepted processes of natural selection. On the other hand, the advantage of water dispersal is obvious for strand, aquatic, and marsh species because of their general adaptation to more specialized conditions. It may also be suggested that dispersal should be studied in connexion with germination. A. S. Watt (1919) has shown for the oak, with immediate germination of the acorns, the need for a humus or soil covering. Another interesting example is in the bladder campions. The common bladder campion (*Silene Cucubalus* Wib.) has its major germination in the spring, but *S. maritima* L. seeds can germinate naturally immediately on ripening, though there is also a second germination period in the spring of

the next year. In the course of experiments with these species Marsden-Jones and I have observed seeds of *S. maritima* L. germinating while held up in the capsules and bladdery calyces attached to the parent plant. It was for long a puzzle how seedlings could establish themselves among the large rounded pebbles of, for example, the Chesil Beach. If the seeds slipped between the pebbles into the lower darkness the epigeal cotyledons could not function and the seedlings must perish. By germination when still held up by the calyces and branches of the plant the radicles could penetrate into the substratum while the cotyledons manufactured food. For dispersal to be successful it must be followed by ecdysis (establishment of the plants).

Another matter which phytogeographers must not neglect is seed-setting. Firstly we have the internal and external factors controlling flowering, such as the carbohydrate-nitrogen ratio and photoperiodism, secondly mechanisms of pollination, thirdly environmental control of seed-ripening, and fourthly cytogenetic factors for fertility or its converse sterility. Space will only allow a mention of these, for any detailed examination would take us into physiology, cytogenetics, and entomology. A mere mention of the subjects, however, serves to show how wide an interest can be developed in the study of distribution. The presence of suitable pollinating agents obviously controls the distribution of species. This is particularly well seen in entomophilous species highly adapted to a particular insect visitor. One may refer to the orchids, amongst which such species as *Angraecum sesquipedale* Thou. may well be considered over-adapted. This species has nectary spurs, green and whip-like and of what Darwin calls "astonishing length," up to a foot or more with only the lower $1\frac{1}{2}$ inches filled with nectar. The pollinia cannot be withdrawn naturally till some huge moth with a wonderfully long proboscis tries to drain the last drop. As Darwin says, "if such great moths were to become extinct in Madagascar, assuredly the *Angraecum* would become extinct." This may be an extreme example but there are many other known plants dependent for their distribution on success in attracting one or a limited number of species of insect.

The work of Raunkiaer and others has concentrated attention on the importance of habit and especially on the structural adaptations which permit the survival of plants during the unfavourable season. Raunkiaer's more important papers on this subject are now available in an English translation, and only one example of the application of his method will be given here. His well-known spectrum method by which the flora of an area is expressed in terms of percentage occurrence of the life forms as classified by him, has a very high value. I found it both easy to use and highly illuminating in my studies on the flora of the Balkan Peninsula. Thus, on the basis of the whole known flora, not on a sample, the spectra for Crete and Serbia were :

Crete : MM/1.3 M/2.9 N/4.8 Ch/13.3 H/27.1 G/10.2 HH/2.0 Th/38.3
 Serbia : MM/1.7 M/2.8 N/3.4 Ch/11.3 H/46.2 G/9.1 HH/4.7 Th/20.7
 Crete is in the Mediterranean Region and Serbia is in the Central European Region, and the spectra show clearly that Crete has a therophytic and Serbia a hemicryptophytic flora. Even in other smaller details the figures are significant. Comparison of these spectra with those given by Raunkiaer for Samos and for Tripoli and Cyrenaica give further proof of the great phytogeographical value of life-form analysis on a comparative basis.

Both phytogeographers and ecologists tend to overlook the importance of plasticity in relation to distribution. The transplant experiments of the British Ecological Society at Potterne have shown how widely even a limited number of different soil conditions and their morphological and physiological reactions to such. Thus *Centaurea nemoralis* Jord. maintains itself with little morphological change on all the five types of soil used in the experiments. *Silene maritima* L., *S. Cucubalus* Wib., *Anthyllis vulneraria* L., and *Fragaria vesca* L. showed significantly different death and survival rates on the different soils. *Plantago major* L. showed very great morphological changes, while *Phleum nodosum* L. and *P. pratense* L. showed great differences in vegetative vigour and in flower production from soil to soil (Marsden-Jones and Turrill, 1938 and earlier references there). If "specific individuality" is shown so markedly in reaction to soil conditions one would expect an even more marked reaction to climatic differences. There is here, again, a wide field of research open to a combination of ecological-taxonomic-phytogeographical attack.

Willis's "Age and Area Theory" must be briefly mentioned. As is generally known, it is based on the thesis that the area occupied by a species in a country depends primarily on the age of the species within that country. Unfortunately, presumably in an attempt to meet criticisms, Willis finally complicated his expression of the rule so that it became quite unworkable. It then read as follows : "The area occupied at any given time, in any given country, by any group of allied species at least ten in number, depends chiefly, so long as conditions remain reasonably constant, upon the ages of the species of that group in that country, but may be enormously modified by the presence of barriers such as seas, rivers, mountains, changes of climate from one region to the next, or other ecological boundaries, and the like, also by the action of man, and by other causes" (Willis, 1922). It seems that such an "expression" leaves nothing to argue about as it is all-inclusive. Those who have attempted to work the Age and Area "rule," including Willis himself, have had to ignore this "expression" and use some one or other statistical method based on known distribution with species (or genera, etc.) as the unit. It is then found (cf. Turrill 1929, pp. 465-472) that "Age and Area sometimes yields conclusions of

phytogeographical value in the study of the flora of a definite area or of the distribution of a particular genus or family. On the other hand, if used without constant reference to the balance of all known factors influencing the distribution of plants, it will, as will any statistical method, give misleading results." The most important criticisms regarding Age and Area, have not been answered and it certainly cannot be regarded as a key to all the problems of distribution. This is neither to disallow it a limited importance nor to refuse acknowledgment of the value of many of the facts recorded by Willis in his papers and in his book.

The evolutionary history of taxonomic units depends largely on the internal constitution of the plants composing the group and to that extent is an endogenous factor in distribution. This subject is, however, so important and so involved that it must be given separate consideration.

R. D'O. Good has synthesized into a "theory of tolerance" the relationship of the internal factors influencing plant distribution to the external (environmental) factors. This theory may be given in his own words as follows: "Each and every plant species is able to exist and reproduce successfully only within a definite range of climatic and edaphic conditions. This range represents the tolerance of the species to external conditions. The tolerance of any species is a specific character subject to the laws and processes of organic evolution in the same way as its morphological characters, but the two are not necessarily linked. . . . The relative distribution of species with similar ranges of tolerance is finally determined by the result of the competition between them. The tolerance of any larger taxonomic unit is the sum of the tolerance of its constituent species." Good's paper is worthy of careful study, for, though open to criticism in some details, it indicates the close connexion between phytogeography and what may be termed "species physiology."

In the course of dispersal which results in extended or modified distribution, the gene content of species frequently changes or the species as a whole may become so changed as to cause the recognition by the systematist of one or more distinct geographical subspecies or even species. Sometimes, perhaps not infrequently, extension of range means the loss of genes in that part of the species which reaches farthest from the dispersal centre. For example, in the British Isles several species are much less polymorphic and are much more clear-cut from their congeners than they are farther to the south, and especially south-east of the British Isles. Such a condition we find in *Silene Cucubalus* Wib. and *Ajuga Chamaepitys* (L.) Schreb. (Turrill, 1934). Some examples of this kind can probably be called major clines (Huxley, 1938) and they are closely comparable to what Vavilov records for cultivated crops (1926). There is a great need for analytical research by methods which would combine investigation, on the same material, on tolerance and clinal variation (in the broadest sense).

The geological history of the earth shows that changes are constantly proceeding everywhere. Some are very slow and almost imperceptible, others are more obvious. In the past such changes have frequently been accompanied by or have even been due to meteorological changes whose study is a matter of extreme difficulty. It follows that the existing distribution of plants has behind it a history whose study falls within the province of the phytogeographer, though conclusions based on geological (including palaeometeorological) data have always to be drawn with caution.

The study of fossil floras shows conclusively that what are designated species and other taxonomic units die out, and that others arise to take their place. The methods of evolution of species, genera, families, etc., no doubt have been and are complex. On the whole, phytogeographical studies support the thesis that natural selection acting on mutations is a most important basis. Groups can, however, only be accepted as distinct species if some form of isolation occurs to separate populations in which there are already different genes or between which gene differences can increase. Thus phytogeographical studies can often throw considerable light on species formation by indicating examples of all degrees of isolation. There appear also to be examples of populations diverging as wholes so rapidly that some form of relative mass change seems probable. The term hamogenesis has been suggested for this. Examples occur in the genus *Colchicum* and in *Abies*.

Vicarious species are particularly instructive to study. These are species inhabiting contiguous but not (or scarcely) overlapping areas. Vicarism may be altitudinal or geographical. In Crete and Greece there are a considerable number of high mountain species limited to a small area, sometimes to a single mountain, and yet closely related in morphological characters to species occupying the lowlands and with ranges more or less in juxtaposition. The latter usually have a much wider distribution and the inference of *in situ* development of the high mountain species seems justified on a number of lines of evidence.

The question as to whether species originate in more than one place independently (polytopism) or always arise in one locality (monotopism) or at more than one time (polychronism) is difficult to answer. Species that are morphologically and genetically little, if anything, more than varieties, such as *Fraxinus Pallisae* Wilmott, may well have arisen polytopically, as may those which have arisen through hybridization. On the other hand, a large number of species have probably arisen by gradual differentiation following the accumulation of small mutations after some kind of isolation of a population. The chances of parallelism in such isolated populations is proportionally less the greater the number of differential characters common to members of the species. Polytopism should only be accepted after a very full investigation of all

relevant facts. It may be remarked here that the whole problem of "parallelism" of characters needs re-investigation.

There is no doubt that migration of species has occurred on a large scale in many parts of the world. Such migration can often be traced after a very careful mapping of the distribution of the species and genera of a flora and a consideration of all the known historical facts. We have already referred to migrational lines across the Aegean. Another very interesting line is from the Alps south-eastwards along the Dinaric Alps. The Alpine flora, i.e., the species with a centre of distribution in the Alps, dies out about the north-centre of Albania, and though there are high mountains to the south these have a flora almost completely distinct from that of the Alps. The Balkan Peninsula was first joined to Europe in the north-west by the formation of the Alpine chains in Miocene times and along the mountains the Central European high mountain flora migrated south-eastwards. The rather sudden cessation of this migration southwards still needs adequate explanation.

In all parts of the world we find problems connected with migration and *in situ* development. Briefly, the centres from which spread occurred may be recognized by the following criteria:

1. The presence of maximum variation. Either the species is here most polymorphic or the genus has most species.
2. The converse, that, in different, but not necessarily all, directions, the polymorphism is found to decrease. In the course of migration certain characters (genes or their allelomorphs) are lost, at least in part through a change in natural selection. It follows that towards the margins of their migrations species are less polymorphic and genera have fewer species than near their centres.
3. Species and genera occupy, as a result of both greater genetical polymorphism and greater plasticity, a wider range of habitats near their centres of origin than near the margins of their distributional areas.
4. Towards the margins of their ranges species may develop characters which are derived from more normal characters—e.g. apomixis, vegetative multiplication, sterility, polyploidy.
5. The known facts of geological and meteorological history may suggest or confirm both centres of origin and lines of migration.

There are, however, many disturbing factors and the determination of migrational lines has, nearly always, to rest on moderate probability for any one species or genus.

Migration, the extension of range in the direction of spread, may or may not be accompanied by retention of area already occupied by the species or other taxonomic group. The converse to migration, retrogression of range, has frequently occurred and may lead to the dying out of species, etc. A considerable number of relict species and genera have ranges now much more restricted than they

formerly had. This explains the discontinuities in the distribution of many of them. A good example are the *Gesneriaceae* of the European flora.

Another important disturbing factor to a regular migrational history is hybridization. This is of much commoner occurrence in plants than in animals and may result in hybrid swarms and allopolyploidy with the formation of new species. Climatic changes and, in recent times, the action of man, increase the chances of migrating species meeting and inter-breeding.

It is impossible to say when or where the Angiosperms arose. The flowering plants now dominate the vegetation of the world but their origin remains a mystery. The latest researches have pushed back the time of their origin to at least the lower Jurassic (Simpson, 1938). As we do not know the place or places of origin of the Angiosperms and they are now so spread over the world and highly differentiated into two hundred or more families it is impossible to be reasonably certain of their first lines of migration. Attention should however, be called to the studies of Guppy (1919). This author in a highly suggestive paper reaches the following conclusions: The great Angiosperm families arose in a period of relatively uniform conditions and became world-ranging. In response to progressive differentiation of environmental (especially climatic) conditions increasing differentiation of families, genera, and species, occurred in that order—great families giving rise to smaller families, families to genera and genera to species. Taking the two main land masses of the earth, the Old World and the New World, Guppy shows that there is decreasing community of distribution between the two areas from cohorts, through families, tribes, and genera, to species. This paper has not received the attention it deserves and many of the suggestions to be derived from it still require investigation.

Wegener's theory of continental drift (Wegener 1924) has attracted considerable attention among biogeographers but its implications have not been fully examined by botanists. The theory is based on two main lines of evidence: 1. geological and geophysical and 2. biogeographical. The evidence on both lines is inconclusive. Recent letters in *The Times* (23.i.39 to 24.ii.39) show something of the basic divergence of views, especially of geophysicists. Reference may also be made to van Waterschoot van der Gracht and others (1928) and Du Toit (1937). On the botanical side, Diels (1928) does not agree that Wegener's theory assists us in understanding plant distribution in the Northern Hemisphere. Kubart (1926) supports, with modifications, the general theory and Sahni (1936) considers, somewhat vaguely, that "we at least seem compelled to agree that drift movements of large magnitude elsewhere have brought into juxtaposition continents once separated by wide oceans. It therefore seems impossible to get away altogether from the idea of continental drift." Lam (1930) also accepts the general terms of the continental drift theory but with special reference to the Malay

Archipelago. Irmscher (1922, 1929) from wider considerations definitely maintains that Wegener's theory is in agreement with the known facts of plant distribution. There is no doubt that the theory of continental drift has certain advantages over the older hypotheses of land bridges but it has been suggested that it raises at least as many biogeographical problems as it solves. There are certainly important problems which it does not solve. It may be suggested that future research on this problem must cover a very wide field if it is to be adequate. At present evidence is too conflicting for a general acceptance of Wegener's views. Not only are both animals and plants involved, but also terrestrial, fresh-water, and marine organisms and both continental and oceanic life. The best position for a phytogeographer is to collect his own evidence and to test any and every possible palaeogeomorphic explanation by this evidence and tentatively to accept the one that appears most helpful.

PHYTOGEOGRAPHICAL DIVISIONS OF THE EARTH'S SURFACE.

It will be evident from the facts already discussed that a very close general correlation is found between the distribution of climate and the distribution of plant-life, whether considered as communities of vegetation or as taxonomic units. The high degree of coincidence found between climatic maps and phytogeographic maps is therefore explicable. Nevertheless, the phytogeographer uses plants and not climates as his material, and both his terminology and his criteria are based on vegetation and flora. Unfortunately there are no generally accepted rules for the nomenclature of phytogeographical units. The following scheme has, however, been found to work fairly well in practice :

Realm. A grouping of regions, largely on the distinctness of their floristic history.

Region. The most fundamental phytogeographical division, based on existing major differences between plant communities and floristic composition from region to region.

Division or Province. A portion of a region based particularly on the occurrence of endemics and on statistically different assemblages of species and less on climax vegetational differences.

Further subdivisions can be made almost indefinitely according to the scale of work. It must, however, always be remembered that for any continuous land area boundaries between phytogeographical units are rarely, if ever, sharp. Often there is a wide transitional belt, perhaps even scores of miles across. Sometimes such transitional belts are themselves so important that they are for convenience given equivalence even in names to more extreme units. Often, however, it is sufficient to recognize such transitional areas merely as phytogeographical ecotones.

A considerable number of authors have attempted to classify the land areas of the world on a phytogeographical basis. One of

the best of these attempts is that of Engler (1936), which, with slight modifications, is, in outline, as follows :

I. NORTHERN EXTRA-TROPICAL REALM.

- A. Arctic Region.
- B. Subarctic Region.
- C. Central European Region.
- D. Mediterranean Region (including the Macaronesian Islands).
- E. Central Asiatic Region.
- F. Eastern Asiatic Temperate Region.
- G. Pacific N. American Region.
- H. Atlantic N. American Region.

II. PALAEOTROPIC REALM.

- A. N. African-Indian Desert Region.
(Probably in part best relegated to the Mediterranean Region in the broad sense.)
- B. African Forest and Steppe Region.
- C. S.W. Cape Region.
- D. S. Atlantic Island Region.
- E. Mascarene Region.
- F. Southern Indian Region.
- G. Monsoon Region.
- H. E. Chinese and S. Japanese Region.
- I. Sandwich Island Region.

III. CENTRAL AND S. AMERICAN REALM.

- A. Central American Region.
- B. Tropical American Region.
- C. Andine Region.
- D. Galapagos Region.
- E. Juan Fernandez Region.

IV. AUSTRAL REALM.

- A. Southern S. American Region.
- B. Antarctic Region.
- C. Kerguelen Region.
- D. New Zealand Region.
- E. Australian Region.
- F. Island Region (Tristan da Cunha, etc.).

V. OCEANIC REALM.

Drude (1897) accepts the following as his main phytogeographical divisions :—

- Arctic Floral Domain.
- Northern Floral Region.
- Mediterranean Floral Region.
- Central Asiatic Floral Region.

East Asiatic Floral Region.
 Indian Floral Region.
 Tropical African Floral Region.
 Mascarene Floral Region.
 South African Floral Region.
 Melanesian-New Zealand Floral Region.
 Australian Floral Region.
 Antarctic Floral Region.
 North American Floral Region.
 Tropical American Floral Region.
 Andine Floral Region.
 Antarctic Floral Region.

Martonne (1925) recognizes six main regions or groups of regions, as follows:—

Holarctic Region.
 Mediterranean Region.
 North Tropical Desert Region of the Old World.
 Intertropical Regions.
 Austral Temperate Regions.
 Antarctic Region.

Schimper (1903) classifies the world's vegetation on a climatic basis but does not give a phytogeographical classification in the usually accepted sense. Various other classifications (e.g., Clarke 1892) have been proposed from time to time. Schimper's statement (1903, author's preface) that "the delimitation of separate floral districts and their grouping into more comprehensive combinations are nearly completed, and the time is not far distant when all species of plants and their geographical distribution will be well known" was premature. It would not be made even to-day by any competent taxonomist with a world outlook.

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XXVII—TWO NEW FERNS FROM INDIA. K. BISWAS.

The genus *Elaphoglossum*, like some other genera of ferns, is in a state of confusion. The remark of Carl Christensen in his Index Filicum, Supplement 3, 103 (1934), that many varieties and subspecies of *Elaphoglossum* from America are good species, is true for India also. Christensen further hints at a mixture of species in *E. conforme* (Sw.) Schott in his "Pteridophyta of Madagascar" (Dansk Bot. Ark. **7**, 165–166: 1932). Similar mixtures and confusion among the Indian species have been discovered by me while examining Indian material of the genus. Comparison of specimens named *E. conforme* from the Eastern Himalaya with the type of *E. conforme* from St. Helena shows that these Indian specimens are quite different from *E. conforme* proper. Beddome's descriptions and illustrations in his Handbook of Ferns of British India and Ceylon and Malay Peninsula, 416, fig. 247 (1883) and Ferns of Southern India, t. 198 (1864) show some of the striking differences in characters from the true *E. conforme*. Wallich in his Catalogue, no. 17 (1829) named this Himalayan specimen of *Elaphoglossum* as *Acrostichum marginatum* Wall. This name was transferred to the genus *Elaphoglossum* by Moore, Ind. Fil. 11 (1857). C. B. Clarke, in his Ferns of Northern India, Trans. Linn. Soc. ser. 2, **1**, 576 (1880), recorded this species as *Acrostichum conforme* Swartz. Under this name Clarke gives the following references and synonymy: Sw. Syn. Fil. **10**, 192, t. 1, fig. 1 (1806); Blume, Fl. Jav. Fil. **23**, t. 5 (1828); Fée, 2me. Mém. Foug. **30** (1845); Hook Sp. Fil. **5**, 198 (1864); Hook. and Bak. Syn. Fil. **401** (1868); Benth. Fl. Austral. **7**, 778 (1878); *A. laurifolium* Thouars sensu Fée, 2me. Mém. Foug. **37**, t. 7, fig. 1 (1845); *A. Gayanum* Fée, 2me. Mém. Foug. **37**, t. 19, fig. 2; *A. glandulosum* Hook. and Grev. Ic. Fil. t. 3 (1827); *A. marginatum* Wall. Cat. **17** (1829); Fée, 2me. Mém. Foug. **31** (1845); *A. angulatum* Blume, Fl. Jav. Fil. **25**, t. 6 (1828); Fée, 2me. Mém. Foug. **52** (1845); *A. gorgoneum* Blume, Fl. Jav. Fil. **28**, t. 8 (1828); Fée, 2me. Mém. Foug. **38** (1845); *E. conforme* and *E. laurifolium* sensu Bedd. Ferns of S. Ind. tt. 198, 200 (1864).

The set of Indian specimens identified by the earlier writers as *E. conforme* is composed of three clear-cut species. The wide range of distribution of *E. conforme* noted in Hook. and Bak. Syn. Fil. **401** (1868) is suggestive of such a mixture of species in this *conforme* group of Indian *Elaphoglossum*. The true *E. conforme* is not an Indian species at all. Christ's record of *E. conforme* from North India in his Monographie des Genus *Elaphoglossum*, 43 (1899) is

evidently given on Beddome's authority, and refers actually to *E. marginatum* (Wall. ex Fée) Moore (*Acrostichum marginatum* Wall.). Two new species distinguished in this *conforme* group of Indian Elaphoglossums are *E. Ballardianum* Biswas and *E. Krajinae* Biswas. All the three species come under Ordo *Stenoneura*, Sectio *Craspedoglossa* and can be grouped under Divisio *Conformia*, according to Christ's classification of the genus.

The species described by Beddome in Handb. Ferns Brit. Ind. 416 (1883) under the name *E. latifolium* has been rightly separated by Christ in his Mon. des Genus Elaphoglossum, 33 (1899) as *E. laurifolium* (Thouars) Moore. *E. latifolium* is a tropical American species and has not yet been recorded from India. Christensen in his Index Filicum, 304 (1905) accepted Christ's views. My examination of herbarium specimens at Kew, British Museum (Natural History) and Calcutta leads me to the same conclusion. The Indian specimens of *E. squarrosum* (= *E. hirtum* (Sw.) C. Chr.) have also been found to be a mixture of two distinct species. These are at present being described by Dr. Vladimir Krajina as two new South Indian species.

I am indebted to Dr. V. Krajina, Mr. F. Ballard and Dr. T. A. Sprague for their helpful suggestions.

Elaphoglossum marginatum (Wall. ex Fée) Moore, Ind. Fil. 2, 11 (1857). *Acrostichum marginatum* Wall. Cat. 17 (1828) nomen; Fée, 2me. Mém. Foug. 31 (1845) partim; 5me. Mém. Foug. 43 (1853). *Acrostichum conforme* Sw.; Hook. & Bak. Syn. Fil. 401 (1868), partim; C. B. Clarke, Trans. Linn. Soc. Bot. ser. 2, 1, 576 (1880). *Elaphoglossum conforme* (Sw.) Schott; Bedd. Ferns S. Ind. t. 198 (1864); Handb. Ferns Br. Ind. 416, pl. 247 (1883), partim; H. Christ, Monogr. Elaphoglossum, 43 (1899); C. Christensen, Ind. Fil. 305 (1906), Suppl. 3, 103 (1934).

Rhizomata breviter repentia, squamosa. *Squamae* ovato-lanceolatae usque lanceolatae, acutae vel acute acuminatae, interdum minute irregulariter dentatae, 5 mm. longae, basi 2 mm. latae. *Stipites* ± caespitosi, frondium sterilium 3-7.5 cm. longi, frondium fertile usque 15 cm. longi. *Laminae* lanceolatae usque linear-oblongae, basi et apice aequae sensim attenuatae, acutae vel acuminatae, usque 31 cm. longae et 5.2 cm. latae, coriaceae, margine cartilagineo.

Rhizome short, densely scaly; scales dark brown, ovate-lanceolate to lanceolate, acute or acutely acuminate, sometimes minutely irregularly dentate, not hair-pointed, cells elongate with thicker and darker walls than in *E. conforme*, 5 mm. long, 2 mm. broad at base. *Stipes* more or less tufted, reddish-brown, densely scaly at point of attachment to rhizome, sometimes sparsely deciduously 15 cm. long. *Blades* lanceolate to linear-oblong, gradually attenuated at both ends, acute, sometimes acuminate, up to 31 cm. long, 5.2 cm. broad, fertile smaller than sterile, coriaceous; margin

entire, slightly revolute, with a cartilaginous band all round; veins indistinct, 1-forked, attaining the cartilaginous margin. *Sori* dense, uniformly spreading over the entire under-surface on both sides of the smooth reddish-brown or yellowish-brown midrib.

Distribution. Himalayas from Nepal to Sikkim and the Khasia and the Naga Hills in Assam, between 1220 m. and 2225 m.

Wall. Cat. no. 17, Nepal, Sheopore, 1821, Wallich (type in Herb. Kew.); Sikkim, 2100 m., Sept. 1882, Levinge; Sikkim, 180 m., Oct. 1881, Gamble 9884; Sikkim, Jeylap Road, 180 m., Nov. 1880, Gamble 9938; Suru Susu, June 26, 1885, Khasia, 1200-1800 m., Hook. & Thoms.; Kalapauce, Khasia, 1650 m., and Khasia, Oct. 28, 1850, Hook. & Thoms.; Vale of Rocks, 1500 m., Khasia, Sept. 1886, Clarke 45828 C; Shora Reef, 1680 m., Khasia, Oct. 16, 1872, Clarke 19239 E; Lohra, Khasia, 1350 m., Oct. 15, 1872, Clarke 18826 A; Kohima, 1800 m., Oct. 21, 1885, Clarke 40971; Logra Reef, Khasia, 1500 m., Nov. 28, 1871, Clarke 14778; Road from Tonglu to Darjeeling, 2100 m., Oct. 1871, Darjeeling, Levinge; Sikkim Himalaya, Ching Tong, 1500 m., Gammie 293/267; Darjeeling, 2280 m., Oct. 10, 1877, Clarke 26913 A; Sikkim, Dr. Jerdon; Sikkim Himalaya, prestid. Dr. Treutler, May 1875; Chura, Mamloo, on trees, June 1850; Assam, 1870-1880, G. Mann; Herb. Griffith, Birmah? (The locality quoted on the label, "Birmah," is doubted. I have not so far observed any specimen of this species recorded from Burma, although it is possible that the species may extend from the upper hill ranges of Assam to Upper Burma.)

The species differs from others by the structure of its rhizome, the scales, and the characteristic fronds with the cartilaginous band along the margin. *Elaphoglossum conforme*, as the type from St. Helena shows, has a wide creeping rhizome densely matted with soft, rather fragile, pale brown scales; stipes much shorter, developing vertically, almost at right-angles, from the horizontally spreading rhizome; lamina much smaller, up to only 10.5 cm. long and 2.7 cm. broad, apex obtuse, and margin not provided with cartilaginous band; veins slightly wide (about 2 mm. apart). *Elaphoglossum marginatum* is confined to the Eastern Himalayas, growing abundantly in the Khasia Hills from 1000 to 2000 m.

Elaphoglossum Ballardianum Biswas, sp. nov.

Rhizomata repentia, squamosa, usque 5 mm. crassa. *Squamae* ovatae usque ovato-lanceolatae, cordatae, acutae, integrae vel interdum ± irregulariter dentatae vel raro minute fimbriatae, basi pallide brunneae, apicem versus atro-brunneae. *Stipites* frondium sterilium 3.5-15 cm. longi, frondium fertile 5-20 cm. longi. *Laminae* anguste ellipticae usque linear-ellipticae, basi et apice sensim attenuatae, acute acuminatae, usque 20 cm. longae et 3 cm. latae, coriaceae, subtus squamulis punctiformibus nigrescentibus interdum fimbriatis sparsis conspersae, margine haud cartilagineo interdum leviter revoluta; frondes fertiles nonnunquam sterilibus angustiores. *Venae* obscurae.

Rhizome creeping, scaly, up to about 5 mm. thick, furnished with wiry roots; scales ovate to ovate-lanceolate, cordate, acute, often acuminate, pale brown at the base becoming dark to blackish brown towards the apex, puckered or almost bullate when dry, entire or sometimes more or less irregularly toothed or rarely minutely fimbriate, cells densely packed, less elongate towards the apices than those of the above species. **Stipes** from a horizontally creeping rhizome, suberect, naked or with pale brown deciduous scales reaching the base of the lamina or extending to the lower portion of the midrib, 3.5–15 cm. long, in fertile leaves 5–20 cm. long. Blades narrowly elliptic to linear-elliptic, gradually attenuated at both ends, acutely acuminate, up to 20 cm. long, 3 cm. broad, fertile sometimes narrower than sterile, lower surface dotted with punctiform blackish scales which are sometimes fimbriate, margin not cartilaginous, entire, sometimes slightly revolute, texture coriaceous, rather thinner than in the other two species here described; veins faintly visible.

Distribution. Common in the Nilgiri mountains in South India; ascending up to an elevation of 2438 m.

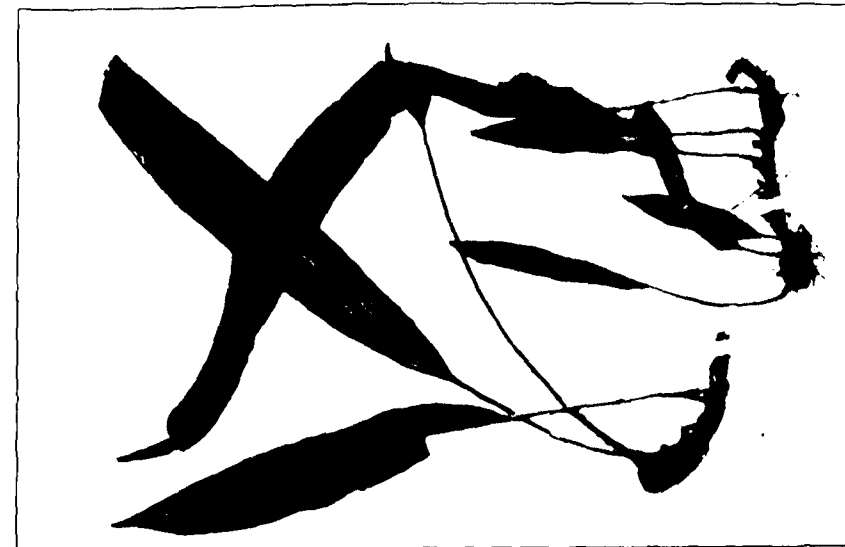
Nilgiris, 2100 m., *Beddome* (type in Herb. Kew.); Nilgiris, 2100 m., *Gamble* 21420; Nilgiris, Otty., 2100 m., Aug. 1885, *Gamble* 16661; Kudrabad, Sispara Road, 2400 m., Nilgiris District, *Gamble* 13473; Kudrabad, Sispara Road, 2400 m., 1883, Nilgiris District, *Gamble* 13474; Nilgiris, *Beddome* 5; Ootacamund, 12/69, *Babcock*.

This new species is quite distinct from *Elaphoglossum conforme*—in the structure of the scales of the rhizome, and the much longer, acute or acuminate lamina, gradually attenuated at both ends. *Beddome's* figures (F.S.I. pl. 198) are not accurate representations of the specimen drawn.

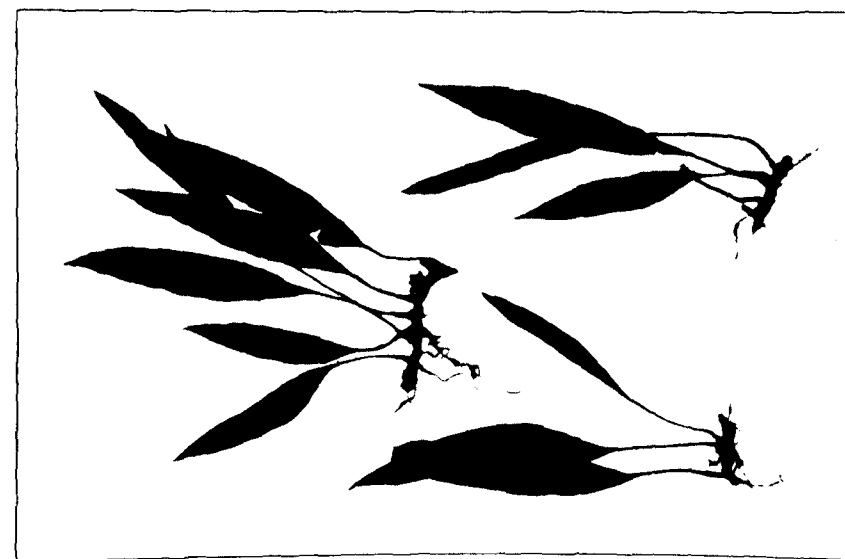
***Elaphoglossum Krajiniae* Biswas, sp. nov.**

Rhizomata late repentia, brunnea, apice squamis dense vestita, usque 1 cm. crassa. **Squamae** ovato-lanceolatae, basi rotundatae, acute acuminatae, integrae vel ± irregulariter lobulatae vel raro remote ciliatae, usque 8 mm. longae, basi 3 mm. latae, molles, fragiles, pallide brunneae. **Stipites** suberecti, nudi vel squamosi, frondium sterile usque 22 cm. longi, frondium fertile usque 26 cm. longi, rubido-brunnei. **Laminae** lanceolatae vel anguste ellipticae usque lineari-oblongae, basi cuneatae vel raro subrotundatae, frondium fertile raro basin versus sensim attenuatae, acutae vel obtusae, integrae, margine crassiusculo saepe revoluta, usque 28 cm. longae et 4 cm. latae, coriaceae. **Venae** indistinctae.

Rhizome wide-creeping, scaly, densely covered with scales at the apex, brown, up to 1 cm. diam.; scales pale brown, rather soft but fragile when dry, ovate-lanceolate, rounded at the base, acutely acuminate, entire or sometimes more or less irregularly lobulate or rarely remotely ciliate, up to 8 mm. long, 3 mm. broad at base, cells of nearly uniform dimensions, not elongated. **Stipes** suberect,



2. *Elaphoglossum Krajiniae* Biswas.
Type sheet collected by Thwaites (C.P. 1311) in
Central Province, Ceylon.



1. *Elaphoglossum pallidum* Biswas.
Type sheet collected by Beddome in the Nilgiris,
2100 m.

naked or squamose, reddish-brown, in sterile leaves up to 22 cm. long, in fertile leaves up to 26 cm. long. *Blades* lanceolate or narrowly elliptic to linear-oblong, cuneate or rarely somewhat rounded at the base, rarely gradually attenuated towards the base in fertile fronds, acute or obtuse, entire, margin rather thick, often revolute, up to 28 cm. long, 4 cm. broad, glabrous on both sides, coriaceous, veins indistinct.

Distribution. In the Nilgiris and Pulney Hills of South India and high hills of Ceylon, ascending up to 2438 m.

Most elevated parts of Cent. Province, Ceylon, *Thwaites* C.P.1311 (type in Herb. Kew.); *Pediotalagalla* 2100–2400 m., Ceylon, 8/67, *Thwaites* C.P.1311 (type number in Herb. Calcutta); Ceylon, *Mrs. Carr*; Bear Shola, Kodaikanal, Pulneys, May 19, 1898, *Bourne* 4972; Kodaikanal Waterfall, Pulneys, May 30, 1898, *Bourne* 4973; Ceylon, *Gardner* 1310, 1165; Nuwara Eeya, Ceylon, May 1906, *Matthew* 635; Adam's Peak, 2100 m., on trees, Feb. 14, 1908, *Matthew*.

This species differs from *Elaphoglossum conforme* and the other two species, in its characteristic rhizome, the scales, and longer, broader, thick-coriaceous, obovate-lanceolate, acute or obtuse lamina. The species is confined to the hills of South India and Ceylon. *Thwaites* no. 1311, quoted by Christ in his monograph (*loc. cit.* p. 36) under *Elaphoglossum laurifolium* is the type number of this new species. Christ evidently accepted, on Beddome's authority, all the sheets of *Elaphoglossum latifolium* of Beddome as *Elaphoglossum laurifolium* without, perhaps, actual reference to the sheets. Such an examination of Indian specimens of the set of *Elaphoglossum latifolium* as identified by Beddome might have prompted Christ to separate this species from the true *Elaphoglossum laurifolium*. *Elaphoglossum laurifolium* (*Acrostichum commutatum* Mett.) is confined to the higher hills of Ceylon and South India. The following specimens at Kew, British Museum (Natural History) and Edinburgh represent authentic *Elaphoglossum laurifolium* (Bedd.) Christ. Bolumpatly Hills, 1500 m., *Beddome*; Ceylon, *Thwaites* C.P. 1310. (as recorded correctly by Christ); Ceylon, *Robinson* 20; Nilgiri Hills, 1200 m., Nov. 1870, *Henderson*; Noolan-Kanda Peak, Matali, Ceylon, Jan. 1860, C. P. 1310.

XXVIII—TROPICAL AFRICAN PLANTS: XVII*.

J. HUTCHINSON.

COMMELINACEAE.

***Floscopa myosotoides* Hutch.** in Hutch. & Dalz. Fl. West Trop. Afr. 2, 311 (1936); affinis *F. flavidae* C. B. Cl., sed caulibus ad apices foliatis, inflorescentiis parce pubescentibus differt.

Caules e basi prostrati et e nodis inferioribus radicales, ad apicem foliati, glabri. *Folia* anguste triangulari-lanceolata, acuta, basi leviter rotundata, 3–4 cm. longa, 0.5–1 cm. lata, glabra;

*Continued from K.B. 1937, 341.

vagina 4 mm. longa, glabra. *Inflorescentia* terminalis, pauciflora, leviter ramosa, pilis brevibus apice glandulosis parce pubescentia; bractee parvae, mox deciduae; pedicelli 2 mm. longi, basi articulati. *Sepala* obovato-elliptica, 1.5-2 mm. longa, glabra. *Petala* coerulea, elliptica, tenuia, 1.5 mm. longa. *Stamina* 6, antheris didymis subglobosis. *Ovarium* bilobum, glabrum; stylus 0.75 mm. longus. *Capsula* obovoideo-globosa, 2 mm. longa, nitida. *Semina* violacea, 1 mm. diametro, multicostata, embryostega orbiculari apice albo-punctiformi.

SENEGAL: Casamance, Feb., *Chevalier* 2582. FRENCH GUINEA: Konkouré, Oct., *Caille*. Fouta Jallon, *Chevalier* 18660. SIERRA LEONE: Mabould, Oct., *N. W. Thomas* 3614 (type in Kew Herb.). Yonibana, Oct., *N. W. Thomas* 4134. Mamaba, *N. W. Thomas* 4552. Malema, Nov., *Deighton* 334. Njala, Oct., *Deighton* 1338. Materboi, Oct., *Glanville* 18. Masataba, weed in rice fields, *Glanville* 50. LIBERIA: Monrovia, Nov., wet sandy soil in thickets, *Linder* 1412.

Floscopa Lelyi Hutch. op. cit. 311; affinis *F. axillari* C. B. Cl., sed inflorescentiis glomerato-ramosis, ramis brevibus, caulibus et foliorum vaginis purpurascentibus differt.

Herba 0.3-0.75 m. lata, semi-erecta; internodia 2.5-4 cm. longa, glabra, purpurascentia. *Folia* lineari-lanceolata, subacuta, e basi ad apicem sensim angustata, 5-6 cm. longa, 6-7 mm. lata, glabra, supra viridia vel purpurascentia, nervis utrinsecus 4-5 prominulis; vagina clausa, 1 cm. longa, in sinu leviter piloso-ciliata. *Inflorescentia* glomerato-ramosa, 3-4 cm. longa, ubique breviter pubescentia; bractee oblanceolatae, parvae; pedicelli 1.5 mm. longi. *Sepala* elliptico-obovata, 3-2.5 mm. longa, leviter pubescentia. *Petala* purpurea, mox decidua, obovata, venosa, sepalis vix aequilonga. *Antherarum loculi* discreti. *Fructus* breviter stipitatus, transverse oblongo-ellipsoideus, 2-2.5 mm. longus, apiculatus. *Semina* ambitu depresso-globosa, obtuse costata, atro-violacea, minute punctata, embryostega verruculosa albida.

NIGERIA. Naraguta, in stony stream beds, Nov., *Lely* 704 (type in Kew Herb.).

Cyanotis bulbifera Hutch. op. cit. 315, 316, fig. 287; affinis *C. angustae* C. B. Cl., sed bractea capitulis subtendente multo breviori, bulbi squamis dense adpresse villosis differt.

Caulis basi bulbiformis, basibus persistentibus foliorum dense villosis indutus. *Folia* late linearia, acuta, 15-20 cm. longa, 6-8 mm. lata, utrinque glabra sed marginibus laxè ciliata. *Inflorescentiae* paucae, subumbellatae, longe pedunculatae; bractea subtendens lanceolata, 2-3 cm. longa, ciliata; pedunculi secundarii inaequales, usque ad 5.5 cm. longi, laxè pubescentes. *Capitula* obliqua, circiter 1 cm. longa, bractea subtendenti lanceolata 1.5 cm. longa leviter recurvata breviter ciliata; bractee flores subtendentes oblique lanceolatae, usque ad 1 cm. longae, pilosae et ciliatae. *Sepala* alba, lanceolata, 3-5 mm. longa, longe pilosa. *Petala* rosea

vel coerulea, alte connata, 7 mm. longa, partibus liberis ovatis striatis. *Filamenta* filiformia, spiraliter torta, apicem versus longe villosa; antherae 1.5 mm. longae. *Ovarium* longe pilosum. *Stylus* undulatus, tenuiter pilosus. *Capsula* pubescens, 3-4 mm. longa; semina laevia.

FRENCH SUDAN: Sikasso, in arid ground, Apr., *Chevalier* 747 (type in Kew Herb.). Couroula, Apr., *Chevalier* 730. IVORY COAST: Valley of the Middle Sassandra, at Orodougou, June, *Chevalier* 21813 bis. NIGERIA: Sokoto Province, abundant, *Dalziel* 543.

Cyanotis scaberula Hutch. op. cit. 315, 316; affinis *C. rubescenti* A. Chev. sed herba erecta haud purpurascens, bracteis minute scaberulis differt.

Herba erecta radicibus numerosis, circiter 10 cm. alta; caules 3-5, glabri. *Folia* pauca, basalia linearia, acuta, 7-9 cm. longa, 1.5 mm. lata, sicco minute scaberula; folia superiora multo minora, lineari-lanceolata; vagina clausa, 7 mm. longa, extra crebre nervosa et minute scaberula. *Capitula* pedunculata, 6 mm. longa, bractea subtendenti ovato-lanceolata et duplo longiori; bractee florales oblique ovatae, acutae, margine hyalinae. *Sepala* oblonga, 5 mm. longa, mucronata. *Petala* in medio tertio conniventia, 7 mm. longa. *Filamenta* filiformia, apicem versus longe et intricate pilosa; antherae 1.25 mm. longae. *Ovarium* apice pilosum; stylus filiformis. *Fructus* non visus.

FRENCH GUINEA: Kouroussa, May, *Pobéguin* 258 (type in Kew Herb.); 368.

Cyanotis Deightonii Hutch. op. cit. 315, 317; affinis *C. lanatae* Benth. sed indumento foliorum et bractearum haud lanato differt.

Herba 1 m. alta; caules simplices, internodiis circiter 9 cm. longis molliter pubescentibus sed haud lanatis. *Folia* late linearia, mucronata, 6-10 cm. longa, 6 mm. lata, breviter pubescentia; vaginae 2 cm. longae, molliter pubescentes. *Capitula* sessilia, multiflora, oblique ovoidea, 2-3 cm. diametro; bractee numerosissimae, oblique oblongo-lanceolatae, acutae, usque 6 mm. longae et 2.5 mm. latae, 3-nervae, longe ciliatae et extra parce pilosae. *Sepala* cymbiformi-lanceolata, apice cucullata, 4.5 mm. longa, carina pilosa. *Petala* connata, 5 mm. longa. *Filamenta* longe villosa. *Ovarium* apice pilosum. *Capsula* triquetra, pilosa. *Semina* verrucosa, embryostega punctiformi.

SIERRA LEONE: Freetown, herb in grassy places, flowers pale blue, Oct., *Deighton* 43 (type in Kew Herb.).

Commelina Thomasii Hutch. op. cit. 317; affinis *C. macrospathae* Gilg et Lederm. ex Mildbr., sed seminibus laevibus laevibus et spathis minoribus differt.

Caules debiles, internodiis glabris. *Folia* late linear-lanceolata, sensim et acute acuminata, ad vaginam breviter angustata, 6-13 cm. longa, circiter 1.5 cm. lata, utrinque breviter sparse pubescentia,

nervis parallelis utrinsecus circiter 4 prominulis; vaginae 2 cm. longae, tenuiter pilosae, apice obliquae et longe ciliato-pilosae. *Spatha* terminalis, solitaria, pedunculata, ovata et longe rostrato-acuminata, 5 cm. longa, 2 cm. lata, utrinque parce pubescentia, marginibus liberis minute ciliolatis; pedunculus 2-2.5 cm. longus, pubescens. *Inflorescentia* 3-flora, leviter exserta; pedicelli 6 mm. longi, demum recurvati. *Sepala* obovata, 4 mm. longa. *Petala* 6 mm. longa. *Capsula* ellipsoidea, rostrata, 6 mm. longa, glabra. *Semina* oblongo-ellipsoidea, 2.5 mm. longa, laevia, leviter carinata.

SIERRA LEONE: Yonibana, Nov., N. W. Thomas 5205 (type in Kew Herb.).

Polyspatha glaucescens Hutch. op. cit. 320; affinis *P. paniculatae* Benth., sed foliis angustioribus, inflorescentiis plerumque solitariis et foliis minoribus, bracteis haud longe ciliatis differt.

Herba decumbens; caules e nodis inferioribus radicales, leviter pubescentes, internodiis interdum elongatis. *Folia* elliptica vel elliptico-obovata, sensim acuminata, basi acuta, 5-9 cm. longa, 2.5-4 cm. lata, glabra, nervis parallelis utrinsecus circiter 3 sicco prominulis, nervis transversis vix manifestis; vaginae 1-1.3 cm. longae, apice oblique truncatae et parce ciliatae. *Inflorescentia* plerumque solitaria, 5-6 cm. longa; axis flexuosus, breviter pubescens, basin versus bractea foliacea oblongo-lanceolata 2 cm. longa instructus; bractae 2-florae, reflexae, late ovatae, subacutae, 1 cm. longae et latae, circiter 7-nervae, breviter ciliatae. *Sepala* elliptica, 6 mm. longa, 1-nerva, glabra. *Petala* et stamina non visa. *Ovarium* glabrum. *Fructus* non visus.

IVORY COAST: Morénou, Dec., Chevalier 22470. CAMEROONS MT.: 950 m., Dec., Mann 2138 (type in Kew Herb.). FERNANDO PO: 600 m., Mann.

LILIACEAE.

Scilla picta A. Chev. Explor. Bot. Afr. Occid. Franç. 657, nomen (1920); Hutch. op. cit. 350; affinis *S. camerooniana* Baker, sed pedicellis brevioribus, racemis foliis longioribus, foliis angustioribus differt.

Bulbi anguste vel late ovoidei, usque ad 3 cm. longi, squamis membranaceis nitidis induti. *Folia* 3-5, maculata, lineari-lanceolata, utrinque attenuata, usque ad 15 cm. longa et 1 cm. lata, 8-10-nervia, glabra, tenuia. *Racemi* foliis longiores, graciles; bractae parvae, glabrae; pedicelli usque ad 5 mm. longi. *Perianthii segmenta* 4 mm. longa, oblongo-elliptica, margine anguste membranacea. *Filamenta* 2 mm. longa; antherae 0.75 mm. longae. *Ovarium* glabrum. *S. mankonensis* et *S. sudanica* A. Chev. op. cit. 657, nomina.

FRENCH SUDAN: Gourma; between Diapaga and Fada, July, Chevalier 24416 (type in Paris Herb.); between Fada and Koupela, July, Chevalier 24513; Karankasso, May, Chevalier 902; Mossi, Aug., Chevalier 24624. FRENCH GUINEA: Faranna, May, Chevalier 13413; Kankan-Kouroussa, Brossart in Herb. Chevalier 15719.

IVORY COAST: Mankono country, June, Chevalier 21855; 21871 bis. DAHOMEY: Savalou Circle, between Banté and Pira, May, Chevalier 23742.

Drimia incerta A. Chev. Explor. Bot. Afr. Occid. Franç. 653, nomen (1920); Hutch. op. cit. 351; species foliis linearibus piloso-ciliatis, bracteis parvis mox deciduis distincta.

Bulbus ovoideus, circiter 6 cm. longus, 3 cm. diametro. *Folia* immature tantum visa, linearia, piloso-ciliata, basibus persistentibus et purpurascens. *Racemi* graciles, circiter 40 cm. longi, in parte tertia superiore floriferi; flores pauci (12-15), ascendentes vel patuli; pedicelli 3 mm. longi; bractae mox caducae, e basi lato lineares, 5 mm. longae. *Perianthium* 1.4 cm. longum, segmentis dimidio inferiore connatis mox recurvatis vel fere reflexis demum spiraliter contortis. *Stamina* segmentis subaequilonga. *Capsula* ambitu elliptico-orbicularis, circiter 8 mm. longa et 7 mm. lata. *Semina* nigra, compressa.

IVORY COAST: Upper Sassandra, near Gouékouma, about 750 m., May 1909, Chevalier 21656 bis. Dourou Mountain, 900 m., near Kouale, May 1909, Fleury in Herb. Chevalier 21733 (type in Paris Herb.).

Asparagus Warneckei Hutch. op. cit. 351, 352; affinis *A. racemoso* Willd., sed pedicellis basin versus articulatis, cladodiis longioribus differt.

Scandens; rami flexuosi, satis robusti, angulati, spinis recurvatis 7 mm. longis acutissimis armati. *Cladodia* plerumque fasciculata, acinaciformia, acuta, 3-4 cm. longa, 2-2.5 mm. lata, uninervia, glabra. *Inflorescentiae* racemosae, plerumque fasciculatae vel interdum solitariae, basi spina brevi armatae, usque ad 5 cm. longae; bractae ovato-triangulares, acutae, 3.5 mm. longae, glabrae; pedicelli 5-6 mm. longi, basin versus articulati. *Flores* cremei, odorati. *Perianthii segmenta* anguste obovata, 4 mm. longa. *Filamenta* 2.5 mm. longa; antherae 0.75 mm. longa. *Ovarium* breviter et crasse stipitatum, glabrum, stylis erectis ad medium connatis. *Fructus* non visus. *A. drepanophyllus* var. *Warneckei* Engl. ex Hutch. op. cit. 352, nomen.

FRENCH GUINEA: Pita, Nov., Pobéguin. GOLD COAST: Accra Dodowah Plains, Feb., Irvine 1502. TOGO: near Lome, Warnecke 28 (type in Kew Herb.).

ARACEAE.

Amorphophallus gracilior Hutch. op. cit. 361, 362; affinis *A. consimili* Blume, sed spatha et spadice breviori, pedunculo longo differt. *A. gracilis* A. Chev. Explor. Bot. Afr. Occid. Franç. 680, nomen, non Engl.

Tuber depressus, 3-3.5 cm. diametro, apice vaginis membranaceis instructus. *Folia* non visa. *Scapus* 15-20 cm. altus; pedunculus gracilis, circiter 3 mm. crassus, glaber. *Spatha* late lanceolata, sensim acute acuminata, 4-5.5 cm. longa, marginibus inferne

convolutis, utrinque glabra, extra tenuiter striato-nervosa. *Spadix* spatha fere duplo longior, intra spatham sessilis, parte feminea 5 mm. longa, mascula 1.3 cm. longa, appendice 4-5 cm. longa gracili superne leviter ampliata. *Stamina* poris duobus dehiscentia. *Ovaria* globosa, stigmatibus obovoideis.

DAHOMÉY: Zagnanado Circle, Hollis Country, between Adjaouéré and Abbo, Feb. 1910, *Chevalier* 22957 (type in Paris Herb.).

Anubias gracilis A. Chev. Explor. Bot. Afr. Occid. Franç. 683, nomen (1920); Hutch. op. cit. 365, 366; species foliis leviter hastato-trilobatis lobis ovato-oblongis distincta.

Petoli 20-25 cm. longi, graciles, angulati. *Folia* leviter hastato-trilobata, ambitu triangularia, circiter 12 cm. longa et 10 cm. lata, glabra, lobis ovato-oblongis apice rotundatis, nervis lateralibus numerosis prominentibus intra marginem conjunctis, venulis transversis obscuris. *Pedunculi* graciles, 12-14 cm. longi, glabri. *Spathae* late ellipticae, mucronatae, 2.5 cm. longae, fere 1.5 cm. latae, obscure nervosae. *Spadix* spatha aequilongus, parte superiore $\frac{3}{4}$ floribus masculis dense aggregatis indutus, inferne floribus femineis circiter 30. *Ovarium* late ovoideum, stylo brevi, stigmatibus discoideo parvo.

FRENCH GUINEA: Konianke's country; Fassakoidou, Feb. 1909, *Chevalier* 20800 (type in Paris Herb.).

Anubias gigantea A. Chev. Explor. Bot. Afr. Occid. Franç. 683, nomen (1920); Hutch. op. cit. 365, 366; affinis *A. gracili* A. Chev. ex Hutch., sed foliis profunde trilobatis, pedunculis longioribus, spatha multo longiori differt. *A. gigantea* var. *tripartita* A. Chev. op. cit.

Petoli crassi, sicco angulati, apice pro 2 cm. tumidi. *Folia* profunde hastato-trilobata, lobo medio ovato-triangulari apice rotundato obtuso circiter 15 cm. longo et 10 cm. lato, lobis lateralibus oblongo-lanceolatis obtusis 15-16 cm. longis usque ad 6 cm. latis, nervis lateralibus arcuatis numerosis. *Pedunculi* robusti, circiter 6 mm. crassi, circiter 25 cm. longi. *Spathae* valde convolutae, abrupte apiculatae, 7-8 cm. longae. *Spadix* spatha leviter longior, parte superiore $\frac{5}{8}$ floribus indutus, inferne floribus femineis dense aggregatis.

FRENCH GUINEA: Nionsomoridou, near Beyla, 600-700 m., Feb. 1909, *Chevalier* 20857 (type in Paris Herb.); between Dienedou and Nionsomoridou, 600-700 m., Feb. 1909, *Chevalier* 20858. IVORY COAST: Upper Sassandra; Toura country, between Farafina and Ouodé, May 1909, *Chevalier* 21634; between Sanrou and Ouodé, May 1909, *Chevalier* 21606.

IRIDACEAE.

Aristea djaloni Hutch. op. cit. 375, 376. *Anthericum djaloni* A. Chev. Explor. Bot. Afr. Occid. Franç. 648, nomen (1920); inter species africanas occidentales inflorescentia plerumque ramosa axi fere alato distincta.

Rhizoma breve, radicibus gracilibus numerosis; caulis usque ad 50 cm. altus, laxe foliatus. *Folia* radicalia linearia, usque ad 20 cm. longa, 5 mm. lata, crebre nervosa, glabra, marginibus tenuibus brunneo-scleriosis. *Flores* non visi. *Infructescentia* simplex vel parce ramosa; axis complanatus, fere alatus; bracteae inferiores oblongo-lanceolatae, circiter 2 cm. longae. *Fructus* glomerati, sessiles, oblongo-ellipsoidei, mucronati, nigrescentes, fere 1 cm. longi, seminarum impressionibus undulati et obscure reticulati. *Semina* leviter verrucosa.

FRENCH GUINEA: Dalaba-Diaguissa Plateau, Fouta-Jallon, 1000 m., fr. Sept.-Oct., 1907, *Chevalier* 18859 (type in Paris Herb.). Diaguissa, 1300-1400 m., fr. Apr. 1905, *Chevalier* 12652.

AGAVACEAE.

Dracaena scoparia A. Chev. Explor. Bot. Afr. Occid. Franç. 647, nomen (1920); Hutch. op. cit. 383, 384; affinis *D. Mannii* Baker, sed frutex, inflorescentia gracillima, pedicellis fructiferis multo longioribus differt.

Frutex 2 m. altus; rami ultimi glabri, circiter 6 mm. diametro. *Folia* conferta, lineari-oblongata, acute mucronata, basi semi-amplexicaulia, usque ad 35 cm. longa, 3-5 cm. lata, nervis parallelis utrinque circiter 15 prominulis; costa infra valde prominens. *Inflorescentia* paniculata, gracillima, 30-35 cm. longa, ramis gracilibus patulis usque ad 15 cm. longis; bracteae inferiores ovato-oblongae, apiculatae, 1 cm. longae, extra distincte nervosae; pedicelli 5 mm. longi, demum (fructu) rigidi et 1.5 cm. longi, supra medium articulati. *Perianthium* alabastro tantum visum, 6 mm. longum. *Fructus* subglobosus et 1.5 cm. diametro vel didymus et 2.5 cm. latus, laevis.

IVORY COAST: Erymacougnié, fl. Jan. 1907, *Chevalier* 16967 (type in Paris Herb.); Alepe, Attie Prov., fr. Feb. 1907, *Chevalier* 17484.

XXIX—NEW OR LITTLE-KNOWN PLANTS FROM SOUTHERN INDIA: X.* C. E. C. FISCHER.

N.B.—The regions noted in brackets after the name of the species are those from which it has been previously reported.

Tetracera scandens (Linn.) Merr. [Dilleniaceae].

(Assam to Singapore and Ceylon.)

TINNEVELLI DISTRICT: Tirukurungadi Hills, fls. May, P. V. *Mayuranathan* (in Herb. Madras Mus.) without number.

Begonia Aliciae C. E. C. Fischer, sp. nov. [Begoniaceae].

B. crenatae Dryand. peraffinis, sed foliis acuminatis haud cordatis, nervis basalibus paucioribus, perianthii ♀ segmentis 6, capsularum alis sub ovario decurrentibus acutis cohaerentibus differt.

* Continued from K.B. 1938, 126.

A scapigerous *herb*, rhizome short, apparently fleshy, with numerous fibrous rootlets. *Leaves* ovate to rotund-ovate, acute or acuminate, base rounded or nearly truncate, 5–13 cm. long, 3.2–8.5 cm. wide, basal nerves 5, the two next the midrib nearly vertical for a short distance and then bending outwards, 2 lateral pairs ascending from the midrib above the middle, all the nerves forking and running to the lobulate, apiculate crenate margins, upper surface furnished with scattered short, stout hairs, glabrous below; petioles 2.5–6 cm. long. *Scape* 10–30 cm. long, sometimes bearing a simple leaf similar to the radical, but much smaller, below the middle, with narrowly ensiform, acuminate stipules up to 5 mm. long; bracts at the forks ovate, acute, 3–5 mm. long; bracteoles similar, smaller. *Flowers* pink, monocious, the ♂ above the ♀; pedicels up to 2.6 cm. long. ♂ *perianth-segments* 4, subequal, broadly elliptic or elliptic-obovate, obtuse, 1 cm. long, 5.5 mm. wide. *Stamens* monadelphous, column 1.4 mm. long, free part of filaments up to 1 mm. long; anthers about 16, oblanceolate, 1.2 mm. long. ♀ *perianth-segments* 6, oblong, obtuse or sometimes the inner acute, 9.3 mm. long, 4.6 mm. wide, the innermost usually considerably smaller and narrower. *Styles* 3, 2.6 mm. long, rather stout; stigmas broad, curved into a half circle. *Ovary* subglobose, somewhat compressed, 3.5 mm. long with a semi-obovate wing on either side 7.5 mm. long, 2.5 mm. wide, united below the ovary and tapering into the petiole, apex abruptly apiculate, one face furnished with a keel 2 mm. wide decurrent along the united wings, wings and petiole minutely glandular; ovary 2-celled, placentae 2 in each cell. Ripe *capsule* not seen, young ones with the united wings acute at the base.

TRAVANCORE HIGH RANGE: Kadalaar Valley, 1500 m., in evergreen forest, fls. Sept., *E. Barnes* 1673, 1674 (type in Kew Herb., including material in spirit); NILGIRI HILLS: Devala, 920 m., fls. Nov., *J. S. Gamble* 15549. Mr. Gamble had named this sheet "B. canarana Miq.?", and had also written "may be *crenata* or a new sp." It is not in very good condition. The specific epithet commemorates Mrs. Barnes.

Ophiorrhiza Barnesii C. E. C. Fischer, sp. nov. [Rubiaceae].

O. caudata C. E. C. Fischer affinis, sed inflorescentiis axillaribus majoribus, bracteolis linearibus, corollis anguste infundibularibus differt.

A glabrous *herb*; stem (basal part and root not seen) somewhat woody below, terete, fistular, purplish brown, very young shoots minutely puberulous. *Leaves* lanceolate to ovate-lanceolate, caudate acuminate, base tapered and more or less decurrent on the petiole, often slightly asymmetric, 6.5–13 cm. long, 2–4 cm. wide, dark green above, paler below, lateral nerves 6–8 pairs, upcurved, anastomosing close to the margins; petioles 1.5–3 cm. long; stipules minute, ovate, very early deciduous. *Inflorescence* axillary; peduncles 2.5–6 cm. long, branches up to 3.5 cm. long in fruit; bracts at the base of the divisions and bracteoles linear, acuminate,

up to 6 mm. long, 1-nerved, brown when dry; pedicels up to 1 mm. long in flower, up to 1 cm. long in fruit. *Calyx* with receptacle 2 mm. long, very shortly produced above the ovary, lobes ovate-lanceolate, acute, 1 mm. long. *Corolla* narrowly funnel-shaped, 9.5–10 mm. long, white; lobes ovate, obtuse, 3–6 mm. long. *Stamens* inserted a little below the middle of the corolla-tube which is white-hairy in that region, included; filaments filiform 2.5 mm. long; anthers linear acute, 1.5 mm. long. *Style* slender, 1.5 mm. long; stigmas ovate, as long as the style, puberulous. *Capsules* narrowly obcordate, 2.5 mm. long, 6 mm. wide, remnants of calyx teeth inconspicuous. *Seeds* minute, brown, more or less quadrate, angled; testa minutely reticulate.

TRAVANCORE HIGH RANGE: Kalaar Valley, fls. & frt. Sept., *Barnes* 1753, 1754 (type in Kew Herb.).

Anaphalis Barnesii C. E. C. Fischer, sp. nov. [Compositae].

Ab *A. Notoniana* DC. caulibus majoribus glabris, foliis minoribus lanceolatis marginibus recurvatis, capitulis paucioribus majoribus, phyllariis majoribus ovatis vel spathulatis albis recedit.

A *herb* 44–75 cm. high, woody below; rootlets slender; stems brown striate, sparsely branched, covered with and, except near the base, almost concealed by the imbricating leaves. *Leaves* sessile, erect and adpressed, sometimes spreading near the base of the stem and of the branches, lanceolate, subacute, 1–1.3 cm. long, 5 mm. wide, margins folded back, greyish-tomentose on both sides. *Inflorescence* terminal, corymbose, densely buff-felted, partial main peduncles up to 2.5 cm. long. *Capitula* sessile or on peduncles up to 6 mm. long, broadly campanulate, 6–10 mm. diam. *Phyllaries* 5–6-seriate, 5–6 mm. long; the outermost ovate, densely long-silky-tomentose on the back, the median lower half rigid, convex and brown on the back, the fringed margins and apex scarious, white, acute; innermost spathulate, obtuse or subacute, basal half rigid, white with a median brown stripe, apical half scarious, entire, white usually with greenish or olivaceous markings, glabrous except for a patch of long hairs at about the middle of the back; intermediate in shape and texture passing from the outer to the inner. *Corolla* 2.5 m. long, yellow, 4-toothed; tube of ♀ florets slender, slightly swollen at the base and slightly expanded at the mouth, teeth lanceolate, short, acute, more or less covered outside with minute yellow glands. *Staminal* filaments short, anthers 1.5 mm. long, tails fringed, tips acute and frequently black-hairy. *Style*-arms 2, truncate, more or less hairy. ♀ *florets* similar but more slender, not swollen at the base and without stamens. *Achenes* narrowly oblong, apex truncate, glabrous, faintly and bluntly 4-angled, 1.5 mm. long. *Pappus* scanty, white, ascendingly barbellate.

TRAVANCORE HIGH RANGE: fls. & frt. Sept., *Barnes* 1703, 1704 (type in Kew Herb.).

Senecio Mayurii C. E. C. Fischer, sp. nov. [Compositae].

S. Grahami Hook. f. et *S. belgaumensi* C. B. Clarke peraffinis, sed ab ambobus caulibus indumento floccoso, foliis angustioribus venis paucioribus, phyllaribus scariosis marginatis, ligulis brevioribus, praeterea ab hac pappo praesente differt.

An *undershrub*; stem flexuous, brown-floccose in the middle part, becoming glabrous, cobwebby upwards; roots and base of stem not seen. *Leaves* alternate, lanceolate, coarsely dentate or lobulate, sometimes with a deeply cut narrowly lanceolate lobe at the base on one or both sides, teeth and lobes apiculate with smaller marginal apiculate teeth, acute or acuminate, base tapered into the petiole, the uppermost sometimes sessile with a broad, acutely and deeply lobed auricle, 2.5-6 cm. long, 8-22 mm. wide, lateral nerves 3 pairs, more if there are basal lobes, ascending at a very sharp angle from the midrib, forking outwards, each branch running into a lobe or tooth, dark-brown when dry, above with scattered multicellular hairs, white-cottony below with the prominent midrib and lateral nerves brown; petioles slender, 6-15 mm. long, more or less brown-hairy. *Capitulum* campanulate, in small dichotomous cymes from the upper axils and terminating the branchlets up to 4 cm. long; bracts at the forks linear, up to 2.5 cm. long, brown-puberulous above, cottony below; ultimate peduncles slender, up to 2.5 cm. long, white- or brown-puberulous, bearing usually several slender, linear puberulous bracteoles up to 7 mm. long. *Phyllaries* about 20 in 2 series, linear to linear-oblong, finely acuminate, 2.7-4 mm. long, up to 1 mm. wide, dark-brown (when dry) with a narrow or broad pale-brown, scarious margin, the dark portion bearing rather thick brownish hairs on the back. *Receptacle* pitted. *Ligulate florets* about as many as the phyllaries, up to 7 mm. long; ovary linear, sparingly pubescent, 1 mm. long; pappus of a few ascendingly barbellate brownish-white bristles up to 1.7 mm. long; ligules narrowly oblong, 4-5-veined, 3-toothed, yellow, puberulous without; style 0. *Disk florets* numerous, 2.8-3 mm. long; ovary and pappus as in the ligulate florets but the pappus more ample and longer. *Corolla* cylindric, very slightly widened to the apex, yellow, puberulous without, rather densely so on the 5 short, bluntly triangular teeth; anthers short, obtuse, muticous; style-arms short, truncate. *Achenes* narrowly oblong, slightly widened to the apex, terete or slightly compressed, 1.9 mm. long, 8-ribbed, ribs bearing short bristles; pappus a little longer than the achene.

MYSOORE STATE: Kemmangandi Hills, fls. and frt. Nov., *P. V. Mayuranathan* (type in Kew Herb., co-type in Madras Museum).

I have much pleasure in naming this plant after the finder, my friend Mr. P. V. Mayuranathan, Botanical Curator at the Madras Museum, who has done much to improve the knowledge of the S. Indian flora.

Mimulus nepalensis Benth. [Scrophulariaceae].
(Nepal to Assam, Japan.)

Travancore High Range: Mannavan Shola in Marsh, 1850 m., fls. Sept., *Barnes* 1671, 1672. The specimens of Professor Barnes differ from the typical ones only in the leaves being rather broader, i.e. broadly ovate to subcircular, 9-16 mm. long, 7-15 mm. wide.

Didymocarpus Humboldtiana Gardn. var. **recedens** C. B. Clarke [Gesneriaceae].

(Ceylon.)

Travancore High Range: Periakanal at foot of rocks, fls. & frt. Sept., *Barnes* 1697.

Pholidota pallida Lindl. [Orchidaceae].

In the Fl. Brit. Ind. this species was united with *P. imbricata* Lindl. but there are good grounds, as pointed out to me by Mr. V. S. Summerhayes, for considering the two as separate species. It is the first only and not the latter that is found in S. India. It is not very easy to distinguish between the two with herbarium material but the distinctions are readily apparent in living plants. *P. pallida* has dark-green, ovate, tapering pseudobulbs, stiffly coriaceous, dark-green, obovate to oblanceolate leaves, flowers not regularly imbricate and appearing about September. *P. imbricata* has pale-green, subcylindric pseudobulbs distinctly truncate at the apex, its leaves are less coriaceous and paler green, more elongate, oblanceolate with a tapered apex, the flowers are regularly and closely distichous and appear about June, the scape is flat though sometimes somewhat twisted.

Cephalostachyum pergracile Munro [Gramineae].

(Chota Nagpur, Assam, Burma).

Rampa Agency, Pamuluru Valley, fls. Dec. *R. B. Cornwell* 5252.

XXX—MISCELLANEOUS NOTES.

The Herbert Medal.—DR. J. HUTCHINSON has been awarded the Herbert Medal of the American Amaryllis Society for 1939, for his "Services in the systematic botanical treatment of the Amaryllis family and related subjects, and especially for his far-sighted phylogenetic understanding of the fundamentals of these interesting plants, which has been an inspiration to other workers in the field."

Appointments in the Colonial Agricultural and Forestry Services.—We learn with interest of the following appointments: MR. R. JOHNS, Agricultural Officer, Zanzibar, to be Agricultural Officer, Fiji; MR. A. F. NICHOLS, Assistant Director of Agriculture, Seychelles, to be Director of Agriculture; MR. W. M. ROBERTSON, Conservator of Forests, Sierra Leone, to be Conservator of Forests, Tanganyika Territory; MR. R. O. WILLIAMS, Chief Horticultural Officer, Palestine, to be Deputy Director of Agriculture, Trinidad and Tobago.

ERNEST GEORGE SALT BROWN.—The untimely death of Dr. E. G. S. Brown, B.Sc., Ph.D., on 5th April 1939, came as a great shock to his colleagues in the Herbarium. Brown, who was Temporary Botanist in the Herbarium, had been on sick leave since early in January on account of the state of his heart. His health, however, had improved considerably by early in April and he was hoping to be able to return to work early in May, when a sudden heart attack proved fatal.

Brown was a Scotsman and was born in Edinburgh on 31st January 1910. He was educated at Broxburn High School, Skerry's College, Edinburgh and the University of Edinburgh. He graduated B.Sc. with First Class Honours in Botany in 1934 and was awarded a Baxter Natural Science Scholarship in the same year. Two years later Brown obtained his Ph.D., his thesis for this degree dealing with the floral development of various genera of the *Theaceae*.

Whilst his studies at the University were principally morphological, Brown spent considerable time working in the Herbarium of the Royal Botanic Garden, Edinburgh. After obtaining his Ph.D. he acted both as Demonstrator in Botany at the University and as a part-time assistant in the Herbarium, where he gained considerable knowledge of the routine methods employed.

In 1937 Brown was appointed Temporary Botanist at the Royal Botanic Gardens, Kew, and he took up his new duties in the Herbarium on 28th June. His time at Kew was occupied with routine work on tropical African phanerogams, including the identifications of current collections.

Brown was a careful worker and quickly gained a knowledge of the groups on which he worked. The nature of the appointment he held did not allow of his devoting official time to research, yet, being keen to attempt some taxonomic work, he had devoted much time to revising the genus *Harrisonia* A. Juss.

Brown's loss has been greatly felt at Kew both by his colleagues in the Herbarium and by his friends at the tennis club, of which he was a keen member.

JOHN CHARLES WILLIAMS.—British horticulture has lost a notable personality by the death of Mr. J. C. Williams, which occurred at Caerhays Castle on 28th March; and especially does that apply to those interested particularly in rhododendrons. Caerhays is situated on the south coast of Cornwall, where the climate is very mild and the rainfall generous, and it is unlikely that there is in the British Isles a locality with conditions better suited for the cultivation of rhododendrons. It was fortunate for English gardening that Caerhays was owned by so enthusiastic a collector and so capable a cultivator. The explorations of Wilson, Forrest, Kingdon Ward and others inaugurated an entirely new era in rhododendron culture in this country, and no-one took advantage

of the new opportunities more eagerly and more successfully than Mr. Williams.

It would nevertheless be erroneous to infer that the horticultural interest of Caerhays centred solely in its rhododendrons. Mr. Williams was as keenly interested in many other genera. The Asiatic species of *Magnolia* there, for instance, are probably more numerous—certainly, taken altogether, they are finer—than in any other property in the British Isles. He was also much attracted by species of *Styrax*, *Enkianthus*, *Erica*, evergreen *Quercus*, *Fuchsia* and *Camellia*, besides being an enthusiastic breeder of daffodils.

One cannot visit Caerhays without being impressed not only by the health and vigour of its vegetation but also by its high quality. This is due to the severe selectiveness of its late owner; for anything inferior, no matter what its origin or credentials, was rooted out.

In what one may term ordinary gardening such as bedding, rock gardening, herbaceous borders, pergolas and so on, Mr. Williams took little or no interest; in fact he was rather contemptuous towards some of these items. Like many another forceful character, he had strong likes and dislikes in other things besides plants.

He was born in 1861 and was educated at Rugby and Trinity Hall, Cambridge. He succeeded to the Caerhays estate on the death of his father in 1880 and soon began to take an active part in Cornish affairs. He was High Sheriff of the County in 1888, joined the County Council the following year, and was a member of Parliament from 1892 to 1895. From 1918 until 1936 he was Lord-Lieutenant of Cornwall.

One very attractive side of Mr. Williams's character was his generosity. If he possessed a good thing in plant life the last of his wishes would be to keep it exclusively for Caerhays. Kew has had much to thank him for; many of the rhododendrons in the Temperate House and Rhododendron House were presented by him.

W. J. BEAN.

A New Species of *Carex*.—*Carex streptorrhapha* Nelves, sp. nov.; affinis *C. agglomeratae* C. B. Clarke, sed foliis et bracteis inflorescentiam longe superantibus, bracteis longe vaginantibus, spica terminali omnino mascula, spicis femineis longioribus et subfastigiatis, pedunculis longioribus praecipue differt.

Culmi laxae caespitosi, 21-23 cm. alti, subvalidi, triquetri, glabri, foliati, basi vaginis aphyllis purpureo-brunneis vestiti. *Folia* 3 mm. lata, marginibus revoluta, scabrida, superiora rubro-brunneae, demum superantia, longe vaginantia; vaginae rubro-brunneae, demum reticulatim fissae. *Spicae* 7-8, subfastigiatæ, superiores sessiles et longius pedunculatae, inferiores 1 vel 2 parum distantes vel breviter pedunculatae, bracteatae; mascula lineari-cylindrica, 1.5-2 cm. longa; laterales femineae, plerumque 1.5-2 cm. longae, oblongae, subdensiflorae. *Bracteae* foliaceae, inflorescentiam longe superantes, longe vaginantes. *Squamae* femineae ovato-lanceolatae,

inferne albescenti-hyalinae, superne brunnescentes, marginibus late albescenti-hyalinae, obtusae, carinatae, carina in mucronem sublongum leviter scabrum excurrente. *Utriculi* 3-4 mm. longi, squamis leviter longiores et latiores, stramineo-virides, suberecti, trigoni, ovoidei, distincte marginati, dense punctulati, enerves sed basi obsolete nervosi et contracti, in rostrum mediocre teres brunneum demum oblique curvatum et interdum leviter tortum ore albescenti-hyalinum subintegrum subabrupte abeuntes. *Nux* arcuata inclusa, obovata, trigona, lateribus concavis, dense papillosa, stipitata, rostrata, stipite et rostro leviter torto-curvato. *Stylus* basi incrassatus. *Stigmata* 3.

BURMA-TIBET FRONTIER. Adung Valley, 28° 20' N., 97° 40' E., sources of the Irrawaddy, open grassy places along the river bank and by streams, 2400-3000 m., 6 June, 1931, *F. Kingdon Ward* 9598 (typus in Herb. Mus. Brit.).

Plant and Animal Communities.—The growth of ecology in the past three decades has been phenomenal and has resulted in the publication of an overwhelming number of books, journals, and scattered papers. It is impossible for anyone who is not specializing in ecology to keep abreast with the wealth of ideas, concepts, and terms which are based sometimes upon detailed field studies and sometimes, one is inclined to think, upon considerations from a study arm-chair. Nevertheless, no biologist who wishes to avoid becoming a narrow specialist can afford to neglect the main developments of ecology. For this reason there should be a wide welcome for the Proceedings of the Conference on Plant and Animal Communities, held at the Biological Laboratory, Cold Spring Harbour, Long Island, New York, from August 29 to September 2, 1938, and published in the American Midland Naturalist, 21, 1-255, January 1939. In the Proceedings, ten papers are published in full and the discussions are given at the end of the papers to which they referred. How far the discussions were edited is not stated but they keep remarkably well to the subject-matter of the paper which they often elucidate considerably. Useful lists of references are appended to the papers. The papers deal with a variety of ecological subjects: botanical, zoological, biological, and sociological, and all repay serious reading.

H. S. Conrad is obviously a pragmatist, and the introductory remarks to his paper "Plant Associations on Land" can be applied with advantage to other subjects than ecology. He very concisely outlines the principal standpoints of the main schools of ecology. He points out that these have been greatly influenced by the nature of the communities studied, that is by the communities characteristic of the country in which the "school" is situated. To discuss just why there is no British "School" of ecology might lead us into a study of national psychology. Conrad quite definitely accepts associations of plants on land as definable entities, susceptible of naming and classifying.

G. E. MacGintie and F. E. Eggleton deal respectively with Littoral Marine Communities and Fresh-Water Communities, both from the zoological standpoint. J. R. Carpenter discusses The Biome, and concludes that "the concept that the community is an organism, while perhaps a useful adjunct, is not essential to the acceptance of the concept of the biome as expressing a living dynamic ecosystem of living organisms, dependent in its climax stages not upon the habitat but upon climate."

The most controversial paper is that by H. A. Gleason on The Individualistic Concept of the Plant Association. His thesis is summarized as follows: "environment varies constantly in time and continuously in space; environment selects from all available immigrants those species which constitute the present vegetation, and as a result vegetation varies constantly in time and continuously in space." It is quite obvious from the context that Gleason does not mean his conclusion to be taken too literally and some of his explanations or elaborations of possible objections tone down very considerably the bald statement just quoted. Gleason does emphasize one very important matter often ignored by ecologists: that only those species can immigrate into an area (or a community) whose disseminules are available within migrating distance. There are several corollaries of this truism that are of importance both in ecology and phytogeography and would repay detailed investigation.

T. Lippmaa in his paper on The Unistratal Concept of Plant Communities (the Unions) considers, in some detail, the advantages of intensive and extensive studies of a single "union," i.e. a community occupying only one height stratum of the aerial parts. He pays particular attention to the *Galeobdolon*—*Asperula*—*Asarum* union of the large-leaved deciduous forest of Eurasia. His paper leads to discussion of many matters of general interest, as, for example, the value of phytogeographical research to ecologists and the influence of the Ice Age on European vegetation.

S. A. Cain discusses the Climax and its Complexities. He accepts the view that Clements's climaxes and associations are physiognomic-floristic groups of undoubted verity. He considers that Clements's scheme, including its latest modifications and extensions, presents a scientifically and philosophically sound system. Certain objections to the all-inclusiveness of the Clementian system are answered, but several others are merely stated and not refuted except in vague general terms. While, for example, it may be true that "most of the differences between the adherents of the monocl意思max hypothesis and the polyclimax hypothesis are differences of *terminology*," it seems evident that attention should be given to community differences that do not fit into the monocl意思max scheme other than by the mere manufacture of a new subordinate term.

The last three papers are sociological, in one or other sense, and not primarily of botanical interest.

In conclusion, a doubt may be expressed regarding the value of manufacturing quite so many terms to express grades, kinds, and groupings of plant communities. Sometimes Latin and Greek are used, sometimes vernacular words are given a (more or less) scientific definition. That a minimum number of terms is an essential for progress in any science is generally agreed, but a similar tendency is ascertainable in ecology to that which has long been a bane in taxonomy—that to give a name to a community (a group or a phenomenon) so that it can be pigeon-holed is the most important thing to do with it. One other criticism may be made and is applicable not only to the Conference here noticed but also to much recent ecological work. Synecology is developing at great speed but autecology is being relegated to the background. This appears to the present writer to be extremely unfortunate for it is difficult to believe that the structure and development of a plant community can be properly understood until the life histories of the constituent species have been investigated.

W. B. TURRILL.

The Structure of Economic Plants.*—In the past the majority of books on plant anatomy have been written so as to present the facts, which might in themselves be very dull, against a phylogenetic background. Others have dealt with structure in relation to physiological function, whilst a third category includes those which are designed to aid the microscopist to identify botanical material. The book now under review, which is based on courses in plant anatomy given at the University of Chicago, falls into a different class from any of those mentioned above. After beginning with a general introduction to plant anatomy, it deals mainly with the structure of a selection of herbaceous economic crop plants at all stages of their development from the seedling to the mature plant. For many of the plants, particulars of floral and seed development and structure are included, and sometimes embryological details as well. This well-written book, in which a great deal of recent but scattered information has been brought together and summarized, should be welcomed by agricultural students and research workers who require information concerning the structure of the crop plants in which they are interested. A valuable feature is the large number of excellent line drawings, on which very considerable care has evidently been expended. It is to be regretted, however, that the general high standard of the illustrations has been marred by those on pp. 493 and 501. The book ends with a glossary of anatomical terms followed by a general index. It is stated in the Preface that the preparation of a companion volume on similar lines dealing with important fruit crops is contemplated. The appearance of this will be awaited with interest.

C. R. METCALFE.

* By Herman E. Hayward. The Macmillan Co., New York, 1938. Pp. x+674, figs. 340. Price 22s.

Poisonous Plants of the United States.*—As poisonous plants are of such vital importance to mankind, not only in animal husbandry, but in other spheres, it is gratifying to record the appearance of an up-to-date and comprehensive work on this subject. It is now nearly thirty years since Pammel's well known "Manual of Poisonous Plants"—also an American publication—appeared, and during this time great advances have been made concerning poisonous plants, especially those that are harmful in the livestock industries of important pastoral countries such as the Americas, Australia, New Zealand and southern Africa. The author's aim has been to bring together in concise form, the results of work of this kind in so far as his own country is concerned.

As the title indicates this book deals only with poisonous plants occurring in the United States. Introduced as well as native plants are dealt with. Many of these are well known in other countries, either in a wild, naturalised or cultivated state. Examples are *Abrus precatorius*, *Buxus sempervirens*, *Cannabis sativa*, *Colchicum autumnale*, *Datura Stramonium*, *Equisetum* spp., *Hypericum perforatum*, *Lychnis* (*Agrostemma*) *Githago*, *Melia Azedarach*, *Nerium Oleander*, *Phytolacca americana*, *Pteridium latiusculum* (Bracken), *Rhus Toxicodendron*, *Ricinus communis*, *Sorghum* spp., and *Tribulus terrestris*. From this it is apparent the sphere of usefulness of the work will not be confined to the United States. Furthermore, it contains a good deal of fundamental material of interest to any student of poisonous or injurious plants.

The book is divided into two parts, the first being devoted to a brief and general consideration of the nature of poisonous plants, while the second and more extensive part consists of a detailed treatment of the various species. In the first part, under "plants poisonous or injurious under special conditions," the subject matter is classified under the following headings—plants causing dermatitis; plants causing photosensitization; cyanogenetic plants; introduced poisonous ornamental plants; plants producing poisonous seeds; seleniferous plants; plants causing mechanical injury; and those causing undesirable flavours in milk and milk products.

The investigations on seleniferous plants that have been carried out during the last decade in the United States no doubt constitute one of the most interesting phases of work on poisonous plants in recent years. The author briefly outlines the results of this work and gives a list of species known to be made poisonous by selenium absorbed from the soil. Maladies such as "alkali disease" and "blind staggers" in cattle and horses have now been traced to selenium in the vegetation, the first mentioned being a disease caused through eating small amounts of selenium-bearing vegetation over a long period and the latter through feeding on relatively large amounts of selenium in a short time. The writer states—"The

* By W. C. Menscher. The Macmillan Company, New York, 1939. Pp. 266, figs. 75. Price 15s.

selenium content of plants growing on soils rich in selenium compounds, such as certain Cretaceous or Eocene shales, may vary greatly. Some species seem always to contain selenium while others may or may not absorb it. According to Beath and his associates, selenium absorbed from seleniferous shales by certain plants is returned to the soil upon their death and decomposition and becomes available to other native species and even to some crop plants that are unable to absorb inorganic selenium from seleniferous soils directly. By this process, plants ordinarily harmless, through the aid of certain "converter" plants, might become poisonous.

In the second or main part of the work the species are arranged according to families (Engler's system). For each species the common names and a general description are given. This is followed by information under the categories of distribution and habitat; poisonous principle; conditions of poisoning; and symptoms and treatment (where known).

The book is written by the same author, and is on similar general lines to one entitled "Weeds" which appeared a few years ago (K.B. 1935, 585). Numerous excellent full page line drawings and a good bibliography are included.

F. N. HOWES.

Floral Morphology.*—The first volume of this work was published in 1937 and reviewed in K.B. 1937, 400. The second volume is much larger (and correspondingly higher in price). The pagination continues from the first volume.

It may be recalled that in the first volume, after a useful, but too brief, general introduction, the author outlines the floral morphology of a selected number of families, with details of illustrative types for every one. The arrangement of the 39 families treated, and the selection of "illustrative types," was largely based upon the general aim of the book "to serve as a guide to the study of types in the laboratory." It was not intended that the professional taxonomist should use the book as a work of reference. The second volume is, in result, more ambitious, since it brings the number of families considered up to 190 and thus includes many not studied in the laboratory by the vast majority of students. An adequate index to both volumes should increase their general usefulness considerably. Volume one was meagrely illustrated. More figures are given in the second volume and these include a number referring to families dealt with in the first volume.

As the subtitle of the work indicates, special reference is given to the interpretation of the gynoecium (gynaeceum). Miss Saunders's investigations of flower structure, and particularly of the vascular supply to the gynoecium and other flower parts, in a wide

*"Floral Morphology, a New Outlook with Special Reference to the Interpretation of the Gynaeceum," by E. R. Saunders, F.L.S. Volume two. W. Heffer & Sons, Ltd., Cambridge, 1939. Pp. xiv + 609, + vii. Price 10s. 6d. net.

range of Angiosperms are well known. She has, in numerous papers in the Annals of Botany, the New Phytologist, and elsewhere, produced a mass of (mainly) anatomical evidence which she interprets as uniformly in favour of the theory that the syncarpous gynoecium is composed of valve and consolidated (the latter including solid and semi-solid or pseudo-valve) carpels. There is no doubt that the data given in detail in Miss Saunders's papers and summarized in the two volumes of "Floral Morphology," require very careful consideration by taxonomists. She claims that the general principles adopted "serve to bring the known facts into line so that they constitute a co-ordinated whole" and that "they dispose of many morphological fictions." That there are "morphological fictions" is certain and there is considerable justification for the claim that Miss Saunders's general principles and detailed interpretations give them a very suggestive and often new explanation. On the other hand, there seems to be little agreement at present among those who have specialized in floral anatomy as to the morphological interpretation of floral parts. Perhaps "Floral Morphology" will bring them into line, or, alternatively, will give them an excuse to mass their batteries to destroy Miss Saunders's imposing attack on orthodoxy and, incidentally, on various heterodoxies.

The working taxonomist is usually not a specialist in floral anatomy. He may, however, question whether Miss Saunders does not over-stress the value of vascular bundles as indicating the number and organization of carpels in a syncarpous gynoecium. A very great deal of the description of flower structure in the two volumes of "Floral Morphology" is in orthodox terms. The taxonomist is concerned primarily with determination, description, and classification on the basis of correlation of characters (coherence of attributes). Miss Saunders's work should make him overhaul his descriptive terms and replace by neutral terms those which are not merely descriptive but by original meaning assume the acceptance of some morphological theory. Such terms are often used without the intentional acceptance of the "explanatory" theory. To say that the ovary of *Tulipa Gesneriana* is trilocular is better description than to say it is tricarpeal, apart from the fact that, according to Miss Saunders, the latter statement is incorrect.

The writer expresses the hope that Miss Saunders will follow up her detailed, and mainly descriptive, work with a synthesis of her views on floral evolution. Acceptance of the theory of carpel polymorphism must surely lead to a classification of taxonomic units different from that in any of the published classifications. It must also have a very considerable bearing upon the problems of divergence, convergence, "parallelism," and reticulation, which the systematist so often meets and which need a thorough investigation from modern standpoints, whether heterodox or more or less orthodox.

W. B. TURRILL.

Wall Shrubs and Hardy Climbers.*—Mr. Bean's latest volume may be described as a companion to his "Shrubs for Amateurs" and "Trees for Amateurs."

In selecting his material, Mr. Bean has interpreted his title in its very widest sense, so as to include not only ordinary climbing plants but also any shrubs which can as a rule be grown better against a wall than in the open shrub border. *Daphne odora* is an example.

The first 24 pages deal with cultivation, methods of support, pruning, and lists of various types of climbers and wall shrubs. The remainder of the book is devoted to a "Descriptive List of Climbers and Wall Shrubs," in alphabetical order. There are 47 full page illustrations depicting a wide variety of plants suitable for the purpose in view.

Most garden lovers are collectors of books dealing with gardening. Their shelves will be crowded already, but this is certainly a volume for which space must be found.

A. OSBORN.

HENRI CORREVON.—We record with regret the death, on May 11th 1939, of the veteran Swiss horticulturist and botanist, M. Henri Correvon, at the age of 84 at Hérissau, Canton Appenzell, where he was undergoing an operation.

M. Correvon was for many years a valued correspondent of Kew and contributed rare and interesting specimens of alpine plants to our collections. He was a renowned cultivator of alpine plants, of which he had an extensive knowledge. His book on "Rock Garden and Alpine Plants" embodied much of his wide knowledge, and the results of his skill in their cultivation were collected together in his now famous garden at Chêne-Bourg, which he established in 1902 after his earlier garden in Vaud had been destroyed by a severe hailstorm.

One of M. Correvon's chief interests was the establishment of mountain gardens for alpine plants. In 1885 he constructed a small rock garden at an elevation of 6000 feet in the Val d'Anniviers, and later he established a similar garden above Bourg-Saint-Pierre. These gardens have inspired similar ventures in other parts of Switzerland and in other countries.

M. Correvon was an ardent champion of the protection of the wild flora of Switzerland, and a committee of the Swiss Alpine Club, formed by him, developed into the international organisation known as Naturschutz. His views on this subject were far-sighted and he insisted that an important means of checking the decimation of the flora was the cultivation of rare alpine plants for sale to the public, a policy which he himself did much to put into practice.

M. Correvon had many friends in this country, and his loss will be mourned by all lovers of alpine plants.

* By W. J. Bean, C.V.O., I.S.O., V.M.H. Putnam, London, 1939. Pp. xii+182, illustrated. Price 7s. 6d.

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ROYAL BOTANIC GARDENS, KEW

XXXI—SOME NEW ASIATIC BARBERIES IN CULTIVATION. L. W. A. AHRENDT.

The notes which follow are concerned in every case but one with barberies which are actually in cultivation in England. The genus *Berberis* has suffered in the past very greatly, from the horticultural standpoint, through the distribution of plants under wrong names. I believe that this is in large measure due to the fact that many species of *Berberis* have been described solely from the material available on herbarium sheets, without examination of corresponding living material, or any reference to whether such exists. Thus in the case of the species described by Franchet, it would appear that hardly any were introduced at the time, and the original material has not been sufficient to provide an adequate idea of the species in question. Consequently later introductions were erroneously referred to Franchet's species, while in reality they were quite different. But although these misidentifications were quickly corrected in the literature, the errors still persist in general horticulture. Thus, *B. Veitchii* is still in practice often called *B. acuminata*, and *B. Soulieana* and *B. atrocarpa* are still referred to as *B. levis*. I believe that the same is true of Franchet's *B. sanguinea*, for although I have tried many sources I have failed to get a plant of it. But what is often called *B. sanguinea* seems to be a quite distinct species, and accordingly it has here been given a separate name. Similarly, a common plant in cultivation passes under the name *B. xanthoxylon* Hasskarl, a species which was never described by him*, and of which the existing herbarium specimens give only a partial idea. But the common cultivated plant is certainly quite different. The true character of this really very distinct *Berberis* has never yet been made clear, and so a full account is here given and a specific name supplied.

Of the species described by Franchet there is one which has escaped the common confusion and is often to be found in gardens: it is *B. pruinosa*, and the living material available at Kew presents two distinct varieties of this, as well as two interesting new species. The other plants here named represent two forms in commercial cultivation which are passing under quite wrong names. As they are quite distinct and cannot be referred to any other species in

* The name was first validly published by Schneider in 1918 and provided with a full description by Stapf in Bot. Mag. t.9283 (1932); but this description, drawn from a living plant, does not completely agree with authentic Javanese herbarium specimens.

their section, the only practical way of clearing up the confusion is to name them and to supply full descriptions of them, even though their origin is uncertain. The only exception to this principle of examining living plants is in the species called *B. muliensis*. I had hoped to find living material of this, but shall not be able to examine the flowers and fruit until the spring and autumn. But in this case the distinctive characters of the species were very evident from the herbarium specimens.

I should like to express my great appreciation of the facilities which Sir Arthur Hill, the Director of the Royal Botanic Gardens, Kew, has so freely allowed me, particularly in the ability to make full examination of the herbarium specimens; my thanks and gratitude are due also to Mr. A. D. Cotton, Keeper of the Herbarium, and to Mr. W. M. Campbell, Curator of the Gardens, for the kindness with which they and members of their staffs have done all that was possible to help me in collecting the information I needed from dried and living material respectively.

Berberis (Sect. *Wallichianae*) *manipurana* Ahrendt, sp. nov.; affinis *B. Hookeri* Lemaire, a qua habitu robustiore altiore, foliis latioribus majoribus subintegris vel subserrulatis vix undulatis, floribus fasciculatis 6–15, sepalorum seriebus solum duobus, petalis haud integris, ovulis tantum 2–5, multum recedit. —*B. Knightii* Hort. non K. Koch. *B. Hookeri* var. *latifolia* Bean, Trees and Shrubs, 1, 243, quoad pl. cult. tantum. *B. xanthoxylon* Schneider in Österr. Bot. Zeitschr. 67, 27 (1918), ex parte, quoad syn. *B. Hookeri* var. *latifolia* et *B. Knightii*, non Hasskarl.

Frutex suberectus, ad 3 m. altus. *Ramuli* glabri, leviter angulati, crassi, haud verruculosi, hornotini sufflavi, annotini flavo-brunnei, vetustiores cinerascetes. *Internodia* 2.2–5 cm. longa. *Spinae* trifidae, validae, 1.5–3 cm. longae, subtus leviter sulcatae. *Folia* subsessilia, elliptica, ovato- vel oblongo-elliptica, apice acuta mucronata, margine subintegra vel (plerumque) parce (10–12 utrinque) remote (3–7 mm. inter se) subadpresse spinuloso- (c. 0.5 mm.) subserrulata, 5–8 cm. longa, 1.5–2.9 cm. lata, supra saturate viridia, nitida, subtus pallide flavo-viridia, subnitida, utraque facie distincte reticulata (nervis supra impressis subtus elevatis), satis tenuiter coriacea, hypodermate nullo (vel indistincto). *Flores* fasciculati 6–12 (–15), 10–14 mm. diametientes. *Pedicelli* satis graciles, 10–18 mm. longi, basi bracteis anguste triangularibus acuminatis c. 4 × 1.5 mm. suffulti. *Prophylla* ovata, acuta, 3 × 2.25 mm. *Sepala* exteriora ovata, obtusa, 4.5 × 3.5 mm., interiora obovata, apice rotundata, 7 × 5 mm., vel suborbiculata 7 × 6 mm. *Petala* late obovata, 5 × 5 mm., apice distincte emarginata, basi glandulis ovatis obtusis 0.8 × 0.5 mm. praedita. *Ovarium* ovulis (2–) 3–5 subsessilibus instructum. *Baccae* oblongae vel oblongo-ovoideae, 10–10.5 × 5.5–6 mm. magnae, atro-caeruleae vel atrae, minutissime glauco-pruinosa, stigmate sessili. *Semen* 1, 6.5–7 × 3–3.5 mm.

ASSAM. Manipur, 1882, Watt 6533 (typus in Herb. Kew.), 7206.

In order to understand the position which this plant occupies among the most closely related members of the genus it is necessary to give a brief summary of their history.

In 1819 Wallich discovered a *Berberis* in Nepal which was described in 1824 by De Candolle as *B. Wallichiana*, and which is the first and the type species of this large evergreen section of the genus. It does not seem ever to have been introduced into cultivation, but its nature is well known from the type specimens in the herbarium at Geneva (duplicate at Kew), from De Candolle's original description, and more particularly from a slightly later, and much fuller, description given by Wallich himself.*

Some time afterwards a very different plant was discovered, by Griffith in Bhutan in 1838† and by Hooker in Sikkim in 1848‡, and this plant was unfortunately referred by Hooker§ to *B. Wallichiana*. Although this error was actually corrected in 1859 when Lemaire|| described the later plant as a new species, *B. Hookeri*, the confusion has persisted down to the present day when plants are still offered for sale under the name *B. Wallichiana*. Such plants are never connected with the original Nepal species but are always forms of *B. Hookeri*.

Now there has been at Kew for many years a plant which was originally called *B. Wallichiana* var. *latifolia*. When it was realized that *B. Wallichiana* was not in cultivation, and that plants so named ought all to be referred to *B. Hookeri*, this principle was extended to the plant just mentioned which was henceforth called *B. Hookeri* var. *latifolia***. This *Berberis*, although certainly much more closely related to *B. Hookeri* Lem. than to *B. Wallichiana* DC., still shews marked differences on many points even from the former, as the following summary of primary diagnostic characters will indicate:—

(1) *B. Wallichiana* DC.

Shortly stipitate solitary ovule. Many-flowered fascicles (10–20). Short pedicels (6–10 mm.). Flowers of moderate size. Large thick leaves with hypoderm.

(2) *B. Hookeri* Lem.

Ovules 5–8††. Few-flowered fascicles (2–6). Long stout pedicels (1.5–2.8 cm.) Very large flowers (1.3–1.8 cm. diam.) Three series of sepals in addition to the set of outer appressed bracteoles. Entire petals. Fairly small thin leaves without hypoderm. Large fruit.

* *Plantae Asiaticae rariores*, 3, 23, t. 243 (1832).

† Griffith no. 1740. ‡ Hooker no. 255. § Bot. Mag. t. 4656 (1852).

|| L'Illustration Horticole, 6, t. 207 (1859).

** W. J. Bean, Trees and Shrubs hardy in the British Isles, Vol. 1, p. 243 and Vol. 3, p. 41.

†† In Bot. Mag. t. 9153, Stapf has figured *B. Hookeri* as having about three ovules. This plant, however, was derived from an unknown locality, so perhaps it may be a distinct variety. I have examined many cultivated plants of *B. Hookeri* and never found less than five ovules.

(3) The cultivated plant, "*B. Hookeri* var. *latifolia*."

Ovules (2-) 3-5. Medium sized fascicles of flowers (6-15). Slender pedicels of medium length (10-18 mm.). Medium sized flowers (10-14 mm.). Only two series of sepals in addition to the bracteoles. Distinctly emarginate petals. Thin leaves of moderate size without hypoderm.

When we also bear in mind that the leaves of *B. Hookeri* have a rather coarse serration and are only slightly, if at all, reticulate, while those of the *Berberis* under description are, at the most, finely serrulate, but distinctly reticulate, it becomes apparent that the latter is a quite distinct species.

The next point to be mentioned is that this *Berberis* is to be found, not only at Kew under the name *B. Hookeri* var. *latifolia* but also very widely in cultivation and commercial distribution under two other invalid names. These are:—

- (a) *B. Knightii*, a name already preoccupied and used by K. Koch for a S. American species from the Straits of Magellan.*
- (b) *B. xanthoxylon*, a name for a species from Java, which is similar to *B. Wallichiana* in its very thick large leaves with distinct hypoderm, and large fascicles of 12-20 flowers, but which has no affinity with *B. Hookeri* Lem. and very little with our present plant.

In conclusion two historical facts remain to be mentioned:—

- (A) In 1855, while still referring to the plant which we now know to be *B. Hookeri* as *B. Wallichiana*, Hooker and Thomson† mentioned also a *Berberis Wallichiana* var. *latifolia*. The type of this, *Hooker* no. 40 from Sikkim, which is in the herbarium at Kew, resembles somewhat in its leaves the familiar cultivated plant which I now call *B. manipurana*, but in all its other primary characters seems to belong to *B. Hookeri*, and to be a variety with leaves green, and not pruinose, on the under surface, very close to *B. Hookeri* var. *viridis* Schneider. The name *B. Hookeri* var. *latifolia* must be kept for this form.
- (B) Two specimens collected in Manipur in 1882 are preserved in the herbarium at Kew. They are *Watt* 6533, Ching Sow, N. E. Ranges, 8000 feet, April 1882, labelled *B. Wallichiana* var. *microcarpa*‡, distributed according to a stamp on the label as No. 6428, and *Watt* 7206, Sirvhirfur, 7000 feet, April 1882, labelled *B. Wallichiana* var. *latifolia*.

These two specimens of *Watt* seem to be conspecific with the cultivated shrub incorrectly known as *B. Hookeri* var. *latifolia* or *B. Knightii*. In view of the fact that herbarium specimens of this distinct *Berberis* were distributed as *B. Wallichiana* var. *latifolia*,

* K. Koch, *Dendrol.* 1, 413 (1869).

† *Flora Indica*, 226 (1855).

‡ *B. Wallichiana* var. *microcarpa* Hook. f. et Thoms. is an entirely different plant which now holds specific rank as *B. sublevis* W. W. Sm. and to which *Watt* 6428 belongs.

and that subsequently what seems to be an identical plant appeared in cultivation under the same name, there is a possibility that the latter was introduced by *Watt*. The most satisfactory method of dealing with the existing situation seems to be to make the herbarium specimens of *Watt* the type of the new species to which the cultivated plants may be referred. The description given has accordingly been based on the herbarium specimens as far as possible, and supplemented as regards the fruit and details of the flowers not clear in these, by the information derived from the living material.

Berberis (Sect. ***Wallichianae***) ***panlanensis*** *Ahrendt*, sp. nov.; affinis *B. sanguineae* Franch., a qua foliis minoribus, floribus solitariis pedicellis brevioribus, ovulis plerumque 3, divergit.

Frutex humilis, compactus, dense ramosissimus, 0.3-0.6 m. altus. *Ramuli* hornotini flavo-virides, sulcati, annotini flavo-cincerei, valde sulcati vel sublati. *Internodia* 7-14 mm. longa. *Spinae* trifidae, pallide flavae, subtus subsulcatae, 8-16 mm. longae, basi 0.5-0.7 mm. latae. *Folia* lineari-lanceolata vel lineari-oblonga vel anguste oblongo-elliptica, apice acuta mucronata, basi in petiolum brevissimum breviter contracta, margine subrevoluta parce (utrinque 3-6) remote (2-4 mm. inter se) subadpresse spinuloso- (0.2-0.5 mm.) subserrulata, 10-25 mm. longa et 2-4 mm. lata, supra cinereo-viridia costa media satis impressa, subtus nitida saturate flavo-viridia costa media elevata, utroque latere enervia, satis tenuiter coriacea, hypodermate nullo. *Flores* solitarii, raro 2 fasciculati, 8-10 mm. diametientes. *Pedicelli* 3-5 (-7) mm. longi. *Prophylla* late ovata, acuta, 2-2.5 (-3) × 1.5-2 (-2.5) mm. *Sepala* exteriora late ovata, obtusa, 4.5-5 × 4 mm., interiora subviridi-lutea, obovato-oblonga, apice rotunda, 5.5-6 × 4.5 mm. *Petala* pallide albo-viridia, obovata, 4.5-5 × 3.5-4 (-4.5) mm., apice subintegra, basi glandulis 0.8-1.2 × 0.5 mm. praedita. *Ovarium* ovulis (2-) 3 sessilibus instructum. *Baccae* ignotae.—*B. sanguinea* var. *microphylla* Hort.

CHINA. W. Szechuan: Pan lan shan, *Wilson* 2875 (typus in Herb. Kew.).

In the past some confusion has arisen between *B. sanguinea* Franch. and *B. triacanthophora* Fedde. Both have long narrow leaves of a thin texture and without a hypoderm, and a fascicled inflorescence of about two to five flowers. They also have in common ovaries containing generally only two ovules and flowers which are distinctly red on the outside, and this feature is so distinct in the former species that it was the origin of Franchet's specific epithet. Apart from this, however, these two species differ in many ways, as can be seen from the type herbarium specimens and the author's descriptions of them. In *B. sanguinea* the stems are very sharply grooved and yellowish green when young, but in *B. triacanthophora* the new shoots are distinctly red and all the stems more or less terete. As regards the foliage, Franchet's species

has a coarse marginal serration, seven up to seventeen teeth each side, surmounted by long spinules, while the leaves of Fedde's species present a margin which is almost entire and which has, at most, up to five tiny spinules a side. Finally, in *B. sanguinea* the flower pedicels are fairly short, about 6 to 16 mm. long, and never exceeding 2 cm., while in the case of *B. triacanthophora* they are distinctly long, generally 2 to 3 cm.

On June 21st 1908 Wilson collected the plant already referred to, No. 2875, on the Pan lan shan, west of Kuan Hsien, where he found it with "flowers yellow and bronze" and where, he stated, it is rare. Dr. C. K. Schneider has already called attention to the fact that this plant has the yellow sulcate stems of *B. sanguinea*, but leaves much more like those of *B. triacanthophora*, and that it differs from both these species in having three ovules.* To this must be added the fact that it belongs to that small, and rather distinct, set of species within the section *Wallichianae* which have solitary flowers. All these features point to its being a distinct species. The importance of this conclusion to horticulturists is greatly increased when it is realized that a *Berberis* shewing all these distinguishing features, and consequently botanically identical with the plant just considered, is in cultivation and distribution under the name *B. sanguinea* var. *microphylla*. In the cultivated plant the bracteoles and outer sepals have only the slightest reddish tinge, in contrast to the distinct red colouring of these parts which is an outstanding feature of *B. sanguinea* Franch., and the general appearance of the solitary flowers of "*B. sanguinea* var. *microphylla*" is a very pale greenish yellow due to the inner sepals and petals. Thus we have one further, and by no means unimportant, distinction between *B. panlanensis* and *B. sanguinea*.

As a garden plant I think that this is a particularly ornamental species on account of its very graceful evergreen foliage, and its very compact habit should make it a useful shrub even in quite small gardens.

***Berberis* (Sect. *Wallichianae*) *pruinosa* Franch. var. *barresiana* Ahrendt, var. nov.**; a typo foliis subtus viridibus, floribus tantum 3-6 fasciculatis, petalis integris, fructibus brevioribus, recedit.

Frutex satis erectus. *Ramuli* teretes, hornotini sufflavi, annotini pallide lutei. *Internodia* 2.5-8 cm. longa. *Spinae* trifidae, validae (basi 1.5-2 mm. latae), 2-3.5 cm. longae, flavae, subtus planae. *Folia* elliptica (vel interdum leviter ovato- vel obovato-elliptica) 2.8-6.2 cm. longa, 1.2-2.5 cm. lata (vel ad 6×1.4 cm.), margine parce (utrinque 5-7) remote (5-8 mm. inter se) spinoso- (0.8-1.5 mm.) serrata, supra cinereo-viridia, subnitida, subnervia, venis lateralibus leviter visibilibus, subtus flavo-viridia, haud nitida, venis lateralibus leviter elevatis, crasse satis rigide coriacea,

hypodermate distincto. *Flores* 6-8 fasciculati, 7-8 mm. diametientes. *Pedicelli* graciles, 10-17 mm. longi. *Prophylla* ovata, acuta, 2.25×1.5 mm. *Sepala* exteriora obovata, c. 3.5×2 mm., interiora late obovata vel suborbiculata, valde concava, c. 5×4 mm. *Petala* obovata, 5×2.5 mm., apice obtusa integra, basi unguiculata, glandulis 2 anguste ovatis acuminatis 1.5×0.5 mm. praedita. *Stamina* 4 mm. longa, filamentis validis, apice viz producta. *Ovarium* ovulis 2-3 sessilibus instructum. *Baccae* breviter ovoideae, 5-6×4 mm., albo-pruinosa, stigmate sessili.

"No. 4775 MV, Barres, 156-32" (typus in Herb. Kew.).

This description was drawn up directly from the living plant at Kew labelled as above. The plant looks fairly like a normal shrub of *B. pruinosa* except that the leaves are more finely toothed. At the appropriate seasons, however, it can be seen to be distinctly different in its few-flowered inflorescence and shorter broader fruit, and also in the fact that its new shoots lack the distinct purple colouring which is generally to be seen for a short while in the very young shoots of *B. pruinosa* before they ripen quickly to their normal yellow shade. More interesting is the contrast between the entire petals of this plant and the deeply incised ones of *B. pruinosa*, a distinction which gives rise to the question whether this may not be a species separate from, even though closely allied to, *B. pruinosa*. As the origin of this plant is unknown it seems best to leave it, for the moment, as a variety, from which it can, if necessary, be raised to specific rank at a later date. The view that it is only a variety is supported by the existence of the following form, which, in some of its characters, is intermediate.

***Berberis pruinosa* Franch. var. *brevifolia* Ahrendt, var. nov.**; a typo spinis debilibus, foliis brevioribus subtus viridibus, floribus tantum 5-9 fasciculatis, fructibus pedicellis breviaribus recedit.

Frutex satis erectus. *Ramuli* teretes, glabri, hornotini sufflavi, annotini pallide lutei. *Internodia* 2-3 cm. longa. *Spinae* debiles, simplices vel 3-fidae, 5-8 mm. longae, subtus planae. *Folia* obovata (vel obovato- vel elliptico-oblonga), 1.6-3.2 (-4.5) cm. longa, 0.8-1.5 (-2) cm. lata, margine parce (utrinque 2-7) remote (4-8 mm. inter se) spinoso- (c. 1 mm.) serrata, supra cinereo-viridia, vix nitida, subnervia, venis lateralibus vix visibilibus, subtus flavo-viridia, subnitida, venis paucis lateralibus subelevatis, crasse satis rigide coriacea, hypodermate distincto. *Flores* 6-7 mm. diametientes, 5-9 fasciculati. *Pedicelli* 6-10 mm. longi. *Prophylla* ovata, acuta, 2×1.5 mm. *Sepala* plus minusve ut in *B. pruinosa* var. *barresiana*. *Petala* obovata, 4.5×3-3.5 mm., apice distincte incisa, basi breviter unguiculata, glandulis 2 anguste ovatis subacuminatis c. 1.2×0.4 mm. praedita. *Stamina* 3.5-4 mm. longa, apice obtusa haud producta. *Ovarium* ovulis 3 subsessilibus instructum. *Baccae* estylosae, breviter ovoideae, 5.5-6×3.5-4 mm., albo-pruinosa.

* Sargent, *Plantae Wilsonianae*, 1, 359 (1913).

"No. 145, U.C.B.G. ; 32/1042R ; 1053/32 Goodspeed" (typus in Herb. Kew.).

The description was drawn up directly from the living plant at Kew labelled as above. This variety, while sharing with the previous one the noticeably small clusters of flowers and shorter and broader fruit, is like the type in its deeply incised petals. However, it can scarcely be said to lie completely between the two for it differs from both in its short pedicels and leaves.

Berberis (Sect. **Angulosae**) **muliensis** Ahrendt, sp. nov. ; affinis *B. dictyophyllae* Franch., a qua ramulis sulcatis, pedicellis longioribus, fructibus multo majoribus stylis haud praeditis, foliis angustioribus divergit.

Frutex 1-1.5 m. altus. *Ramuli* sulcati, glabri, hornotini rubri epruinosi, annotini atro-rubri vel rubro-fusci. *Spinac* nunc absentes nunc trifidae validae, subtus planae, 2-3.3 cm. longae. *Internodia* 2-5 cm. longa. *Folia* anguste obovata, apice obtusa, basi cuneata in petiolum 2-3 mm. longum contracta, margine integra (raro utrinque 1-2-spinulosa), utraque facie reticulata, 1.5-3 (4.5) cm. longa, 3-7 (-11) mm. lata, supra viridia, subtus cinereo-viridia. *Flores* solitarii (interdum 2 fasciculati), 16-19 mm. diametientes. *Pedicelli* validi (1-) 1.5-3 cm. longi. *Prophylla* late ovata, acuta, 2.5×2.5 mm. *Sepala* exteriora ovata, subacuta, c. 7×4 mm., interiora obovata, apice rotundata, 8-10×6-7 mm. *Petala* late obovata, 6-6.5×5-5.5 mm., apice breviter emarginata, basi glandulis elongatis anguste ellipticis utrinque acutis 1×0.2 mm. praedita. *Stamina* 4-5-5 mm. longa, apice distincte producta apiculata. *Ovarium* ovulis c. 3 instructum. *Baccae* anguste ovoideae vel oblongo-ovoideae, 14-17×6-9 mm., stigmate sessili. *Semina* 2-3.

CHINA. S. W. Szechuan : Mu-li Mts., open alpine meadows, 3300-3600 m., 1921, *Forrest* 20431 (fl.), 20633 (fr. ; typus in Herb. Kew.).

B. dictyophylla Franch., according to the herbarium specimens collected by Delavay, has berries which measure about 9×6 mm. and possess a very short style. In other, and later, specimens which have been referred to this species, the style is distinctly longer. *B. muliensis* differs primarily from this species of Franchet in its very much larger fruit and complete lack of style. The other differences mentioned above are very noticeable in the two type specimens quoted but may be of secondary diagnostic importance for the following reasons :

(1) There seems to be a form of *B. muliensis* with somewhat shorter pedicels. This is represented by *Forrest* 20350, a fruiting specimen from S. E. Tibet, Tsarong, also of 1921, which differs only in having pedicels restricted to 10-15 mm. in length. It seems quite likely too that this form includes a flowering specimen, *Forrest* 16448, from N. W. Yunnan, Mu-li Mts., but, as there is no fruiting companion to this, one cannot be quite certain. This

last specimen of *Forrest*'s has been referred to *B. yunnanensis*,* but this can hardly be so. It is true that *B. yunnanensis* Franch. also possesses red stems which have no bloom, and estylose berries, but these are very much smaller, and the form of the inflorescence is quite different, having from three to eight flowers in a somewhat elongated pseudo-umbellate or subracemose arrangement, with very long pedicels comparable with those described above.

(2) There exist also specimens which appear to belong to this species but which have broader leaves with a toothed margin. These seem sufficiently distinct to have a varietal name :

Berberis muliensis var. **atuntzeana** Ahrendt, var. nov. ; a typo foliis serrulatis latioribusque recedit.

Folia obovata, apice rotundata, basi breviter contracta, sessilia, 2.5-3×1-1.5 cm., margine parce (utrinque 3-7-) spinuloso-serrata. *Pedicelli* 2-4.5 cm. longi.

CHINA. Yunnan : E. of Atuntze, fr. Sept. 1921, *Forrest* 20713 (typus in Herb. Kew.).

To this variety the following specimen also probably belongs, but on the herbarium sheet at Kew its very long pedicels alone remain, without either flowers or fruit—S. E. TIBET : Tsarong, fl., 1921, *Forrest* 20264.

There seems to be yet another form lying between this variety (which it resembles in its spinulose leaves) and the type (to which it has similar narrow foliage) :

Berberis muliensis var. **beimanica** Ahrendt, var. nov. ; a typo foliis distincte serrulatis recedit.

Folia oblongo-oblanccolata, 2-3 cm.×4-6 mm., parce (utrinque 5-7) remote (2-5 mm. inter se) spinoso-subserulata, satis anguste reticulata. *Pedicelli* validi, 14-22 mm. longi.

CHINA. N. W. Yunnan : Bei-ma-shan, fr., 1921, *Forrest* 21002 (typus in Herb. Kew.).

This specimen, according to the field notes attached to the herbarium sheet, has scarlet-crimson fruit and grows only 2-3 feet high on ledges and cliffs on the stony slopes of its habitat. *Forrest* 20264 is described as having flowers with an orange ruddy exterior.

Although the specimens listed under *B. muliensis* and its varieties come from Szechuan, Yunnan and Tibet, it should be noted that actually a comparatively small area is concerned where the boundary between the extreme north-west of Yunnan and the most south-westerly portion of Szechuan meets the Tibetan-Chinese frontier.

Berberis lepidifolia Ahrendt, sp. nov. ; affinis *B. Poirerii* Schneid., a qua foliis angustioribus, pedicellis longioribus, bracteis brevioribus, baccis atro-caeruleis stylosis multo recedit.

Frutex satis erectus, ad 2 m. altus. *Ramuli* sulcati, glabri, annotini pallide virides, interdum paullum rubescentes, annotini

* Notes from the Royal Botanic Garden, Edinburgh, Vol. 17, 200, March 1930.

brunnei. *Internodia* 8–20 mm. longa. *Spinae* solitariae, plerumque debiles, 3–6 mm. longae, interdum basi ramulorum 1–2 cm. longae, saepe absentes. *Folia* decidua, lineari-oblongata, basi sensim cuneata, sessilia, apice breviter acuta, mucronulata, margine integra revoluta, 1.7 cm. $\times$ 1.5–2 mm. usque 4.5 cm. $\times$ 4–5 mm., supra viridia, costa media satis impressa nervis lateralibus paucis visibilibus, subtus papillosa, leviter cinereo-pruinosa, nervis lateralibus paucis. *Inflorescentiae* 5–12-florae, umbellatae vel subumbellatae, interdum pseudo-umbellatae laxae subracemosae, 2–4.5 cm. longae. *Pedunculi* graciles, 1–2–3 cm. longi, medio bracteis lanceolatis acuminatis 1.5 $\times$ 0.7 mm. suffulti. *Pedicelli* (5–) 7–10 mm. longi, basi bracteis ovatis 1 $\times$ 0.6 mm. apice acuminatis suffulti. *Sepala* 3, ovata, apice obtusa vel subacuta, 2.2–5 $\times$ 1.3–1.5 mm., margine flava, medio rubra. *Petala* oblongo-elliptica, 2.5 $\times$ 1.3 mm., apice emarginata biapiculata, basi haud unguiculata, glandulis 2 ellipticis vel ovato-ellipticis obtusis 0.5 $\times$ 0.2 mm. praedita. *Stamina* 1.8 mm. longa. *Ovarium* ovulis 2 breviter stipitatis instructum. *Baccae* ovoideae, 5.5–6 $\times$ 4.5–5 mm., atro-caeruleae, leviter glauco-pruinosae, stylo brevissimo sed distincto. *Semen* solitarium, 4 $\times$ 1.9 mm.

CHINA. Yunnan: Chien-Chuan-Mekong divide, 3300 m., Aug. 1923, *Forrest* 23614 (typus in Herb. Kew.).

This very attractive species, of which there is a fairly full grown specimen at Kew, is unusual on account of its blue black fruit (not often to be found combined with deciduous foliage, in cultivation) and very ornamental because of its slender and graceful leaves. There is in the Herbarium a sterile specimen which looks as if it would be identical with this plant, although in the absence of both flowers and fruit it is not possible to be quite certain. I refer to *Forrest* 22051, "B. sp. aff. *Poiretii*, 4–5 feet, sparingly spinous; open rocky hillsides and amongst scrub on mountains between Yung-peh and Yung-ning, S. W. Szechuan, July–August, 1922, 10,000 feet." The type collection is described in the Field Notes as "shrubs, 3–4 feet, fruits black purple, on ledges of cliffs and stony slopes in side valleys."

The fine and almost fully grown specimen of *B. lepidifolia* is to be found in the Berberis Collection in the gardens close to the lily pond.

Berberis (Sect. **Angulosae**) **validisepala** Ahrendt, sp. nov.; affinis *B. angulosae* Wall., a qua ramulis glabris, fructibus minoribus, ovario ovulis tantum 2–4 instructo multum recedit.

Frutex; ramuli plus minusve sulcati, glabri, annotini brunnei. *Internodia* 1.5–3.5 cm. longa. *Spinae* trifidae, 1–1.4 cm. longae, subtus planae. *Folia* obovata, apice rotunda mucronulata, basi in petiolum 2–7 mm. longum contracta, margine integra (raro parce, utrinque 1–2-spinulosa), 1–3 cm. longa et 0.4–1 cm. lata, superne viridia nervis lateralibus paullo prominulis, subtus albo-pruinosa reticulata. *Inflorescentiae* fasciculatae, (1–) 2–5-florae.

Flores 1.3–1.6 cm. diametientes. *Pedicelli* glabri, validi, 12–18 mm. longi, basi bracteis triangularibus 1.7 $\times$ 1 mm. suffulti. *Inflorescentiae* raro umbellatae, 2–3-florae, pedunculo nudo 4–8 mm. longo, pedicellis 7–10 mm. longis. *Prophylla* saepe nulla, interdum oblongo-ovata, acuta, 3.8 $\times$ 1.8 mm. *Sepala* rigida, exteriora 3 obovata, apice rotunda vel obtusa, 7–8 $\times$ 4.5–5 mm., interiora 3 obovata, apice rotunda, 8.5 $\times$ 5.5 mm. *Petala* obovata, 7–8 $\times$ 4–4.5 mm., apice breviter emarginata, biapiculata, basi cuneata, haud unguiculata, glandulis separatis late ellipticis (0.7–0.8 $\times$ 0.5–0.6 mm.) praedita. *Stamina* c. 3.7 mm. longa, apice distincte producta, apiculata vel subobtusata. *Ovarium* ovulis 2–4 instructum. *Baccae* late ellipsoideae, 8–9 $\times$ 6.5–7.5 mm., rubrae, stigmate sessili vel subsessili. *Semina* 1–3, 5.5–6 $\times$ 3.5–4 mm., vel 6 $\times$ 2.5 mm.

Typus: "No. 152" in Herb. Kew.

This interesting species was described with the aid of living material of the plant from which the herbarium specimen was taken. This species has also an affinity with *B. yunnanensis* Franch. in the number of its ovules and in its estylose fruit, but its berries are much broader and more globose, and it is easily distinguished, too, on account of the non-racemose inflorescence and the distinctly white undersurface to the leaves.

Berberis (Sect. **Angulosae**) **suberecta** Ahrendt, sp. nov.; affinis *B. rubrostillae* Chittenden, a qua fructibus brevioribus latioribusque, floribus minoribus, sepalorum seriebus tantum duobus, petalis haud integris, ovulis pluribus, foliis amplioribus multum recedit.—*B. Giraldui* Hort. non Hesse. *B. rubrostilla* forma *erecta* Hort.

Frutex suberectus. *Ramuli* sulcati, glabri, hornotini flavo-virides, annotini rubro-fusci, vetustiores cinerascens. *Internodia* 1.4–2.2 (–2.7) cm. longa. *Spinae* sufflavae, subtus subtiliter sulcatae, 1.5–2.3 (–2.8) cm. longae. *Folia* obovato-elliptica, elliptica, vel elliptico-oblonga, apice obtusa vel rotunda, basi cuneata et in petiolum brevissimum (1–5 mm. longum) attenuata, margine parce (utrinque 3–7) remote (2.5–4 mm. inter se) aristato- (1–2 mm.) dentata (0.5–1 mm.), 1.2–3 $\times$ 0.7–1.4 cm., vel usque 3.2 $\times$ 1.2 cm. (surculorum 2.3 $\times$ 1.5 cm.), supra haud nitida, saturate viridia, indistincte nervata, subtus leviter pruinosa, leviter papillosa, pallide canescentia. *Inflorescentiae* 2–3 (–4) cm. longae (pedunculo nudo (2–) 6–10 mm. incluso), (3–) 5–6 (–8)-florae, umbellatae vel pseudo-umbellato-subracemosae, raro fasciculatae. *Flores* 10–12 mm. diametientes. *Pedicelli* (4–) 6–10 mm. longi, basi bracteis rubescentibus late triangularibus (1.1 $\times$ 0.9 mm.) suffulti. *Prophylla* ovata, subacuta, 2–3 $\times$ 1–1.5 (–2) mm. *Sepala* exteriora ovata vel elliptico-oblonga, obtusa, 5–6.5 $\times$ 2.5–3.5 mm., interiora obovata vel elliptico-oblonga, apice rotunda, 6–7 $\times$ 3–5 mm. *Petala* obovata, 4 $\times$ 2.5–3 mm., apice emarginata et biapiculata, basi breviter unguiculata, glandulis oblongo-orbiculatis (0.4 $\times$ 0.35–0.4 mm.) praedita. *Stamina* normalia apice haud producta. *Ovarium* ovulis

5-8 subsessilibus instructum. *Baccae* oblongo-ovoideae, saturate rubro-roseae, 10-12×7-8 mm., stigmatibus subsessilibus.

Origin unknown; typus in Herb. Kew.

This plant has been cultivated and distributed for some time under the name *B. Giralddii*. The true plant of this name as described by Hesse belongs to the section *Brachypodae* and has very large leaves and an elongated spike-like inflorescence and has only recently become available for purchase in this country. When it became known that the plant which had been previously sold as *B. Giralddii* was entirely different, and belonged to the Section *Angulosae*, it was referred to as the upright form of *B. rubrostilla*. This name is certainly appropriate in many ways, for the two plants are alike in certain outward characters, and are both of outstanding ornamental value. The new plant can easily be distinguished by its shorter and broader fruit, its broader leaves and more erect habit. When the important botanical differences mentioned above are taken into account it will be seen to be specifically distinct, not only from *B. rubrostilla* Chittenden, but from all the other members of its section.

Berberis (Sect. *Angulosae*) *diantha* Ahrendt, sp. nov.; affinis *B. concinna* Hook. f. et Thoms., sed floribus duobus pedunculatis, ovario ovulis 4-6 instructo, fructibus stylis praeditis distincta.

Frutex humilis, compactus. *Ramuli* angulati et leviter sulcati, glabri, hornotini flavescentes, annotini subnitidi, atro-rubri. *Internodia* 10-20 mm. longa. *Spinae* trifidae, satis validae, subtus sulcatae, 1.5-2.5 cm. longae. *Folia* obovata, 1-2.2 cm. longa et 0.5-1.2 cm. lata, apice rotunda, aristata, basi cuneata, margine parce (utrinque 2-3) remote (3-4 mm. inter se) aristato- (2.3 mm.) dentata (1-2 mm.), supra opace cinereo-viridia, subtus albo-pruinosa, utraque facie subtiliter nervata, haud reticulata, subchartacea. *Inflorescentiae* umbellatae, biflorae (raro triflorae), floribus 9-12 mm. diametientibus, pedunculis pedicellisque 1.2-2 cm. longis. *Prophylla* flava, ovata, c. 2 mm. longa. *Sepala* exteriora ovata vel elliptica, subacuta, 5.5-7×2.5-3.5 mm., interiora late elliptica vel oblongo-obovata, 7-9×5-6 mm. *Petala* anguste obovata, 5-6×2.5-3 mm., apice rotunda integra, basi glandulis ellipticis 0.5-0.6×0.3 mm. praedita. *Stamina* 4 mm. longa, apice leviter producta apiculata. *Ovarium* ovulis 4-6 instructum. *Baccae* anguste oblongae vel oblongo-ellipsoideae, 13-15×4-5 mm., distincte stylosae.

Origin unknown; typus in Herb. Kew.

This shrub is very like *B. concinna* in habit, in its long and narrow fruit, and in its fairly broad small leaves with a conspicuously white undersurface. The leaves differ from those of *B. concinna* only slightly, in having a more gradually cuneate base and fewer marginal teeth. In certain other characters of greater botanical importance it is quite distinct and deserves specific rank. These are the distinctly stylose fruit (rather smaller in size), the ovary with fewer ovules, and, more noticeably, the peduncled umbellate

inflorescence of very constant form, since it has almost invariably two flowers, rarely three.

B. diantha has the same garden value as *B. concinna* and will be useful for those who have room for more than one plant of the former, and yet prefer to have as much variety as possible within their collection.

I do not know the origin of this plant. It came to me labelled *B. aetnensis*, and may possibly be a hybrid.

Berberis (Sect. *Polyanthae*) *arido-calida* Ahrendt, sp. nov.; affinis *B. parvifoliae* Sprague, a qua foliis latioribus haud integris, fasciculis plurifloris, pedicellis brevioribus, sepalis angustioribus, petalorum glandulis majoribus, fructibus angustioribus divergit; affinis etiam *B. aggregatae* Schneid., a qua inflorescentiis haud paniculatis, floribus paucioribus praecipue distinguenda.

Frutex suberectus, usque 1.5 m. altus; ramuli puberuli, angulato-sulcati, hornotini flavo-virides, annotini pallide flavo-brunnei. *Internodia* 1.2-1.7 cm. longa. *Spinae* trifidae, graciles, subtus subtiliter sulcatae, 8-13 mm. longae. *Folia* late elliptica vel late obovata, basi breviter cuneata, subsessilia, apice subacuta vel subobtusata, ramulorum fertilium margine parce (utrinque 3-6) spinoso- (c. 1 mm.) subserrulata, surculorum saepe integra, supra opace viridia, subtus albido-pruinosa, papillosa, utraque facie anguste reticulata. *Inflorescentiae* 6-10 (-14)-florae, fasciculatae vel racemoso-subfasciculatae, 8-13 mm. longae. *Flores* c. 4 mm. diametientes. *Pedicelli* 1-2 mm. longi, basi bracteis triangularibus 1.5×1 mm. suffulti. *Prophylla* lanceolata vel anguste ovata, 2×0.8 mm. *Sepala* exteriora oblonga, obtusa, 2.5×1 mm., interiora oblonga-ovata, obtusa, 3.3×1.6 mm. *Petala* ovata, apice plus minusve truncata, vix emarginata, basi glandulis suborbiculatis c. 0.7×0.6 mm. praedita, 2.8×1.4 mm. *Stamina* 2 mm. longa, apice parum producta sed truncata. *Ovarium* ovulis 2 instructum. *Baccae* sanguineo-coccineae, elliptico-oblongae, 3-4×1.5-2 mm., stylo distincto, 0.5-1 mm. longo.

CHINA. Kansu: Farrer 355 (typus in Herb. Wisley.).

This very attractive and hardy species of which there is a well grown specimen at Wisley is referred to in Journ. R. H. S. 42, 61 (Oct. 1916), as "found in Kansu, North China, in the open upper alpine turf of the Siku-Satanee ranges, where it is small growing, 12-24 inches high, with tightly bunched blood scarlet berries, a native of hot dry regions," and it is from this characteristic of its habitat that its specific epithet has been derived. Its botanical position seems rather distinct. I have not seen any analysis published of this section, but it would seem to fall, apart from this species, into three easily marked divisions:

(1) Subsection **Eupolyanthae***—characterized by the very long (6-17 cm.) paniculate inflorescence with very many flowers,

*Subsect. **Eupolyanthae** Ahrendt, subsect. nov.—*Inflorescentiae* elongatae (6-17 cm. longae), paniculatae, multiflorae, (25-) 35-100-florae; ovula tantum 2.—Typus: *B. polyantha* Hemsl.

generally 25–100. This would include *B. polyantha* Hemsl., *B. Koehneana* Schneid. and *B. Prattii* Schneid. This last species seems to me to be quite distinct and best given specific rank and not reduced to a variety of *B. aggregata* as has sometimes been done. Most of the living plants passing under the name *B. polyantha* that I have met are really *B. Prattii* or a hybrid of it. The true *B. polyantha*, as the type herbarium specimens clearly show, possesses elongated fruit with a remarkably long style.

(2) Subsection **Subpolyanthae***—with a much shorter but still paniculate inflorescence with fewer flowers, 10–20 (–40), and only about (1–) 1.5–3 cm. long. Like those of the preceding subsection the members of this one show only 2 ovules within the ovary and generally have mature stems of the first years coloured a fairly pale yellowish brown. Here I should place *B. kunawurensis* Royle, *B. Edgeworthiana* Schneid., *B. aggregata* Schneid. and *B. brevipaniculata* Schneid.

(3) Subsection **Pseudopolyanthae**†—in which the inflorescence is no longer paniculate but only fascicled, or possibly racemose-subfascicled, possesses only 3–10 (–15) flowers, and is only about 4–12 mm. in length. Furthermore the members of this subsection possess 3–5 ovules and have fairly, or very, dark mature first year stems of a red or purple colour. The members of this section are *B. Wilsonae* Hemsl., *B. Stapfiana* Schneid., *B. subcaulialata* Schneid., *B. parvifolia* Sprague and *B. favosa* W. W. Smith. The second and third members of this list have been reduced in rank since description, and may quite well be regarded as varieties of *B. Wilsonae*. It is interesting to note that these species were originally placed, when described, in the section *Sinenses*, with which they have a certain affinity in their dark purplish stems and few-flowered fascicled or at most subracemose inflorescence. But their very distinctly stylose fruit separates them from the *Sinenses* and associates them with the *Polyanthae*. The possession of more than two ovules distinguishes this little group from the two preceding subsections as well as from the section *Sinenses*.

Berberis arido-calida is of interest because it does not fall exactly into this classification. The inflorescence is that of the subsection *Pseudopolyanthae*; but the number of ovules and the colour of the stems associate it rather with the preceding subsection, as indeed do also its spinose deciduous leaves, which are a character of the *Subpolyanthae* generally, contrasting with the subsistent entire leaves of the *Pseudopolyanthae*. In this case I should regard the form of the inflorescence as the primary character and include *B. arido-calida* in the *Pseudopolyanthae*.

*Subsect. **Subpolyanthae** Ahrendt, subsect. nov.—Inflorescentiae brevipaniculatae (1–3 cm. longae), 10–20 (–40)-florae. Ramuli annotini pallide flavo-brunnei. Ovula 2.—Typus: *B. kunawurensis* Royle.

†Subsect. **Pseudopolyanthae** Ahrendt, subsect. nov.—Inflorescentiae fasciculatae vel racemoso-subfasciculatae. Ramuli annotini atro-purpurei. Ovula (2–) 3–5.—Typus: *B. Wilsonae* Hemsl.

While referring to *B. parvifolia*, Schneider (in Sarg. Pl. Wils. 3, 436: 1917) mentioned *Purdom* 826 (seed number) from W. Kansu, April 25th, 1912, as differing from *B. parvifolia* Sprague in having a fascicled inflorescence of up to 12 flowers, and only two ovules in the ovary. It seems likely that this number of *Purdom* should be referred to *B. arido-calida*.

In order to complete this reference to the classification of the Section *Polyanthae* it seems desirable to depart from my main purpose of dealing with species which are actually in cultivation and to refer to the following one which is only known to me through its herbarium sheet:

Berberis oblanceolata (Sect. **Polyanthae**, Subsect. **Subpolyanthae**) (Schneid.) Ahrendt, stat. nov.; ob folia integra oblanceolata affinis *B. Wilsonae* Hemsl., a qua inflorescentiis paniculatis subelongatis recedit.—*B. polyantha* var. *oblanceolata* Schneid. in Sarg. Plant. Wils. 1, 376 (1913).

Frutex decumbens, 1–1.6 m. altus. *Ramuli* puberuli, sulcati. *Folia* oblanceolata, integra, 1–2 cm. longa, 0.3–0.5 cm. lata, apice acuta. *Inflorescentiae* graciliter paniculatae, 10–15-florae, (2.5–) 3–4.5 (–5) cm. longae. *Pedicelli* 2–3 (–4) mm. longi.

CHINA. W. Szechuan: *Wilson* 2868 (typus in Herb. Kew.).

The preceding classification will show that this *Berberis* really differs very much from *B. polyantha*, and again like *B. arido-calida* lies between the last two subsections, but in a reflected sense, for now we find that the entire leaves associate it with the *Pseudopolyanthae*, while the form of the inflorescence, still the primary character, places it with the *Subpolyanthae*.

XXXII—ADDITIONS TO THE FLORA OF BORNEO AND OTHER MALAY ISLANDS: XII.*

THE ANNONACEAE OF THE OXFORD UNIVERSITY EXPEDITION TO SARAWAK, 1932. H. K. AIRY-SHAW.

The following abbreviations are used for works or periodicals frequently cited:—

ABGC = Ann. Roy. Bot. Gard.	NGBI = Nuovo Giorn. Bot. Ital.
Calc.	NTNI = Natuurk. Tijdschr.
FBI = Fl. Brit. Ind.	Nederl. Ind.
FMP = Fl. Mal. Penins.	PJS = Philipp. Journ. Sci.
JASB = Journ. As. Soc. Beng.	SMJ = Sarawak Mus. Journ.
KB = Kew Bull.	UCPB = Univ. Calif. Publ. Bot.

Small type indicates matter not directly relevant to the Oxford University Expedition's collection.

Enicosanthum paradoxum Becc. in NGBI. 3, 184, t.v, figs. 13–17 (1871), e descr. et ic.; Scheff. in NTNI. 34, 80 (1874); Ridley in SMJ. 1, no. 3, 73 (1913).

* Continued from K.B. 1939, 31.

Dulit, primary forest, rocky valley of small stream, under 300 m., 22 Aug., *Richards* 1389: "Tree, c. 8 m. high. Cauliflorous. Petals cream coloured."

Enicosanthum erianthoides *Airy-Shaw*, sp. nov., *E. eriantho* (Ridley) *Airy-Shaw** peraffinis, habitu caulifloro, ramulis persistenter villosa-tomentosis, foliis tenuioribus basi magis rotundatis subtus dense supra decidue fulvo-tomentosis, nervis utrinque dense villosis distincta.

Arbor 18 m. alta, trunco 17 cm. diametro, cortice circiter 1.5 cm. crasso radiis medullariis conspicuis, ligno saturate luteo. *Ramuli* dense persistenter fulvo-villosa-tomentosi, longitudinaliter sinuato-striati, 3-5 mm. diametro. *Folia* oblonga vel oblongo-elliptica vel suboblanceolata, 12-40 cm. longa, 6-13 cm. lata, basi truncato-rotundata, apice in uno folio rotundato-emarginato in ceteris manco, integra, chartacea, subtus dense breviter fulvo-tomentosa, supra (costa nervisque exceptis) evanide pubescens; costa supra subplana vel leviter impressa, subtus valde prominens, utrinque dense villosa-tomentosa; nervi primarii laterales 10-20-jugi, interstitiis 1-3 cm. latis sejuncti, quam in *E. eriantho* magis patuli et procurvi (angulo majore orti), graciliusculi, subtus prominentes; nervi secundarii gracillimi, inter primarios scalariformiter dispositi; petioli robusti, 1-1.5 cm. longi, usque 4 mm. diametro, dense fulvo-tomentosi. *Inflorescentiae* e nodis caulinis ortae, totae dense sericeo-tomentosae. *Pedunculi* brevissimi, 1-3-flori; bracteae ovatae, 5-10 mm. longae; pedicelli robusti, 1-1.5 cm. longi; bracteola 1, ovata, cordata, amplexicaulis, 5-10 mm. longa, apice pedicelli sita, sepalo extimo opposita. *Sepala* 3, late triangulari-ovata, 1-2 (plerumque circiter 1.6) cm. longa, basi 1-1.8 cm. lata, subcordata, subacuta, crassa, intus parcius sericeo-villosa. *Petala* 6, obovata, exteriora fere 3 cm. longa et 1-1.5 cm. lata, interiora 2-2.7 cm. longa et 1-1.2 cm. lata, omnia obtusa et plus minus cucullata, crassa, intus parce pubescentia et basin versus fere glabra. *Stamina* numerosa, complanato-oblonga, 4 mm. longa, 1-1.5 mm. lata, connectivo expanso oblique truncato interdum parce piloso. *Carpella* (? fertilia) circiter 20, linearia, 4 mm. longa, longe hirsuta, stigmatibus glabro anguste obconico. *Orula* non visa. *Fructus* ignotus.

Dulit, primary forest on steep slope, under 300 m., 19 Aug., *Richards* 1353: "Tree, 18 m. high. Diam. 17 cm. Bark with conspicuous rays, c. 1.5 cm. thick. Wood dark yellowish. Fls. cauliflorous to near ground."

Vernacular name: *serebah mangis*.

The genus *Enicosanthum* Becc. is apparently the same as *Griffithianthus* Merr. (*Griffithia* Maing. ex King, non Wight et Arn.), and I regard *Marcuccia* Becc. also as not generically distinct. As the name *Griffithianthus* is antedated

* **Enicosanthum erianthum** (Ridley) *Airy-Shaw*, comb. nov.—*Polyalthia eriantha* Ridley in KB. 1912, 384 (sphalm. *erianthia*), et in SMJ. 1, no. 3, 81 (1913).

by both Beccari's generic names, and as all three genera have hitherto been kept up, I propose to retain the name *Enicosanthum* for the aggregate genus, rather than suggest the conservation of *Griffithianthus*. It is closely related to *Polyalthia*, differing principally in the large size of the flowers and in the large leaves with numerous parallel nerves. Several species described in *Polyalthia* require transference.

Enicosanthum acuminatum (Thw.) *Airy-Shaw*.

Polyalthia acuminata Thw. Enum. Pl. Ceyl. 399 (1864); Bedd. Ic. Pl. Ind. Or. 12, t. lvii (1869); Hook. f. et Thoms. in Hook. f. FBI. 1, 63 (1872); Trimmen, Handb. Fl. Ceyl. 1, 25 (1843); King in ABGC. 4, 71, t. 98 (1893).

CEYLON.

Enicosanthum congregatum (King) *Airy-Shaw*.

Polyalthia congregata King in JASB. 61 (2), 61 (1892), et in ABGC. l.c. 76 (1893).

MALAY PENINSULA.

Enicosanthum coriaceum (Ridley) *Airy-Shaw*.

Polyalthia coriacea Ridley in KB. 1912, 383, et in SMJ. 1, no. 3, 82 (1913).

SARAWAK.

Enicosanthum cupulare (King) *Airy-Shaw*.

Griffithia cupularis King in ABGC. l.c. 9 (1893).

Griffithianthus cupularis (King) Merr. in PJS. 10, 231 (1915).

MALAY PENINSULA.

Enicosanthum fuscum (King) *Airy-Shaw*.

Griffithia fusca King, l.c. 10 (1893).

Griffithianthus fuscus (King) Merr. l.c.

MALAY PENINSULA.

Enicosanthum gigantifolium (Merr.) *Airy-Shaw*.

Polyalthia gigantifolia Merr. l.c. 246 (1915).

PHILIPPINES.

Enicosanthum grandiflorum (Becc.) *Airy-Shaw*.

Marcuccia grandiflora Becc. in NGBI. 3, 183, t. iii (1871); Scheff. in NTNI. 34, 79 (1874); Ridley in SMJ. 1, 73 (1913).

SARAWAK.

Enicosanthum grandifolium (Elm.) *Airy-Shaw*.

Polyalthia grandifolia Elm. Leaf. Philipp. Bot. 1, 292 (1908); Merr. in UCPB. 15, 66 (1929).

P. Nickersonii Elm. l.c. 1733; cf. Merr. Enum. Philipp. Fl. Pl. 2, 160 (1923).

P. pinnatinervia Elm. l.c. 1736; cf. Merr. in PJS. 10, 250 (1915).

PHILIPPINES.

I reduce the above two species to *E. grandifolium* on Merrill's authority, but I suspect that *E. Klemmei* and *E. mindanaense* are also forms of the same species. The material at Kew is insufficient to decide this.

Enicosanthum Klemmei (Elm.) *Airy-Shaw*.

Polyalthia Klemmei Elm. l.c. 1735.

PHILIPPINES.

Enicosanthum magnoliiflorum (Hook. f. et Thoms.) *Airy-Shaw*.

Polyalthia magnoliaeflora Hook. f. et Thoms. in Hook. f. FBI. 1, 64 (1872); King in JASB. l.c. 54 (1892).

Griffithia magnoliaepetala Maing. ex King in ABGC. l.c. 9 (1893); Ridley, l.c. 26 (1922).

Griffithianthus magnoliiflora (Hook. f.) Merr. in PJS. 10, 231 (1915); Craib, Fl. Siam. Enum. 1, 29 (1925).

S. PENINSULAR SIAM; MALAY PENINSULA.

The epithet "*magnoliaeflora*" was ascribed to Maingay by Hooker and Thomson, l.c., but Maingay, as his specimens and manuscripts in Herb. Kew.

show, used the epithet "*magnoliaepetala*." King took this up in 1893 and was followed by Ridley in the FMP., but the modified epithet published in the Flora of British India is the valid one and should be ascribed to Hooker and Thomson.

Enicosanthum mindanaense (Elm.) Airy-Shaw.

Polyalthia mindanaensis Elm. l.c. 1734.

PHILIPPINES.

Enicosanthum nitidum (A.DC.) Airy-Shaw.

Guatteria nitida A.DC. Mém. Fam. Anon. in Mém. Soc. Phys. Genève, 5, 218 (reimpr. 41) (1832); Hook. f. et Thoms. Fl. Ind. 1, 143 (1855).

Polyalthia nitida (A.DC.) Benth. et Hook. f. ex Hook. f. et Thoms. in Hook. f. FBI. 1, 64 (1872); King in ABGC. l.c. 83, t. 92 (1893).

P. macrantha King in JASB. l.c. 54 (1892) in ABGC. l.c. 68, t. 93 (1893); Ridl. FMP. 1, 58; Henderson in Gard. Bull. Str. Settlement. 4, 216 (1928); *synon. nov.*

MALAY PENINSULA; ? BURMA.

Griffithianthus Merrillii (C. B. Rob.) W. H. Br. ex Merr. is, as noted by Merrill, anomalous in this genus. Sterile material, probably of this species, was described by Miquel as *Uvaria acuminatissima*, and a closely allied species was described by Hooker and Thomson as *Popowia foetida* Maing. These species do not appear to fit satisfactorily into any genus hitherto described, and the following new one is proposed for their reception.

Neo-uvaria Airy-Shaw, gen. nov., *Uvariae* affinis, petalis exterioribus aestivatione alabastri vitta mediana elevata petalorum interiorum sejunctis, fructibus partialibus maximis oviformibus monospermis distincta.

Sepala parva, deltoideo-ovata, aestivatione aperta (nec distincte valvata nec imbricata), ab initio patentia. *Petala* 6, subaequalia, sub anthesin patentia: exteriora aestivatione valde aperta, alabastro interioribus arcte adpressa, marginibus vitta (vel area anguste triangulari) mediana elevata canaliculata petalorum interiorum omnino sejunctis; interiora stricte valvata, ima basi levissime separata (velut initia vel vestigia unguicularum exhibentia), apice incrassata; omnia dense tomentella. *Stamina* 20-30, brevissima, connectivo latissimo convexo-truncato. *Carpella* 4-12, oblongo-ovoidea, longe pubescentia; stylus clavatus, glaber; ovula 1 vel 2. *Fructus* *partiales* 1-12, mediocres usque maximi, oblongo-ovoides, brevissime et crasse stipitati vel subsessiles, dense breviter fulvo-tomentosi, pericarpio crustaceo usque tenuiter lignoso; semen solitarium, carpellum fere implens, testa ossea.

Arbores mediocres vel magnae. *Ramuli* gracilisculi, juniores cum innovationibus fulvo-velutini, demum glabrescentes, cortice cinereo. *Folia* mediocria, plus minus elliptica, acuminata, breviter petiolata, subtus dense vel parce stellato- vel fasciculato-tomentosa vel -pubescentia, conspicue laxè graciliter nervosa, nervis primariis adscendentibus parallelis, secundariis inter primarios scalariformiter parallelis. *Flores* parvi, lutescentes, ex axillis foliorum delapsorum secus ramulos annotinos per 1-3 fasciculatim orti, breviter pedicellati, petalis sub anthesin omnibus late patentibus.

Species forsan 2, Peninsulae Malaicae insularumque Sumatrae, Borneonis necnon Philippinensium incolae. Typus: *N. foetida* (Maing. ex Hook. f. et Thoms.) Airy-Shaw.

Neo-uvaria foetida (Maing. ex Hook. f. et Thoms.) Airy-Shaw, comb. nov.

Popowia foetida Maing. ex Hook. f. et Thoms. in Hook. f. FBI. 1, 69 (1872); FMP. 1, 76.

MALACCA. Maingay 1053, 1349, 1349A.

Not certainly known from any other locality or collection, but possibly represented by *Beccari* 2671 from Sarawak, and *Elmer* 21183 from Tawao, Brit. N. Borneo, on account of the very large fruits.

Neo-uvaria acuminatissima (Miq.) Airy-Shaw, comb. nov.

Uvaria acuminatissima Miq. in Ann. Mus. Bot. Lugd.-Bat. 2, 6 (1865); Ridley in SMJ. 1, no. 3, 74 (1913).

Mitrephora ferruginea Merr. in Gov. Lab. Publ. (Philipp.) 17, 16 (1904), excl. descr. fl., et in PJS. 1, Suppl. 54 (1906); non Boerl.

Mitrephora Merrillii C. B. Rob. in Bull. Torr. Bot. Club, 35, 67 (1908).

Mitrephora viridifolia Elm. Leaf. Philipp. Bot. 5, 1716 (1913).

Griffithianthus Merrillii (C. B. Rob.) W. H. Brown ex Merr. in PJS. 10, 231 (1915); Merr. in UCPB. 15, 74 (1929).

PENANG. Pulau Boetong, March 1892, *Curtis* 2768: "tree 30-40 ft."

SUMATRA. Sibolangit: Bukit Semaik, 5 Aug. 1921, *Md. Nur* 7448: "true 40-50 ft., flower yellow."

DUTCH S.E. BORNEO. Dusun River, *Korthals* (type).

BRIT. N. BORNEO. Sine loc., Sept. 1919, *Agama* 737. Tawao, *Elmer* 20423, 21112 (cf. Merrill l.c. 1929). Bettotan, logged area, alt. 22 m., 16 Apr. 1933, *Oroflo* in *For. Dept.* 3085: "shrub, 8 ft. high, 3 in. girth." Hulu Bole, edge of stream, 360 m., 30 Apr. 1933, *Puasa* in *For. Dept.* 3110: "tree, 25 ft. high, 9 in. girth; fruit like olive, hairy, used for treating fever in children." Bode Gaya Forest Reserve, Semporna, edge of river, 24 Feb. 1935, *Mail* in *For. Dept.* 4339: "tree, 15 ft. high, 12 in. girth; fruit brown, hairy."

PHILIPPINES. See Merrill, Enum. Philipp. Fl. Pl. 2, 154 (1923).

Vernacular names (North Borneo): *pisang-pisang* (Kedayan, Bajau); *kayu bisling* (Idahan).

This genus is certainly closely related to *Uvaria*, and would be included in it but for the fact that certain other closely related species, not more distinct than *Neo-uvaria*, are currently given generic rank, e.g., *Anomianthus* Zoll., *Rauwenhoffia* Scheff. and *Uvariella** Ridley.

The imbrication of the petals in *Neo-uvaria* is, of course, exceptional for the tribe *Uvarieae*. This tribe would therefore probably be better defined by reference to the stellate indumentum.

I am uncertain how many species can usefully be distinguished. Only a limited amount of flowering material is available, and I therefore provisionally maintain the two species given above, separating them as follows:

Leaves densely and uniformly tomentose below; flower-buds subglobose; ovules generally 2; fruiting carpels very large, up to 5.5 cm. long by 3.3 cm. in diameter.....*N. foetida*

Leaves never so densely tomentose, often merely pubescent or almost glabrous between the nerves; flower-buds oblong; ovule 1; fruiting carpels much smaller, 1.5-3.7 cm. long by 0.7-2.6 cm. in diameter.....*N. acuminatissima*

Polyalthia insignis (Hook. f.) Airy-Shaw, comb. nov.

Sphaerotheralamus insignis Hook. f. in Trans. Linn. Soc. 23, 156 (1860); Becc. in NGBI. 3, 190 (1871); Scheff. in NTNI. 34, 85

* A second species of this genus is *Uvariella ferruginea* (Ham. ex Hook. f. et Thoms.) Airy-Shaw, comb. nov. [*Uvaria ferruginea* Ham. ex Hook. f. et Thoms. Fl. Ind. 1, 96: 1855; *Ellipeia ferruginea* (Ham. ex Hook. f. et Thoms.) Hook. f. et Thoms. in Hook. f. FBI. 1, 52: 1872; Williams in Bull. Herb. Boiss. sér. 2, 5, 23 (1904), *pace* Craib, Fl. Siam. Enum. 1, 32: 1925! *Ellipeia cherreensis* Pierre ex Fin. et Gagnep. in Bull. Soc. Bot. Fr. Mém. 4, 76: 1906]. This is known from E. Bengal, Burma, Siam and Indo-China. Additional records for the original species, *U. leptopoda* (King sub *Ellipeia*) Ridley, are the following: JOHORE: Muar, Apr. 1901, *Curtis* 3617; Batu tiyoh, Sungei Tebrau, Castlewood, 23 Apr. 1905, *Ridley* 12215; SINGAPORE: Toas, 29 May 1890, *Gamble* in *Ridley* 2124. The last two specimens are erroneously cited by Ridley, FMP. 1, 32, under *Uvaria Ridleyi* King. The latter and *U. astrosticta* Miq. (Ridl. l.c. 34) are identical with *U. rufa* Bl.

(1874); Gibbs in Journ. Linn. Soc. **42**, 57 (1914); Ridley in SMJ. **1**, no. 3, 73 (1913), cum var. *parviflora* Ridl.

? *Unona miniata* Elm. Leaf. Philipp. Bot. **5**, 1740 (1913).

Polyalthia dolichophylla Merr. in PJS. **14**, 391 (1919), et in UCPB. **15**, 65 (1929).

? *P. Elmeri* Merr. Enum. Philipp. Fl. Pl. **2**, 160 (1923).

Gunong Balapau, Ulu Tinjar, alt. c. 300 m., near small stream, primary forest, 1 Feb., *Richards* 2456: "Tree c. 4 m. high. Perianth creamy yellow, segments with orange patch at base internally on upper side of flower only. Fls. borne on leafless part of large branch."

This polymorphic and locally common species cannot be maintained generically distinct from *Polyalthia*, in which indeed it has at least once been independently described. Field studies are required in order to determine whether more than one distinct species are involved. It is practically impossible to decide this from existing herbarium material owing to the great and rapid increase in size of the floral parts before and during anthesis, and the foliage offers few distinctive characters.

Polyalthia insignis is closely related to *P. microtus* Miq. in Ann. Mus. Bot. Lugd.-Bat. **2**, 13 (1865), synonyms of which appear to be *Unona jambosifolia* Ridley [KB. 1912, 384; SMJ. **1**, no. 3, 80: 1913; *Desmos jambosifolia* (Ridley) Merr. in Journ. Roy. As. Soc. Str. Br. spec. no. 255: 1921], *Polyalthia Elmeri* Merr. (UCPB. **15**, 66: 1929; non Merr. 1923, supra!), and *P. subcordata* Bl. sec. Merr. (l.c. 67), non Bl.

***Polyalthia sumatrana* (Miq.) Kurz** in JASB. **43** (2), 53 (1874), *emend.* King in JASB. **61** (2), 53 (1892); Ridley in SMJ. **1**, no. 3, 80 (1913); Ridl. FMP. **1**, 52.

Guatteria sumatrana Miq. Fl. Ind. Bat. Suppl. 380 (1860).

Ulu Koyan, sandy rain-forest, 800-1000 m., 18 Sept., *Native Collector* 1918: "Tree, 22 m. high, 24 cm. diam. No buttresses. Perianth segments dull yellowish internally, tinged with red externally, greenish at base."

Vernacular name: *selaut gunong*.

***Polyalthia tenuipes* Merr.** in Journ. Roy. As. Soc. Str. Br. **85**, 184 (1922).

Dulit, primary forest on slope of ridge, under 300 m., 21 Oct., *Richards* 2306: "Tree, 6-7 m. high. Fls. hanging down on long flexible peduncles. Perianth dull reddish purple. Twigs and flowers smelling of guavas."

Vernacular name: *serebah*.

***Polyalthia Motleyana* (Hook. f.) Airy-Shaw**, comb. nov.

Oxymitra Motleyana Hook. f. in Trans. Linn. Soc. **23**, 155 (1860); Ridley in SMJ. **1**, no. 3, 88 (1913).

Hooker suggested no affinity for his species and gave no reasons for placing it in *Oxymitra*. His original description being very short, a more extended one is herewith provided.

Species *P. chrysotrichae* Ridley et *P. oblongae* King affinis, sed floribus brevissime pedicellatis differt; a priore insuper foliis floribusque minoribus, a posteriore perianthii segmentis dense sericeo-villosis recedit.

Arbor parva, 3-4 m. alta, ramulis graciliusculis circiter 4 mm. crassis vetustioribus glabrescentibus cortice cinerascete hornotinis 2 mm. crassis dense breviter subfulvo-velutinis. *Folia* oblanceolata, interdum oblique elliptico-oblanceolata, 10-30 cm. longa, 3-10 cm. lata, basi rotundata vel late cuneata, apice rotundata vel brevissime cuspidato-acuminata, margine integerrima et fere plana, chartacea, siccitate supra grisea subtus brunnescens, utrinque sparse pilosa subtus densius, pilis supra e foveolis minutis ortis; costa supra pilosa, vix impressa, subtus valde tereti-elevata, dense breviter subtomentosa, pube patente fulvescente; nervi laterales 15-20-jugi, patuli, arcuati usque subrecti, graciles, prope marginem arcuato-anastomosantes et nervum intramarginalem efformantes, supra vix impressi, subtus argute prominentes et pubescentes, rete venularum laxo; petioli 3-7 mm. longi, 2-3 mm. crassi, dense fulvescenti-tomentosi. *Flores* conspicue extra-axillares, saepe inter folia adjacentia fere medii, e ramis hornotinis orti, pedicello subnullo usque 5 mm. (raro 1 cm.) longo dense tomentoso. *Sepala* ovato-deltaeidea, 8-9 mm. longa et fere aequae lata, plerumque acuta, extra longe dense tomentosa, intus glabra. *Petala* exteriora late lanceolata, circiter 1.5 cm. longa, 7-8 mm. lata, obtusa usque acuta, interiora oblongo-elliptica, circiter 1.5 cm. longa, 5-6 mm. lata, obtusiuscula, omnia extra dense longe sericeo-tomentosa, intus glabra et verruculosa. *Stamina* numerosissima, cuneiformia, 2.5 mm. longa, glabra, apice expanso plano, in massam 8-9 mm. diametro conglobata. *Carpella* dense longe hirsuta. *Fructus* ignotus.

Dulit, secondary forest, said to be about 40 years old, under 300 m., 23 Aug., *Richards* 1408 (typus, Herb. Kew.): "Small tree, c. 3-4 m. high."

Gunong Balapau, Ulu Tinjar, IVth Division, primary rain forest, c. 400-500 m., 2 Nov., *Richards* 2387: "Tree, c. 4 m. high. Perianth brownish straw colour."

SARAWAK. Sine loc., *Beccari* 1624; *Garai* in *Haviland* 418 (d.m.r.b.). Near Kuching, 6 Nov. 1894, *Haviland & Hose* "418 A": "1-2 ft. high; carpels 2-ovuled, very hairy, style cohaering, stigmas hairy." Baram, May 1894, *Haviland & Hose* 3736.

There is evidently a complex of closely allied forms related to *Polyalthia oblonga* King. One such form is *P. chrysotricha* Ridley, described from imperfect material and hitherto known only from the type gathering (Ulu Langat, Selangor), but apparently also represented by an imperfect specimen from Brastagi, SUMATRA, collected by *Ridley* (s.n.) in Feb. 1921. Closely

related to *P. chrysotricha* is *P. velutinos*a Ridley, with smaller leaves pubescent below.*

The following variety is somewhat intermediate between *P. Molleyana* and *P. oblonga* :

P. Motleyana* var. *glabrescens *Airy-Shaw*, var. nov. foliis costa utrinque brevissime tomentella excepta glabris vel fere glabris exsicando subrubro-brunneis, nervis lateralibus in nervum submarginalem conspicue arcuato-conjunctis.

Guatteria ? *multinervis* Wall. Cat. no. 6445 (1832), *nomen*.

Polyalthia cinnamomea Hook. f. et Thoms. Fl. Ind. 1, 138 (1855) et in Hook. f. FBI. 1, 65 (1872), quoad syn. *G. multinervis* et flor. descr. ; King in JASB. 61 (2), 66 (1892), quoad syn. *G. multinervis* Wall. tantum.

PENANG. "From the Hills," *G. Porter* in Wallich 6445 : "a small tree ; fl. brown." Government Hill, 360 m., April, *Curtis* 1409 : "erect undershrub." PERAK. Hermitage, 600-900 m., Dec. 1887, *Curtis* 1277 : "small tree." SINGAPORE. *Lobb*.

SARAWAK. Sine loc., *Beccari* 1621, 1813 (typus, Herb. Kew). Mt. Koum, limestone, 21 Sept. 1892, *Haviland* 1711.

The variety *glabrescens* approaches *P. oblonga* King, in that the pedicels are sometimes rather longer and the petals rather less sericeous than usual, especially in the Peninsula specimens.

The confusion of this plant with the very different *P. cinnamomea* Hook. f. et Thoms. originated with Wallich's note in his catalogue, under no. 6445, *Guatteria* ? *multinervis* Wall. : "(an eadem ac *G. cinnamomea* ?)." The type-specimen of *G. ? multinervis* is in flower, while that of *G. cinnamomea* is in fruit, and these two specimens formed the whole basis of *Polyalthia cinnamomea* Hook. f. et Thoms. It is logical to make the specimen of *Guatteria cinnamomea* Wall. the lectotype of Hooker & Thomson's species, since those authors took their epithet from it, and King interpreted *P. cinnamomea* in this sense, though apparently without realising that the original description of the flowers was quite inapplicable to those of his plant.

Polyalthia cauliflora Hook. f. et Thoms. Fl. Ind. 1, 138 (1855), et in Hook. f. FBI. 1, 66 (1872) ; Ridley in Journ. Roy. As. Soc. Str. Br. 75, 6 (1917) ; Ridl. FMP. 1, 51 ; Craib, Fl. Siam. Enum. 1, 41 (1925).

Uvaria cauliflora Wall. Cat. 6476 (1832), *nomen*.

Guatteria Teysmanni Miq. Fl. Ind. Bat. Suppl. 378 (1860).

G. ? palembanica Miq. l.c. 379, teste Miq. in Ann. Mus. Bot. Lugd.-Bat. 2, 19 (1865).

Monoon Teysmanni (Miq.) Miq. in Ann. Mus. Bot. Lugd.-Bat. l.c.

Polyalthia macrorhyncha Miq. l.c. 14 ; Boerl. in Ic. Bogor. 1, 108 (1899).

Unona desmantha Hook. f. et Thoms. in Hook. f. l.c. 61 (1872) ; King in JASB. 61 (2), 48 (1892).

Polyalthia Beccarii King, l.c. 65 (1892) ; Ridley in SMJ. 1, no. 3, 80 (1913) ; Ridl. FMP. 1, 50 ; Merr. in SMJ. 3, 523 (1928).

* Additional record for *P. velutinos*a Ridley :

PAHANG. Sunget Yet, Bukit Fraser, 1110 m., 28 Aug. 1923, *Md. Nur* 11127 : "Tree 30 ft. high ; fls. large, brown hairy." Fraser Hill, 1200 m., 28 Aug. 1923, *Henderson* 11421.

Henderson 11421 was distributed as "*Polyalthia cinnamomea* var. ?" The fruits of the two species are very similar, but the flowers are utterly different.

P. Teysmanni (Miq.) King, l.c. 66 (1892), in obs. ; Boerl. in Ic. Bogor. 1, 107 (1899) ; Ridley in SMJ. l.c.

Desmos desmanthus (Hook. f. et Thoms.) Safford in Bull. Torr. Bot. Club, 39, 508 (1912).

Polyalthia desmantha (Hook. f. et Thoms.) Ridley in Journ. Roy. As. Soc. Str. Br. 75, 6 (1917) ; Ridl. FMP. 1, 49 ; Merr. in Pap. Mich. Acad. Sci. 20, 96 (1935).

Dulit, primary forest on steep slope, under 300 m., 19 Aug., *Richards* 1354 : "Tree, c. 25 ft. [7.5 m.] high, diam. 3" [7.5 cm.]. Bark with conspicuous rays, smelling of guava jelly. Fls. pale yellowish green, cauliflorous."

Vernacular name : *serebah*.

Dulit, secondary forest on ridge (said to be about 40 years old), under 300 m., 23 Aug., *Richards* 1405 : "Tree, c. 8 m. high. Cauliflorous. Petals cream coloured. Fls. with peculiar sickly sweet smell."

Dulit, primary forest on steep ridge, under 300 m., 17 Oct., *Richards* 2249 : "Tree, 8.5 m. high, 8 cm. diam. Bark 0.4 cm. thick, with strongly marked medullary rays. Wood smelling of guava. Young leaves drab, hanging limply. Cauliflorous flowers from 1.5 m. above ground to about 1.5 m. from top on main shoot and larger branches. Fls. with smell of rotten fruit when old. Few insect visitors, one Meliponine bee noticed. Many trees of same species in flower at same time in neighbourhood."

Vernacular name : *selaut* or *bigis*.

I have been quite unable to find any characters whereby to distinguish *P. Teysmanni* and *P. Beccarii* from *P. cauliflora*. They appear to represent forms of one common and moderately variable species. Ridley suggests (FMP. l.c.) that *P. pycnantha* (Hook. f. et Thoms.) King may also be merely a form of *P. cauliflora* : this seems very likely, and moreover *P. Wrayi* (Hemsl.) Ridley is scarcely separable. The available material of these two species is hardly sufficient, however, to warrant their reduction.

Polyalthia flagellaris (Becc.) *Airy-Shaw*, comb. nov.

Unona flagellaris Becc. in NGBI. 3, 186 (1871) ; Ridley in SMJ. 1, no. 3, 79 (1913).

Desmos flagellaris (Becc.) Merr. in Journ. Roy. As. Soc. Str. Br., spec. no. 255 (1921).

Dulit, opening in primary forest on steep ridge, under 300 m., 16 Aug., *Richards* 1300 : "Tree, c. 11 ft. [3.3 m.] high. Diam. 2" [5 cm.]. Flowering near base, from trunk. Petals yellowish green. Bark smelling of guava jelly."

Dulit, primary forest, under 300 m., 23 Aug., *Richards* 1407 : "Tree, c. 4 m. high. Fls. produced on small leafless twigs from near base of main stem. Petals dull red. Bark and twigs with strong smell of guava jelly."

Certainly a *Polyalthia*, related to *P. cauliflora* Hook. f. et Thoms. and its allies. The peculiar habit is comparable with that of *P. hypogaea* King.

Woodiella sympetala Merr. in Journ. Roy. As. Soc. Str. Br. 85, 188 (1922).

var. **grandifolia** Airy-Shaw, var. nov., foliis 34-41 cm. longis 12-16 cm. latis subpandurato-oblongatis, nervis 19-24-jugis distincta.

Dulit, stream-side in primary forest, under 300 m., 31 Aug., Richards 1574: "Tree, c. 6 m. high. Cauliflorous. Fls. yellowish green in bud."

A very slight tendency to the subpandurate shape which is so noticeable in this specimen is also observable in some of the smaller leaves of *Ramos* 1808, one of the original specimens cited by Merrill.

Goniothalamus Tapis Miq. Fl. Ind. Bat. Suppl. 371 (1860); Ridley in SMJ. 1, no. 3, 84 (1913); Ridl. FMP. 1, 67.

Dulit Trail, rocky rain-forest undergrowth, under 300 m., 9 Aug., Richards 1170: "Tree, c. 8 m. high. Fls. and fruit reddish."

As a contribution to the question whether this species is really distinct from *G. malayanus* Hook. f. et Thoms. (cf. Corner in Gard. Bull. Str. Settlement. 10, 13: 1939), the following observations may be placed on record.

I have examined type or authentic material of both species, that of *G. Tapis* being somewhat fragmentary and lacking fruit. I have found it possible to sort the Kew material into two groups corresponding reasonably closely with the type sheets. A study of the two series of specimens reveals the following points as probably significant:

	<i>G. malayanus.</i>	<i>G. Tapis.</i>
Leaves ...	8-16 (-25) cm. long, 3-7 cm. wide, usually drying black or blackish-green above, often rather shining, most often relatively narrowly oblong.	15-25 (-33) cm. long, 6-8 (-12) cm. wide, usually drying brownish above, rarely shining, most often broadly elliptic-oblong.
Outer petals ...	acute or rather broadly acuminate, more conspicuously ferruginous-adpressed-pubescent.	usually finely and very acutely acuminate, glabrous or glabrescent or sparingly minutely ferruginous-adpressed-puberulous.
Fruits ...	large, oblong, 2-seeded.	small, ellipsoid, 1-seeded.

SPECIMENS EXAMINED.

G. malayanus Hook. f. et Thoms.:

MALAY PENINSULA. Malacca, Griffith 402 (type); Maingay 1038 A, 1046. Perak, King's Collector 4746, 7139. Selangor, Kloss 15, 27.

SUMATRA. Indrageri, Sungei Laloh, Curtis 3552.

BANGKA. Teysmann (distrib. as *G. Slingelandii* Scheff.).

DUTCH BORNEO. Korthals (distrib. as *G. dispermus* Miq.); Banjarmasin, Moiley 1127.

SARAWAK. Near Kuching, Haviland 6 (b.o.r.c.), 925 (d.x.f.c.), " - 925."

BRIT. N. BORNEO. Tenom, hill, 90 m., Melegrito in For. Dept. 2590; Mengalong, swampy forest area, Keith in For. Dept. 2598.

G. Tapis Miq.:

MALAY PENINSULA. Malacca, Maingay 3061 (fruits of *G. malayanus*, doubtless from no. 1046, mounted on both the Kew sheets of no. 3061). Perak, King's Collector 1973, 5105, 6527; Scortechini 1726. Penang, Curtis 302. Pangkore, Curtis 1634.

SUMATRA. Lubu Alang, Teysmann (paratype); sine loc., Korthals.

SARAWAK. Sine loc., Beccari 357, 788, 1836; Rock Rd. (nr. Kuching), 2nd Mile, Haviland 405 (c.l.q.c.); Baram, Haviland & Hose 3150; nr. Kuching, Haviland & Hose 3338 (?); Bau, Ridley 11767; Matang, Ridley 11768; sine loc., Native Collector (for Bur. Sci. Manila) 853; Dulit, Richards 1170.

I conclude that the two species are distinct, but that their ranges of variation overlap in many respects. The character of the fruit, however, appears to be constant for each.

Goniothalamus sp. aff. *G. malayanus* Hook. f. et Thoms. et *G. Tapis* Miq.

Dulit, primary forest on slope of ridge, under 300 m., 21 Oct., Richards 2305: "Tree, c. 3 m. high. Perianth yellowish green. Twigs when broken with strong, peculiar and very pleasant smell. Fl. on upper branch."

This specimen might almost equally well be placed in either species. Such "intermediate" specimens are, however, noticeably rare, and the fruit (here unfortunately lacking) would probably be decisive. The leaves are very similar to those of a long-petalled group from British North Borneo which has been identified by Merrill with his *G. suluensis*.

Goniothalamus cylindrostigma Airy-Shaw, sp. nov., *G. uvaroidi* King affinis, sed foliis subduplo longioribus triente angustioribus, nervis multo distantioribus, floribus subduplo minoribus, carpellis 2-ovulatis stylis cuneato-truncato-expansis convolutis satis distincta.

Frutex usque 1 m. altus. *Rami* teretes, usque 7 mm. diametro, cortice pallido glabro aromatico. *Folia* anguste oblonga, vel levissime oblanceolata, 50-65 cm. longa, 6-10 cm. lata, basi angustato-rotundata, apice acuta vel breviter acuminata, margine angustissime revoluta, glaberrima, leviter bullata, chartacea, supra griseo-vel olivaceo-viridia, subtus griseo-vel brunneo-viridia; costa supra angustissime impresso-sulcata, subtus valde prominens, circiter 1.5 mm. lata, subteres; nervi laterales 28-30-jugi, utrinque (sed maxime subtus) prominuli, graciles, late patentes, conspicue arcuatim anastomosantes; petioli usque 1 cm. longi et 5 mm. diametro, fusci, supra canaliculati, glabri. *Flores* solitarii, axillares vel (foliis delapsis) caulini. *Pedicelli* 1-1.5 cm. longi, glabri, fusci. *Calyx* synsepalus, basi intrusus, 7-8 mm. diametro, undulatus, 6-lobus, lobis sepalinis 3 deltoideis acutis, intersepalinis rotundatis brevioribus, omnibus dorso et margine minutissime ferrugineo-puberulis. *Petala* exteriora anguste deltoideo-lanceolata, 2-3.5 cm. longa, basi rotundata 5-6 mm. lata, in apicem acutum sensim attenuata, crassa, utrinque minute ferrugineo-puberula, intus basi

fusco- vel fere fuligineo-tomentella. *Petala interiora* lanceolata, 2-2.3 cm. longa, 6-8 mm. lata, supra basin angustatam liberam conniventia et usque ad apicem arcte valvato-connexa, acuta, marginibus fulvo-tomentella, intus basi rugulosa et fuligineo-tomentella. *Stamina* valde numerosa, 3 mm. longa, connectivo mitriformi brunneo minute papilloso. *Carpella* circiter 12, oblonga, 1.5 mm. longa, pubescentia, stylo vaginiformi (latere fesso) glabro 3-5 mm. longo in stigma expanso-cuneatum apice truncatum marginibus convolutis desinente, ovulis 2. *Fructus immaturi* subglobosi, circiter 1 cm. diametro, minute apiculati, 6 mm. stipitati, monospermi.

Dulit, river bank forest, under 300 m., 18 Aug., *Native Collector* 1334 (typus, Herb. Kew.): "Shrub, 1 m. high. Fls. green. Leaves somewhat bullate. Bark with pleasant aromatic scent."

Dulit, primary forest on ridge, under 300 m., 31 Aug., *Richards* 1553: "Shrub, under 1 m. high. Perianth creamy yellow. Wood with pleasant smell."

The type of stigmatic structure found in the present species and apparently in *G. uvarioïdes* King (cf. Ann. Roy. Bot. Gard. Calc. 4 (3), t. 143, fig. 7) is shared also by *G. latistigma* C. E. C. Fischer (in Kew Bull. 1927, 204, c. fig.). The latter species, however, differs considerably in characters of foliage, sepals, inner petals and anther-connectives. The drawing of the stigma of *G. uvarioïdes* published by King (l.c.) shows the structure only partially, but the longitudinal slit down the style is visible. This is not alluded to in the text (l.c. 100). The 4-ovulate character of the carpels appears to be of minor importance, since the species associated on this basis by Boerlage (in Ic. Bogor. 1, 136: 1899) as Sect. *Beccariodendron* (Warb.) Boerl. show little evidence of affinity on other grounds.

In foliage, and especially in nervation, the present species strongly resembles *G. sesquipedalis* Hook. f. et Thoms.

Goniothalamus velutinus *Airy-Shaw*, sp. nov., foliis et indumento *G. Curtisii* King simillimus, sed nervis duplo distantioribus, sepalis parvis, connectivis rotundatis nec conicis recedit; florum structura *G. fulvo* Hook. f. et Thoms. accedens, sed ramis fusco-ferrugineo-velutinis, foliis multo majoribus pubescentibus valde distincta.

Arbor parva, circiter 6 m. alta, cauliflora. *Caulis* (parte florifera) gracilis, 7-8 mm. diametro, cortice pallido. *Ramuli* teretes, 3-5 mm. diametro, dense fusco-ferrugineo-velutini. *Folia* oblanceolata, 40-42 cm. longa, 8.5-10 cm. lata, basi rotundata, apice subabrupte breviter deltoideo-acuminata, acumine acutissimo 1.5-2 cm. longo, margine levissime incurva, tenuiter chartacea, siccitate olivacea, utrinque (maxime subtus, supra praecipue secus nervos) longiuscule patenti-pubescentia pilis fusco-ferrugineis; costa supra impressa, dense longiuscule pilosa, subtus prominens, patenter pilosa, inferne dense velutina; nervi laterales 22-25-jugi, graciles, late patentes, sursum arcuati et obscure reticulatim anastomosantes, utrinque prominuli; petioli tumidi, 1.8 cm. longi, 5 mm. crassi, ut ramuli

dense velutini. *Flores* (? immaturi) virides, perianthio ferrugineo-sericeo; pedicelli 5-9 mm. longi; bracteolae circiter 4, basales, 2-4 mm. longae. *Sepala* deltoideo-ovata, breviter connata, circiter 7 mm. longa et 4 mm. lata, acuta. *Petala exteriora* ovato-lanceolata, usque 1.8 cm. longa et 8 mm. lata, basi rotundata, intus area ovata 3 mm. longa minute tomentella notata, apice acuminato-attenuata. *Petala interiora* ovata, usque 1.2 cm. longa et 6 mm. lata, basi libera subcuneata circiter 4 mm. longa, ceterum usque ad apicem subacutum arcte valvato-connata, marginibus reflexis tomentellis. *Stamina* numerosissima (circiter 140), cuneato-oblonga, vix 2 mm. longa, connectivo hemisphaerico minute tomentello. *Carpella* 12-16, fusiformia vel ovoïdea, circiter 2 mm. longa, basi longe ferrugineo-hirsuta, stylo subnullo, stigmatibus parvo minute bilobo. *Fructus* ignoti.

Dulit, by small stream, primary forest, under 300 m., 31 Aug., *Richards* 1559: "Small tree, c. 6 m. high. Fls. green, cauliflorous."

In its large leaves and in the dark-rusty velvety indumentum of the branchlets and petioles this is very distinct from all species except *G. Curtisii*, which is immediately separable from *G. velutinus* by its large membranous sepals. In *G. Curtisii*, moreover, the main lateral nerves (i.e., those which anastomose near the margin) are on the average about 1 cm. apart (as against 1.5-2 cm. in the present species) and the marginal anastomosis is much more clearly marked. *G. fulvus* has flowers very similar to, but somewhat larger than, those of *G. velutinus*, but, being otherwise quite glabrous, it presents a very different facies in the vegetative parts.

It is doubtful whether the carpels are normal in the available material of *G. velutinus*. In the best-developed flower they are markedly rugulose, and no ovules could be detected. Those of younger flowers also appear somewhat malformed. None of King's figures show a comparable type of carpel and stigma.

Fissistigma Kingii (Boerl.) *Burkill* in KB. 1935, 317, et Dict. Econ. Prod. Mal. Penins. 1, 1021 (1935).

Melodorum parviflorum Scheff. sec. King in JASB. 61 (2), 107 (1892), non Scheff.

M. Kingii Boerl. in Ic. Bogor. 1, 134 (1899).

var. **multinerve** *Airy-Shaw*, var. nov. nervis primariis circiter 23-25 (nec 16-17)-jugis, alabastris longioribus angustioribus acuminatis (15×5 mm. nec 11×6 mm.).

Dulit Trail, stony primary forest in valley, under 300 m., 10 Aug., *Richards* 1192: "Woody climber on tree 90' high. Sepals [i.e. outer petals] light brown externally, creamy white internally; petals creamy white; texture of both somewhat fleshy."

var. **grandiflorum** *Airy-Shaw*, var. nov. nervis ut in typo, alabastris magnis suboblongis 22 mm. longis 9 mm. latis.

SARAWAK. Near Kuching, 13 Nov. 1894, *Haviland & Hose* 3336K: "flowers scented when cut."

The following specimen is intermediate between this variety and the type:

SUMATRA. Goerach Batoe, Asahan, Yates 1749.

var. **tomentosum** Airy-Shaw, var. nov. nervis ut in var. *multinervi*, floribus fere ut in var. *grandifloro*, foliis subtus dense ferrugineo-tomentosis (nec tenuiter rubiginosis).

SARAWAK. Sine loc. exact., Beccari 3787.

var. **fagifolium** (Ridley) Airy-Shaw, stat. nov.

Melodorum fagifolium Ridley in KB. 1912, 386, et in SMJ. 1, no. 3, 91 (1913).

A typo differt foliis tantum 7-11 cm. longis, nervis 5-10-jugis.

SARAWAK. Entoyut River, Dec. 1894, Hose 397.

This is very close to typical *Kingii*, and probably not worth distinguishing. It has neither the glaucous leaf-undersurface nor the very small flowers of *F. litseifolium* (King) Merr., with which it was originally compared.

Oxymitra biglandulosa (Bl.) Scheff. in NTNI. 31, 341 (1870).

Guatteria biglandulosa Bl. Fl. Jav. Anon. 102, t.li (1828).

Dulit, secondary forest, under 300 m., 12 Aug., Richards 1217: "Liane on tree 80-90' high?"

Drepananthus ramuliflorus Maing. ex Hook. f. et Thoms. in Hook. f. FBI. 1, 56 (1872); Ridley in SMJ. 1, no. 3, 78 (1913); Ridl. FMP. 1, 38.

Dulit, rocky primary (?) forest in valley, under 300 m., 10 Aug., Richards 1187: "Said to be a common species. Slender tree. Height 150 ft. [45 m.]. Circumference at breast height 86" [2.15 m.]. Slightly buttressed. Bark very thin, not longitudinally fissured, smooth. Wood hard, white. Medullary rays in bark conspicuous."

Vernacular names: *selaut* (Malay), *kametan* (Sehop), *detan* (Kenyah).

Drepananthus carinatus Ridley, FMP. 1, 38 (1922); Henderson in Gard. Bull. Str. Settlm. 4, 213, 215 (1928).

var. **deltoideus** Airy-Shaw, var. nov. sepalis minoribus triangularibus 4-5 mm. tantum latis, foliis subtus brevius spariusque pubescentibus distincta.

Dulit, primary forest on hillside, under 300 m., 15 Aug., Richards 1282: "Tree, 58 ft. [17.4 m.] high. Diam. 2 ft. [0.6 m.] from ground, 14 inches [0.35 m.]. No buttresses. Branching about 7 ft. [2.1 m.] from top. Bark smooth, yellowish. Fls. with sickly sweet scent. Petals creamy yellow (green when young)."

Vernacular name: *selemoh*.

Dulit Ridge, "transition" forest, c. 1200 m., 9 Sept., Syngé 1651: "Tree, c. 15 m. high. Diameter c. 14 cm. Bark smooth. Has gum. Sap said to be good to drink when tree is not in flower."

Vernacular name: *selemoh gunong*.

In size and shape of leaves and petals this is indistinguishable from Ridley's species, but further material may show the desirability of treating it as specifically distinct. I follow Henderson (l.c. supra)

in maintaining the genus *Drepananthus*, as the case for its reduction to *Cyathocalyx* does not appear to be conclusively proved.

A feature of *Drepananthus* species, to which I have not seen attention drawn, is that they afford unusually good examples of sympodial branching. The branchlets are stout and almost straight, and the leaf-opposed inflorescences arise along them on alternate sides with the greatest regularity. Richards 1282 shows this very clearly.

Artabotrys suaveolens (Bl.) Bl. Fl. Jav. Anon. 62, tt. xxx, xxxi D (1828); Ridley in SMJ. 1, no. 3, 76 (1913).

Unona suaveolens Bl. Bijdr. 17 (1825).

Dulit, secondary forest, under 300 m., 14 Aug., Richards 1258: "Large liane on trees, 30-40 ft. [9-12 m.] high. Perianth segments pale green when young, cream coloured when mature. Fls. sweet scented."

Popowia tomentosa Maing. ex Hook. f. et Thoms. in Hook. f. FBI. 1, 70 (1872); ? Ridley in SMJ. 1, no. 3, 87 (1913), cf. Merr. in Journ. Roy. As. Soc. Str. Br. spec. no. 265 (1921).

Dulit, primary forest on crest of ridge, under 300 m., 29 Oct., Richards 2360: "Tree, 18 m. high, 15 cm. diam. No buttresses. Petals pale pinkish."

Vernacular name: *medang kasap*.

Mitrephora glabra Scheff. in Ann. Jard. Bot. Buitenz. 2, 20 (1885); Ridley in SMJ. 1, no. 3, 86 (1913); Diels in Mitt. Inst. Bot. Hamb. 7, 80 (1927).

Sungei Balapau, R. Tinjar, bank of small river, secondary forest, under 300 m., 15 Oct., Richards 2223: "Tree, c. 6-8 m. high, but trunk relatively thick. Fls. with strong sickly sweet scent. Outer perianth segments bright yellow, inner with yellowish 'claw' and purplish expanded portion, externally with pale border, internally marked with dark purple streaks. Inner perianth segments joined at tips. Leaves thinnish, slightly rough."

Pseuduvaria calliura Airy-Shaw, sp. nov., *P. caudata* Merr. ut videtur proxima, a qua foliis duplo majoribus supra haud nitentibus, floribus duplo minoribus, staminibus subduplo paucioribus differt.

Frutex circiter 3 m. altus. *Ramuli* graciles, usque 4 mm. diametro, cortice fusco longitudinaliter reticulato-striato dense minute cinereo-tomentello. *Folia* elliptico-oblongata, 20-26 cm. longa, 6.5-7.5 cm. lata, basi angustato-subrotundata, apice abrupte longe tenuiter caudata, cauda 4.5-5.5 cm. longa basi 5 mm. lata apice obtuso 1 mm. lata, papyracea, fusco-cinerea, costa nervisque exceptis glabra; nervi laterales 12-15-jugi, graciles, supremis exceptis subrecti, prope marginem arcuato-anastomosantes, supra leviter impressi, subtus prominentes, utrinque ut costa cinereo-tomentelli; petioli crassiusculi, 6-8 mm. longi, 2.5 mm. diametro, cinereo-tomentelli. *Inflorescentiae* axillares, fasciculares, pauciflorae.

Flores masculi (? an maturi) pusilli, pedicellis gracilibus 5-6 mm. longis cinereo-puberulis medio minute 1- vel 2-bracteolatis. *Sepala* ovato-deltoidæa, vix 1 mm. diametro, parce puberula. *Petala exteriora* sepalis similia sed subduplo majora. *Petala interiora* rhomboïdæa, unguiculata, circiter 4 mm. longa et 3 mm. lata, cinereo-tomentella. *Stamina* 20-25, vix 1 mm. longa, connectivis truncatis. *Flores feminei* et *fructus* ignoti.

Dulit, by stream in primary forest, under 300 m., 31 Aug., Richards 1571: "Shrub, c. 3 m. high."

Well characterized by the long slender abrupt drip-tip. The small size of the flowers (male only present) may possibly be due to youth. The writer fully endorses Merrill's views in PJS. 10, 254 (1915) regarding the distinctness of the genus *Pseuduvaria*. See also Merrill in Contrib. Arn. Arb. 8, 60 (1934).

***Disepalum grandiflorum* Ridley** in KB. 1912, 384, et in SMJ. 1, no. 3, 83 (1913); Merr. in Contrib. Arn. Arb. 8, 59 (1934).

Marudi, edge of road in "heath" (white sand) forest, under 300 m., 25 July, Richards 1007: "Shrub, c. 2 m. high."

It seems probable that the genus *Disepalum* is related to *Polyalthia*. The foliage, terminal long-pedicelled flower, calyx-texture, and very numerous long-stalked fruiting carpels of all the species are strongly reminiscent of *Polyalthia pulchra* King. The recently described Sumatran *D. platypetalum* Merr. (l.c. 58) may be compared, in its hexamerous sympetalous corolla, with *Papualthia*.

XXXIII—NOTES ON THE NOMENCLATURE OF CERTAIN RUTACEAE-AURANTIOIDEAE. H. K. AIRY-SHAW.

I. *Limonia monophylla* Linn. and *Atalantia monophylla* DC.

No fewer than five distinct species of *Rutaceae-Aurantioideae*, belonging to five closely related genera (four of them sections of one genus in Engler's treatment), have had the epithet *monophylla*, for various reasons, applied to them.

Limonia monophylla L. Mant. Alt. 237 (1771).

Atalantia monophylla DC. Prodr. 1, 535 (1824).

Triphasia monophylla DC. l.c. 536 (1824).

Paramignya monophylla Wight, Ill. Ind. Bot. 1, 109 (1840).

Severinia monophylla Tanaka, Stud. Citrol. 1, 95 (1928).

Of these, the third and fourth were proposed quite independently of *Limonia monophylla* L., and need not concern us further; they are mentioned here in order that they may not be confused with the species with which we are particularly dealing in this paper.

The confusion here has already been commented on, and to a great extent unravelled, by Burkill in Gard. Bull. Str. Settle. 5, 215 (1931), and the ensuing remarks are an attempt to clarify the situation, if possible, further and to follow Burkill's remarks to their logical conclusion.

Limonia monophylla L. was explicitly based upon *Limonia* "*pusilli*" [i.e. *pumili*] *Zeylanici sylvestres* Burm. Thes. Zeyl. 143,

t. 65, fig. 1 (1737). Burman's description and figure were based on a plant in Hermann's herbarium, listed as *Dehighaha* in the latter's Mus. Zeyl. ed. 2, 40 (1726). Trimen examined Hermann's specimen and wrote of it in his flora (Handb. Fl. Ceyl. 1, 227: 1893) as follows: "The figure of Burman (a very poor one) appears to represent this [*Atalantia ceylanica* (Wight) Oliv.] rather than *A. monophylla*, to which it is referred in Fl. B. Ind. and elsewhere; this is therefore *Limonia monophylla*, L. Hermann's specimen, however, is described by Linnaeus (Fl. Zeyl. n. 406) under the name of *Phantis*, a name never afterwards referred to in his later works; it is certainly *A. zeylanica*."

In view of this statement, which there seems no reason to doubt (though Hermann's specimen, which the writer has examined at the British Museum, is a poor one), Tanaka's interpretation of the Linnaean species as the South Chinese and Tonkin *Severinia buxifolia* (Poir.) Ten., on the basis of the undetermined specimens of the latter in the Linnaean herbarium (see below, p. 292), is indefensible. *Limonia monophylla* L. is clearly the Ceylon endemic known as *Atalantia ceylanica* (Wight) Oliv.

Burkill (l.c. 216) writes: "obviously the Ceylon plant has a right to the name [*A. monophylla*]." But the name *Atalantia monophylla* was proposed by De Candolle (l.c. *supra*) expressly for the plant figured by Roxburgh, Corom. Pl. 1, 60, t. 83 (1795), as *L. monophylla* L. (which it unfortunately was not). De Candolle, however, did not cite *Limonia monophylla* L. under *Atalantia monophylla*, and it seems probable, from his total omission of *L. monophylla* from the Prodr. that he regarded it as a *species omnino dubia*. *Atalantia monophylla* DC. was therefore a new name for Roxburgh's misidentified species, not a new combination based indirectly on *Limonia monophylla* L. (The epithet *monophylla* was presumably retained by De Candolle because it was appropriate.) The epithet *monophylla* (L.) cannot therefore be used for *A. ceylanica* (Wight) Oliv., since this would create a later homonym of *A. monophylla* DC., which was based on a different type; but *monophylla* (L.) would be the correct epithet for *A. ceylanica* in Rissoa Arn. or *Sclerostylis* Bl., should either of those genera be revived.

Roxburgh's species was subsequently described by Willdenow, Linn. Sp. Pl. ed. 4/5, 2, 554 (1799), as *Trichilia spinosa*, and again, independently, by Blume, Bijdr. 1, 134 (1825)—a year after De Candolle—as *Sclerostylis spinosa*. Unaware of Willdenow's plant, Koorders transferred Blume's species to *Atalantia* in 1912; thus Tanaka's and Alston's transference of Willdenow's species to the same genus in 1930 and 1931 resulted in a later homonym, which is of course inadmissible. The valid name under *Atalantia* for the species which has been called *A. spinosa* is therefore *A. monophylla* DC.

The tangled synonymy of these species may now be set out as follows:

Atalantia monophylla DC. Prodr. 1, 535 (1824).

Limonia monophylla L. sec. Roxb. Corom. Pl. 1, 60, t. 83 (1795), non L.

Trichilia spinosa Willd. Linn. Sp. Pl. ed. 4/5, 2, 554 (1799).

Sclerostylis spinosa Bl. Bijdr. 1, 134 (1825).

Atalantia spinosa (Bl.) Koord. Exkursiönsfl. Java, 2, 427 (1912).

Atalantia spinosa (Willd.) Tanaka in Journ. Bot. 68, 232 (1930); Alston, Trim. Handb. Fl. Ceyl. 6, 38 (1931) (ut videtur de novo); nom. illegit.

Atalantia ceylanica (Arn.) Oliv. in Journ. Linn. Soc. 5, Suppl. 2, 25 (1861); Trimen, Handb. Fl. Ceyl. 1, 227 (1893) ("ceylanica").

Limonia monophylla L. Mant. Alt. 237 (1771).

Rissoa ceylanica Arn. in Act. Acad. Nat. Cur. 18, 324 (1836).

Sclerostylis ceylanica (Arn.) Wight, Ill. Ind. Bot. 1, 109 (1840).

Severinia monophylla Tanaka, Stud. Citrol. 1, 95 (1928); Bull. Mus. Hist. Nat. [Par.] sér. 2, 2, 163 (Apr. 1930); Journ. Bot. 68, 232 (Aug. 1930), q.v.; quoad syn. *Limonia monophylla* L. tantum.

A few words may be added regarding Merrill's synonymy and discussion under *Atalantia buxifolia* (Poir.) Oliv., in his Commentary on Loureiro's "Flora Cochinchinensis" (Trans. Amer. Philos. Soc. n.s. 24 (2), 223: 1935). On the basis of Tanaka's statement that the specimens of *Limonia monophylla* in the Linnaean herbarium are *Severinia buxifolia*, Merrill gives the Linnaean species as a synonym of *Atalantia buxifolia*. But, as he points out, the Linnaean specimens (*vide* Jackson) are not authentically named,* and therefore cannot be taken as the type of the species. *Limonia monophylla* L. must certainly be interpreted on the basis of the Burman synonym, and Hermann's specimen is therefore the type. The citation of *L. monophylla* L. Mant. must accordingly be deleted from the synonymy of *Severinia buxifolia*.

By a slip, Merrill states that *L. monophylla* was published in Linnaeus's "Mantissa 1: 237. 1767;" it was, of course, published in the "Mantissa Plantarum Altera."

The citation "*Atalantia monophylla* (Roxb.) DC." (Merrill, l.c.) is misleading. It is true that *A. monophylla* DC. "was based wholly on *Limonia monophylla* [L. sec.] Roxb.," but Roxburgh did not publish the latter as a new species: he thought he was dealing with Linnaeus's plant, for he wrote "LIMONIA MONOPHYLLA. Linn. Mant. 237." Roxburgh's misidentification of *Limonia monophylla* L. cannot be treated as a new name, and therefore no new combinations can be based upon it. The citation of Roxburgh should be given in the form "*Limonia monophylla* L. sec. Roxb. . . ., non

* The writer has examined the Linnaean specimens, identified (no doubt correctly) by Tanaka with *Severinia buxifolia*. There is no evidence whatever to justify their being regarded as the type of *Limonia monophylla* L., or even to connect them with that species at all. They are not so determined by Linnaeus, and may well have been received after that species was described.

L.," and De Candolle's new name must be kept for the plant actually described by Roxburgh, Correa and De Candolle, i.e. for the species commonly known as *Atalantia spinosa* (Bl.) Koord.

II. *Limonia* Linn. versus *Feronia* Correa.

Swingle, in his article on the name of the wood-apple (Journ. Wash. Acad. Sci. 4, 325: 1914), has argued that the generic name *Limonia* L. is invalid, "being a mere variant of *Limonium*." He accordingly uses the next available name, *Feronia* Correa, and has been followed by other authors, including Tanaka and Engler.

But according to Art. 70 (International Rules, ed. 3, 22: 1935), "when the difference between two generic names lies in the termination, these names must be regarded as distinct, even though differing by one letter only." Among the "examples of different names" given in the Rules (l.c. 23) are *Peponia* and *Peponium*, from which it logically follows that *Limonia* and *Limonium* are also different. The chance of confusion between maritime herbs of the temperate zone and a tree of tropical India, in two totally unrelated families such as *Plumbaginaceae* and *Rutaceae*, is practically nil. It is in any case desirable, in the interests of historic continuity, to preserve Linnaean generic names whenever possible. There is, therefore, no justification, under International Rules, for rejecting *Limonia* L. in favour of the much later *Feronia* Correa.

The genus is monotypic, being restricted to the species originally described by Linnaeus.

Limonia L. Gen. Pl. ed. 6, 213 (1764).

Feronia Correa in Trans. Linn. Soc. 5, 224 (1800); Engl. in Engl. et Prantl, Nat. Pflanzenfam. ed. 2, 19a, 354 (1931).

Anisifolium Rumpf ex Kuntze, Rev. Gen. Pl. 1, 98 (1891).

L. acidissima L. Sp. Pl. ed. 2, 554 (1762); Alston, Trim. Handb. Fl. Ceyl. 6, 41 (1931).

Schinus Limonia L. Sp. Pl. ed. 1, 389 (1753).

Feronia elephantum Correa, l.c.

Hesperethusa acidissima (L.) M. Roem. Syn. Monogr. 1 (Hesper.), 38 (1846).

Anisifolium Limonia (L.) Kuntze, l.c.

Feronia Limonia (L.) Swingle in Journ. Wash. Acad. Sci. 4, 325, 328 (1914); Engl. in Engl. et Prantl, l.c. 355.

It is a matter for regret that certain modern authors such as Haines, Bot. Bihar and Orissa, 163 (1921), Craib, Fl. Siam. Enum. 1, 229 (1926), etc., have persisted in the use of the name *Limonia acidissima* for *Hesperethusa crenulata* (Roxb.) M. Roem., in spite of the fact that the incorrectness of this was pointed out by Swingle (in Bailey, Stand. Cyclop. Hort. 3, 1478) as long ago as 1915. It is to be hoped that the authors of future floras will use the correct nomenclature for this confused group.

XXXIV—RESEARCHES ON *SILENE MARITIMA* AND *S. VULGARIS*: XXII.* E. M. MARSDEN-JONES AND W. B. TURRILL.

[Kew Bulletin, 1939]

FURTHER RESEARCH ON THE GENETICS OF PETAL SIZE AND OTHER CHARACTERS IN *S. MARITIMA*.

In K.B. 1933, 357 seq., we described genetical research with a plant of *S. maritima* which had very poorly developed petals (see l.c. plate 16). The series of intraspecific crosses there analyzed were made by crossing a narrow-leaved plant, S.P.5, with a broader-leaved plant (A.13). It was felt desirable to test petal size by selfing further F_1 plants obtained by breeding together two broader leaved plants, one with normal and one with poorly developed petals.

The following scheme shows the series of families described here:

A. 2 $\times$ A. 13
N. 36

F_1

F_2 N.107=N.36 plant 8 selfed. 54 plants.
N.109=N.36 plant 5 selfed. 79 plants.
N.118=N.36 plant 15 selfed. 90 plants.

A.2 was described in K.B. 1928, p. 4. A.13 was described in K.B. 1929, p. 150 and the results of selfing this stock-plant in K.B. 1933, pp. 357-8, where a family (N.68) from a sib of the F_1 plants used to produce the three families described below is analyzed.

F_1 FAMILY.

N.36. 44 plants in the family.

Habit: prostrate, uniform, stems up to 3.2 dm. long, with little anthocyanin.

Leaves: lanceolate to oblanceolate-linear.

Inflorescence: with from 3 to 7 flowers, which are erect and actinomorphic.

Calyx: fluctuated from cylindric to broadly ellipsoid (even on the same plant, No. 5); Nos. 8 and 15 were cylindric. Much anthocyanin.

Corolla: all with fully developed petals, petals and segments overlapping, excepting segments divergent in No. 23, all bilobed, lobed three-quarters, with good scales, 12 with blotch: 32 with no blotch.

Androecium: 19 with purple filaments: 18 with white filaments; anthers all purple; 26 with hermaphrodite flowers only: 11 with hermaphrodite and female flowers: 7 with female flowers only.

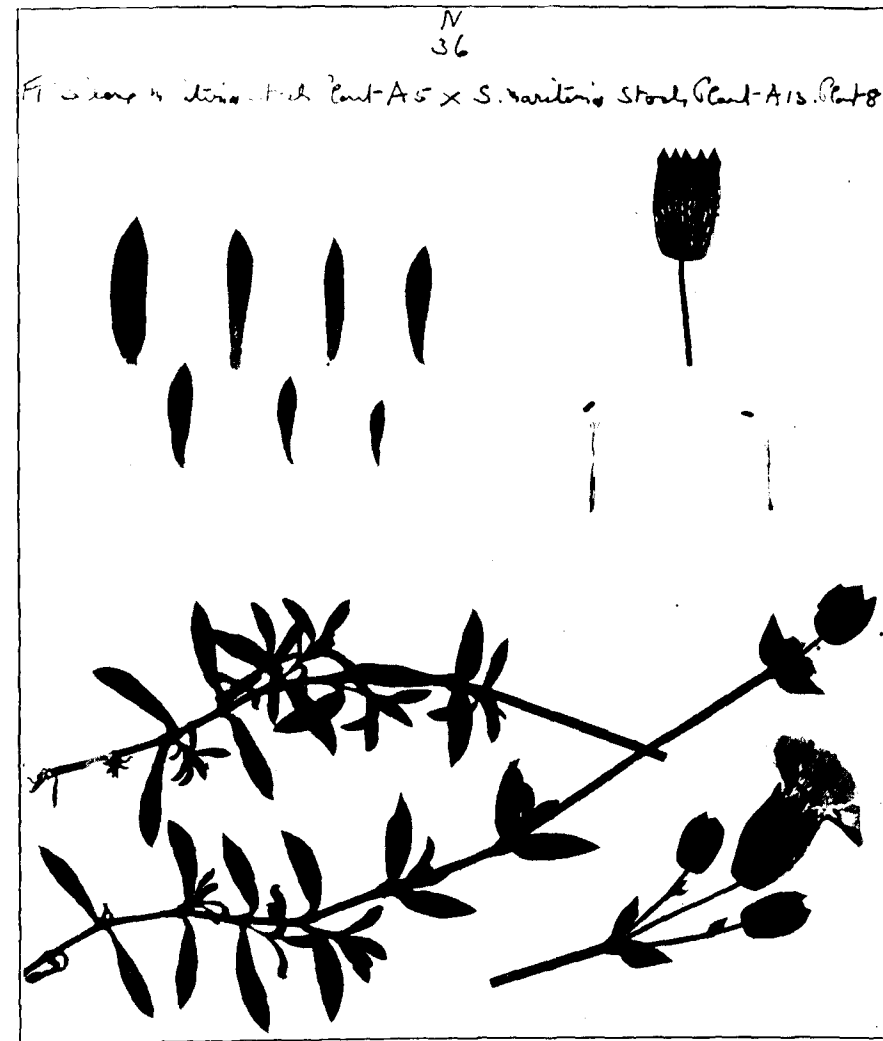
Gynoecium: stigmata 29 purple: 15 white; immature seeds all purple.

Fruits: 24 broadly ovoid: 14 obloid: 4 fluctuating.

Seeds: all armadillo.

* Continued from K.B. 1938, 254.

PLATE II



Card material of *Silene maritima* N.36, plant 8 (F_1 family stock plant A.5 $\times$ stock plant A.13).

CHARACTERS OF F₁ PLANTS SELFED.

Plant 5: calyx shape fluctuating; no blotch; purple filaments; hermaphrodite and female flowers; stigmata purple; fruits obloid.

Plant 8: calyx cylindric; blotch present, purple filaments; hermaphrodite flowers; stigmata purple; fruits broadly ovoid.

Plant 15: calyx cylindric; blotch present, purple filaments; hermaphrodite flowers; stigmata purple; fruits broadly ovoid.

F₂ FAMILIES.

Habit: prostrate, uniform.

Leaves: uniformly of typical *S. maritima* type.

Anthocyanin in vegetative parts: medium.

Anthocyanin in calyx:

		Very much.	Much.	Medium.	Little.	None.
N. 107	...	0	42	11	0	0
N. 109	...	0	55	18	2	0
N. 118	...	0	60	27	0	0

Calyx shape:

		Ellipsoid.	Narrow ellipsoid.	Cylindric.	Fluctuating.
N. 107	...	0	33	12	8
N. 109	...	2	45	6	22
N. 118	...	1	52	7	27

Corolla: petals all with well-developed scales.

		Petals bilobed.	Petals multi-lobed.	Petals 2/3 lobed.	Petals 3/4 lobed.	Petals fully developed.	Petals poorly developed.
N. 107	...	46	0	14	29	33	21
N. 109	...	67	9	3	71	64	15
N. 118	...	77	1	1	77	76	14
Totals	...	190	10	18	177	173	50

		Petals overlap.	Petals diverge.	Segments overlap.	Segments diverge.	Blotch	No blotch.
N. 107	...	28	16	26	18	40	5
N. 109	...	64	11	50	25	0	76
N. 118	...	74	5	68	11	7	70
Totals		166	32	144	54	47	151

Androecium and sex :

	Anthers purple.	Anthers yellow-green.	Filaments purple.	Filaments white.	Flowers hermaphrodite.	Flowers hermaphrodite and female.	Flowers female.
N. 107	25	0	17	8	15	11	26
N. 109	13	0	8	5	3	10	62
N. 118	33	0	22	11	15	18	55
Totals	71	0	47	24			

Stigmata and immature seed colour :

	Sitgmata purple.	Stigmata white.	Immature seeds purple.	Immature seeds white.
N. 107	37	15	48	0
N. 109	52	25	76	0
N. 118	64	24	84	0
Totals	153	64	208	0

Fruits and seeds :

	Broadly ovoid.	Obloid.	Tubercled.	Armadillo.
N. 107	43	11	0	54
N. 109	0	76	0	76
N. 118	41	31	0	72
Totals	—	—	0	202

DISCUSSION.

Calyx : The parent A.2 had much, A.13 a small amount of anthocyanin. The F_1 had much and the F_2 families gave the figures 0 very much : 157 much : 56 medium : 2 little : 0 none. This is practically a 3 : 1 ratio.

The fluctuation for calyx shape in F_1 and F_2 , both between and on individual plants, was greater than in any other families within our experience. It is possible that modifiers functioning independently of the ordinary genome are responsible.

Corolla : 10 plants in F_2 showed some petals (usually very few per plant) multilobed.

There was a considerable range in degree of petal development in F_2 plants. In extreme poorness of lamina development the lobing was two-thirds and the petals and segments did not overlap. Fully developed to more or less poorly developed gave, for the three F_2 families together, 173 : 50, which approximates to 3 : 1. It should be noted that female flowers usually have smaller petals than

hermaphrodite ones and this in turn tends to modify lamina depth of lobing and lobe overlapping. In this series of families, poor petal development did not affect the development of coronal scales.

F_1 segregated for blotch. In F_2 the families showed very different segregations : N.107, derived from an F_1 plant with a blotch, gave a ratio of 8 present : 1 absent ; N.109, derived from an F_1 plant without a blotch, had all plants without a blotch ; N.118, derived from an F_1 plant with a blotch, gave a ratio of 1 present : 10 absent. It is certain that several factor pairs (possibly including inhibitors) are involved.

Filaments : A.2 had purple filaments (in the few stamens produced) ; A.13 had white filaments ; F_1 showed 1 : 1 segregation ; all F_2 plants selfed had purple filaments ; the F_1 families show a 2 : 1 segregation. Owing to the high proportion of female flowers these figures cannot be further explained at present.

Sex : A.2 was female (except for the production of relatively few stamens) ; A.13 was hermaphrodite. F_1 and F_2 families segregated for sex. It is interesting to note the low proportion of hermaphrodites and high proportion of females in N. 109, an F_2 from an immediate selfed parent which produced both hermaphrodite and female flowers.

Stigmata colour : A.2 had purple and A.13 white stigmata ; F_1 gave 2 purple : 1 white ; all F_1 plants selfed to produce F_2 families had purple stigmata ; F_2 total ratio was 2.4 purple : 1 white.

Capsule shape : N. 36 plant 5 bred true to obloid capsules ; N.36 plant 8 and N.36 plant 15, both with broadly ovoid capsules, segregated on selfing in the ratios 4 broadly ovoid : 1 obloid and 1.26 broadly ovoid : 1 obloid, respectively.

Uniform behaviour occurred for the following in F_1 , and all F_2 families : habit, leaf-shape, coronal scales, anther colour, immature seed colour, and armadillo testa.

SUMMARY.

Two broad-leaved plants of *Silene maritima* were crossed together, the one with fully developed normal petals, the other with poorly developed petals. Three F_2 families were raised, totalling 223 plants. Petal size is shown to have a monohybrid genetical basis, in agreement with earlier results, when a narrow-leaved variety was crossed with the same broad-leaved poor-petalled plant. It is obvious that the narrow-leaved character of the second parent does not influence the genetic inheritance of petal size. Other characters scored were : habit, leaf-shape, anthocyanin in vegetative and floral parts, calyx-shape, petal lobing and overlapping, corona, sex, fruit-shape, and testa structure.

The research on which this paper is based has been aided by a Royal Society Government Grant.

XXXV—RESEARCHES ON *SILENE MARITIMA* AND *S. VULGARIS* : XXIII. E. M. MARSDEN-JONES AND W. B. TURRILL.

GENETICS OF CALYX-SHAPE AND OTHER CHARACTERS IN *S. MARITIMA*.

Calyx shape within the species *S. maritima* and *S. vulgaris* shows a wide range of variation. It is often difficult to score because of the occurrence of all grades of intermediates, between markedly different extremes, and sometimes of fluctuation on an individual plant. An extreme variant with long cylindric calyces was found in a wild population and has been used in various crosses, of which one is considered here.

The following is the key to the families described below :

N.104=*S.P.70* selfed.

N.106=*N.36* plant 15 $\times$ *S.P.70*.

N.220=*N.106* plant 7 selfed.

N.222=*N.106* plant 45 selfed.

N.36 plant 15 is described in pp. 294-297.

DESCRIPTION OF STOCK-PLANT 70.

Collected on Chesil Beach, Dorset, Abbotsbury end, 1932.

Habit : compact and ascending, stems up to 4.7 dm., anthocyanin in vegetative parts much.

Leaves : linear to oblanceolate-linear, well-developed leaf 2.5 cm. long, 0.4 cm. broad.

Inflorescence : of 1 to 3 (rarely 5) flowers.

Calyx : Long cylindric, 2.6 cm. long, 0.8 cm. in diameter, narrowing downwards in fruit, with medium anthocyanin.

Corolla : white petals only slightly protruding from mouth of calyx, the laminae together giving a fruit-bowl shape, natural diameter 2.0 cm., when artificially spread out 2.9 cm. diameter ; petals 2.7 cm. long, 1.2 cm. broad, multilobed, $\frac{3}{4}$ lobing, when fully spread out the segments and petals did not overlap, but with the natural bowl-shape the petals were mostly more or less discontinuous and the segments were overlapping or contiguous ; no anthocyanin blotch ; corona of small scales.

Androecium : fully functional, flowers hermaphrodite ; anthers purple ; a trace of anthocyanin in the filaments.

Gynoecium : stigmata purple ; immature seeds purple.

Ripe capsules : broadly ovoid, 8 mm. long (without teeth), 7 mm. diameter (in broadest part below middle), teeth each an isosceles triangle, 3 mm. long, 2 mm. broad at base, strongly recurved.

Seeds : armadillo.

N.104. *S.P.70* selfed. 126 plants in the family.

Habit : uniform, all compact and ascending ; anthocyanin in vegetative parts much.

Leaves : uniform, and as parent.

Inflorescence : of 1 to 3 (rarely 5) flowers.

Calyx : uniform, long cylindric, with medium anthocyanin.

Corolla : petals overlapping or contiguous 51 : petals not overlapping or contiguous 68 ; segments overlapping or contiguous 89 : segments not overlapping or contiguous 30 ; petals multilobed 122 : petals bilobed 2 ; all $\frac{3}{4}$ lobed ; all with small scale ; all except 1 without anthocyanin blotch.

Androecium : 104 with anthers purple ; filaments 72 white : 32 purple.

Sex : 75 with hermaphrodite flowers only ; 29 with hermaphrodite and female flowers ; 20 with female flowers only.

Gynoecium : stigmata 41 white : 83 purple ; immature seeds all purple.

Ripe capsules : all broadly ovoid.

Seeds : all armadillo, in one plant there was a slight roughing on the back of some of the seeds.

N.106. *N.36* plant 15 $\times$ *S.P.70*. 103 plants in the family.

Habit : uniform and intermediate between parents ; anthocyanin in vegetative parts 80 much : 23 medium.

Leaves : intermediate between parents.

Inflorescence : of 1 to 3 (rarely 5) flowers.

Calyx : no long cylindric calyces appeared, i.e., none of *S.P.70* shape, but the calyces ranged from cylindric to ellipsoid, often on the same plant, 3 plants had definitely ellipsoid calyces and 11 definitely cylindric (not long cylindric), the remaining 89 had intermediate or fluctuating calyces ; anthocyanin medium in all.

Corolla : petals overlapping or contiguous 103 : petals not overlapping or contiguous 0 ; segments overlapping or contiguous 81 : segments not overlapping or contiguous 22 ; petals multilobed 7 : petals bilobed 96 ; all $\frac{3}{4}$ lobed ; scale 101 : small scale 2 ; anthocyanin blotch present 34 : absent 69.

Androecium : 101 with anthers purple ; filaments 27 white : 74 purple.

Sex : 90 with hermaphrodite flowers only ; 11 with hermaphrodite and female flowers ; 2 with female flowers only.

Gynoecium : stigmata 43 white : 60 purple ; immature seeds all purple.

Ripe capsules : broadly ovoid 79 : intermediate 24.

Seeds : all armadillo.

N.220. *N.106* plant 7 selfed. 67 plants in the family.

Habit : all typical *S. maritima* ; stems ascending 20 : intermediate 44 : prostrate 3 ; anthocyanin in vegetative parts 39 much : 28 medium.

Inflorescence : of 1 to 3 (rarely 5) flowers.

Calyx : shape was more definite than in *F*₁ ; ellipsoid 27 : intermediate 36 : cylindric 2 : long cylindric 2 ; anthocyanin in calyx much 31 : medium 36.

Corolla : petals overlapping or contiguous 46 : petals not overlapping or contiguous 21 ; segments overlapping or contiguous 23 : segments not overlapping or contiguous 44 ; petals all bilobed ; $\frac{3}{4}$ lobed 55 : $\frac{2}{4}$ lobed 12 ; scale 64 : small scale 3 ; anthocyanin blotch present 4 : absent 63.

Androecium : 67 with anthers purple ; filaments white 11 : purple 56.

Sex : all hermaphrodite.

Gynoecium : stigmata 61 white : 6 purple ; immature seeds all purple.

Ripe capsules : obloid 6 : intermediate 33 : broadly ovoid 26.

Seeds : all armadillo.

N.222. N.106 plant 45 selfed. 69 plants in the family.

Habit : all typical *S. maritima* ; stems ascending 6 : intermediate 38 : prostrate 25 ; anthocyanin in vegetative parts, much 2 : medium 42 : little 25.

Inflorescence : of 1 to 3 (rarely 5) flowers.

Calyx : shape was more definite than in F_1 ; ellipsoid 0 : intermediate 39 : cylindric 30 ; anthocyanin in calyx, much 37 : medium 32.

Corolla : petals overlapping or contiguous 68 : petals not overlapping or contiguous 1 ; segments overlapping or contiguous 22 : segments not overlapping or contiguous 47 ; petals multilobed 12 : bilobed 57 ; $\frac{3}{4}$ lobed 64 : $\frac{2}{4}$ lobed 5 ; scale 68 : small scale 1 ; anthocyanin blotch present 29 : absent 40.

Androecium : 58 with anthers purple ; filaments white 0 : purple 58.

Sex : hermaphrodite flowers only 51 : hermaphrodite and female flowers 7 : female flowers only 11.

Gynoecium : stigmata, white 11 : purple 58 ; immature seeds all purple.

Ripe capsules : broadly ovoid 45 : intermediate 24 : obloid 0.

Seeds : all armadillo.

DISCUSSION.

Habit : a plant with prostrate stems was crossed with a plant with ascending stems and gave an F_1 intermediate in habit. Since the original plants bred true for habit the different ratios in F_2 are difficult to explain. These are ascending 20 : intermediate 44 : prostrate 3 and ascending 6 : intermediate 38 : prostrate 25. It may be that the F_1 was heterozygous for lethals which affected habit ratios in F_2 .

Anthocyanin in vegetative parts : all plants in the series had some anthocyanin. There is no doubt that not only presence or absence but also intensity of coloration has a genetic basis. A plant with little anthocyanin was crossed with a plant with much. F_1 segregated into much and medium and the F_2 families came from plants with much and medium respectively. The former gave an F_2 of much 39 : medium 28 and the latter much 2 : medium 42 :

little 25. Two, or possibly three, factors with a cumulative result are presumably involved.

Calyx : a plant with cylindric calyces was crossed with a plant with peculiar long cylindric calyces. The former plant segregated on selfing into ellipsoid, narrow ellipsoid, cylindric, and fluctuating, while the latter bred true for calyx shape. The F_1 showed segregation into ellipsoid, intermediate, and cylindric. An F_2 family from an F_1 with ellipsoid calyces gave ellipsoid 27 : intermediate 36 : cylindric 2 : long cylindric 2. An F_2 family from an F_1 with cylindric calyces gave ellipsoid 0 : intermediate 39 : cylindric 30 : long cylindric 0. Ellipsoid throws a majority of ellipsoid and intermediate, and cylindric only intermediate and cylindric. The very few long cylindric plants in F_2 (2 out of 136) and the fact that none of these came from a cylindric F_1 suggests that long cylindric is in some sense a bottom recessive for the factor group involved and particularly that the presence of a factor for cylindric prevents its expression or at least its full expression.

All plants in the series had much or medium anthocyanin in the calyces. Between "much" and "medium" there is no sharp line of demarcation and the character expression is easily modified by environmental conditions. The spring drought of 1938 probably increased the depth of colour and was the cause of the higher number of plants with "much" anthocyanin in the F_2 families—much 76 : 60 medium.

Corolla : the exceptional difficulty of scoring for overlapping of petals and segments in flowers with long cylindric calyces has been noted above. One parent also segregated on selfing for poorly developed petals. There is thus a good deal of interference with the normal expression of these characters. The parents had overlapping and more or less not overlapping petals and segments respectively. F_2 families segregated in different ratios, which, however, while showing higher figures where expected, suggest considerable interference from factors having a modifying influence upon the expression of those genes which are sometimes clearly responsible for overlapping or its absence.

The ovule parent had bilobed petals, the pollen parent had very many petals multilobed. On selfing the former bred practically true to "multilobed"—102 multilobed : 2 bilobed. It must be noted that by "multilobed" is meant that at the time of scoring one or more petals, in flowers then at full anthesis, show clearly one or more extra lobes. Very rarely are all the petals multilobed. It follows that some plants scored as "bilobed" may during some part of their often very long flowering period really be "multilobed," i.e., in a segregating family the figure for "bilobed" may be too high and for "multilobed" too low. "Bilobed" is nearly but not fully "dominant" over "multilobed." One F_1 family bred true to "bilobed" and the other segregated in the empirical ratio (of one scoring) of approximately 5 : 1.

The two parents and all F_1 plants showed $\frac{3}{4}$ lobing. The appearance of a few (17 out of 136) plants with $\frac{2}{4}$ lobing in the F_2 families is possibly due to genes for poorly developed petals introduced through the ovule parent.

All plants in the series of families had scales. The ovule parent had fully developed scales and the pollen parent small scales. It may be that the latter would have produced fully developed scales had the petals been able to spread normally, which they could not do because of the long cylindric calyces. A very few plants in F_1 and F_2 (6 out of 239) had scales not fully developed, possibly caused by other than genetic factors.

Complementary factors are involved in anthocyanin production, and there are many degrees of development of anthocyanin blotch on petals. The ovule parent had a blotch but segregated on selfing. The pollen parent had no blotch but on selfing produced one plant (out of 126) with a blotch (? a mutation). The F_1 and F_2 families all segregated with the majority of plants not showing blotches.

Androecium: anthers were purple in all plants of the series. Both parents had anthocyanin in the filaments, but there was only a trace in the pollen parent. F_1 segregated (74 purple : 27 white). One F_2 bred true to purple filaments from an F_1 with purple filaments and the other, also from an F_1 with purple filaments, segregated (56 purple : 11 white).

Sex: Both parents were hermaphrodite but segregated for sex on selfing. The F_1 and one F_2 family segregated for sex and one F_2 family bred true to hermaphroditism.

Gynoecium: both parents had purple stigmata but both segregated on selfing. It was noted that in plants in N.104 with both hermaphrodite and female flowers the latter often had purple thicker stigmata while the former had white more slender stigmata. F_1 and F_2 families all segregated. The former approximated to a 9:7 ratio. An F_2 family from an F_1 plant with purple stigmata gave 58 purple : 11 white. An F_2 family from an F_1 plant with white stigmata gave 6 purple : 61 white. Immature seeds were purple in all plants of the series.

Ripe capsules: both parents had broadly ovoid capsules. The ovule parent segregated on crossing, the pollen parent bred true on selfing. F_1 segregated for broadly ovoid and intermediate as did also one F_1 family. The second F_1 family segregated into 6 obloid : 33 intermediate : 26 broadly ovoid. The factor or factor-group responsible for obloid ("squat") capsules has certainly come from the ovule parent.

Seeds: all plants in the series had armadillo seeds.

CALYX SHAPES IN *SILENE MARITIMA*.

Within both *S. maritima* and *S. vulgaris* there is a very great range in calyx shape. There are many difficulties in scoring variants into definite classes but a few well-marked variants are easily recognized. In the course of our studies we have examined many

thousands of plants of both species in or from localities representing most of the geographical and ecological ranges of the species. Extreme variants are rare in nature and in the British Isles are, at least usually, of casual occurrence. In this paper we have used a plant, from the Chesil Beach, which had very long cylindric calyces from which the petals could not properly expand their laminae. Only a single individual was found showing this character, among a very large population, of which some thousands were examined in the course of several visits. This plant (S.P.70) is described above.

In July 1930 on the bank of the R. Ystwyth, south-east of Aberystwyth, and about a mile inland from the mouth, a plant very similar in calyx shape to S.P.70 was found as a single individual amongst a very large population. This plant is now referred to as S.P.55.

S.P.55. Bank of R. Ystwyth, Cardiganshire, 13.7.1930.

Habit: stems spreading, semi-prostrate below, ascending above (in the wild), up to 3.8 dm. long; medium anthocyanin in the vegetative parts.

Leaves: broadly linear or oblanceolate-linear, apex acute to shortly acuminate, average of well developed leaves 3.5 cm. long, 0.6 cm. broad, margins more or less and often sparsely shortly ciliated.

Inflorescence: of 1 to 3 (rarely up to 7) flowers, which are erect at full anthesis and actinomorphic. Bracts glabrous, sparsely or not ciliated, lower green and herbaceous similar to but smaller than uppermost leaves, upper smaller and narrower, the uppermost completely scarious.

Calyx: long narrow cylindric, about 2.3 cm. long (including lobes) and 0.5–0.6 cm. diam. at anthesis, somewhat enlarging and broadening in the upper part in fruit, with much anthocyanin.

Corolla: with the petals and segments not contiguous or overlapping, included in the calyx and not spreading. Petals mostly poorly developed, 1.8 cm. long, 0.5 mm. broad, white, lamina lobed for one-third to half its length, scales fairly well developed, anthocyanin blotch present.

Androecium: rarely developed, but a few stamens occasionally formed in several flowers; filaments white; anthers purple.

Gynoecium: stigmata white (under cultivation often poorly developed, and flowers may then be more or less neuter); immature seeds purple.

S.P.55 was grown at Potterne for four years and then died. During this period it remained absolutely sterile, never setting fruits or seeds with either controlled or open pollination. This appeared to be due to gynoeceal degeneration. Wild material is in Herb. Kew. as No. 2044 and cultivated material under S.P.55.

N.129. S.P.55 $\times$ S.P.70. No seed set.

N.130. S.P.55 selfed. No seed set.

In open polination the plant had a full chance of receiving pollen from any of thousands of plants of many different stocks.

We suggest that S.P.55 and S.P.70 arose as independent mutations in the wild in widely separated localities. In neither plant was there any reason for supposing previous contamination by *S. vulgaris*.

SUMMARY.

An account is given of a plant with long cylindric calyces, and it is shown that this plant breeds true for this and certain other characters. It was crossed with a plant with cylindric calyces and an F_1 and two F_2 families were raised. The characters scored included those for habit, anthocyanin in vegetative and floral parts, calyx shape, petal lobing and overlapping, coronal development, sex, capsule shape, and testa surface. The results obtained are discussed at some length. The long cylindric calyx appears to be a bottom recessive and a factor for normal cylindric especially prevents its expression.

Another plant with similar calyces, but from a widely separated locality, is also described. It proved entirely sterile.

The research on which this paper is based has been aided by a Royal Society Government Grant.

XXXVI—NOTES ON CAREX: VIII.* E. NELMES.

THREE NEW SPECIES FROM LAOS.

Dr. A. F. G. Kerr, as is well known, has made large collections of plants in Siam during many years. In 1932, on his final expedition, he penetrated into Laos and climbed Pu Bia, one of the highest mountains in French Indo-China.

Among his Laos gatherings are four *Carices*, all of which appear to be new to science. Three of them are described below: the fourth is unfortunately in too advanced a stage for adequate description.

This high percentage of new species suggests that the Pu Bia mountain region would repay further exploration.

Carex Kerrii Nelm., sp. nov.; affinis *C. tereti* Boott, sed vaginis foliorum purpureo-sanguineis, spicis paucis brevioribus, utriculis longioribus ovato-lanceolatis paucinerviis differt.

Culmi 45–62 cm. alti, acutanguli, inferne laeves, superne scabri, subvalidi, rigidi, foliati, basi vaginis aphyllis paucis purpureo-sanguineis circumdati. *Folia* inflorescentiam superantia, 4–6 mm. lata, planiuscula, valde 3-costata, coriacea, rigida, vaginis basilaribus purpureo-sanguineis. *Spicae* 5–7, fastigiatae, superiores 1–3 gynaeandreae, subsessiles, ceterae femineae, pedunculatae, plerumque 5–7 cm. longae, nutantes, superiores subapproximatae, inferiores subdistantes; pedunculi tenues, parce scabri. *Bracteae* foliaceae, evaginantes, inferiores inflorescentiam longe superantes, superiores

parvae. *Squamae femineae* ovato-ellipticae, apice obtusae vel subacutae, inferne pallide ferrugineae, superne atro-sanguineae, pallide viridi-carinatae, in mucronem excurrentes. *Utriculi* squamis longiores et latiores, 4–4.5 mm. longi, ovato-lanceolati, plano-convexi, subpatentes, pallide ferruginei, glabri, membranacei, dorso 4–6-nerves, facie tenuiter 3-nerves, in rostrum mediocre subteres laeve ore atro-sanguineum subintegrum sensim desinentes. *Nux* late ovato-elliptica, sublaxe inclusa, breviter et valde stipitata. *Stigmata* 2.

LAOS. Pu Bia, in open patch in evergreen forest, c. 2500 m., 13 April 1932, Kerr 21,031 (Kew).

Carex euprepes Nelm., sp. nov.; affinis *C. spatiosae* Boott var. *bogorensi* C. B. Clarke, sed foliis multo latioribus late elliptico-lanceolatis dorso nervibus adpresso-hispidulis, utriculis magis curvatis praecipue differt.

Culmi 70 cm. alti, stricti, laeves, rigidi, triquetri, foliati, validi, basi vaginis aphyllis paucis inferne pubescentibus circumdati. *Folia* late elliptico-lanceolata, apice acuminata, plerumque 18–21 cm. longa, medio 3.5–3.7 cm. lata, patentia, plana, vaginantia, superiora 1–3 inflorescentiam superantia, supra inferne laevia superne nervis 2 prominentibus scabra, infra nervis adpresso-hispidula. *Inflorescentia* paniculata, elongata, interrupta, 10–15 cm. longa; *paniculae secundariae* suberectae, suboblongae, bracteatae. *Spicae* androgynaeceae, subdivaricatae, 8–10 mm. longae, pauciflorae, pars mascula parti femineae aequilonga. *Bracteae* inferiores late foliaceae, inflorescentiam longe superantes, vaginantes, superiores abrupte minores. *Squamae femineae* parvae, late ovatae, albae, tenuiter striatae, subacutae, mucronulatae. *Utriculi* squamis multo longiores et latiores, 4–4.5 mm. longi, late elliptico-lanceolati, trigoni, divaricati, laeves, plurinerves, superne anguste marginati, marginibus hispidi, in rostrum sublongum curvum leviter tortum planiusculum marginatum (marginibus hispidulis) ore oblique sectum bidentatum (dentibus strictis) subabrupte contracti. *Nux* arcte inclusa, elliptica. *Stylus* basi bulbosus. *Stigmata* 3.

LAOS. Tawiang, Chiengkwang, evergreen forest, c. 900 m., 6 April 1932, Kerr 20,927 (Kew).

Note.—The status and relative position of *C. spatiosa* Boott var. *bogorensis* C. B. Clarke are not yet clearly defined. The plant appears to be more closely related to *C. euprepes* than to *C. spatiosa*, and its identification with *C. Horsfieldii* Boott, by Kükenhal, is certainly erroneous.

Carex laosensis Nelm., sp. nov.; affinis *C. euprepi* Nelm., sed foliis multo angustioribus, utriculis majoribus laevioribus, paniculis minoribus angustioribus praecipue differt.

Culmi stricti, rigidi, subvalidi, foliati. *Folia* superiora inflorescentiam longe superantia, apice acuminata, 10–13 mm. lata, plana, utrinque laevia sed apicem versus marginibus scabra, vaginantia.

* Continued from K.B. 1939, 202.

Inflorescentia paniculata, anguste oblonga, interrupta, usque 13 cm. longa; *paniculae secundariae* suberectae, oblongae, inferiores bracteatae. *Spicae* subdivaricatae, androgynaeceae vel superiores saepe omnino masculae, pauciflorae, pars mascula parti femineae aequilonga. *Bracteae* foliaceae, inflorescentiam longe superantes, vaginantes. *Squamae femineae* parvae, late ovatae, albidae, tenuiter striatae, mucronulatae. *Utriculi* squamis multo longiores et latiores, 4-4.5 mm. longi, ovato-lanceolati, conspicue trigoni, divaricati, valde marginati, marginibus superne hispiduli, plurinerves, in rostrum sublongum curvum leviter tortum planiusculum valde marginatum (marginibus hispidulis) ore brevissime bidentulum subabrupte contracti. *Nux* arcte inclusa, late elliptica, faciebus inaequalibus. *Stylus* basi incrassatus. *Stigmata* 3.

LAOS. Pak Munung, Wieng Chan, in evergreen forest, c. 1200 m., 22 April 1932, Kerr 21,202 (Kew).

XXXVII—NOTES ON CAREX: IX. E. NELMES.

SPECIES CONFUSED WITH *C. nivalis* BOOTT.

In the Pflanzenreich, under *Carex nivalis* Boott, Kükenthal placed three forms which seem to me to call for some elucidation.

I.

"*C. nivalis* Boott forma 1. *Griffithii* (Boott) Kükenth.—*C. Griffithii* Boott in Trans. Linn. Soc. xx. (1846) 138.—Spicula terminalis mere ♂.—Afghanistan (Griffith n. 78, n.v.). Northwest-himalaya: Gilgit (Giles!)."

Griffith's plant, no. 78, is the type of *C. Griffithii* Boott. If Kükenthal had seen it he would, I feel sure, have decided that it was not so closely related to *C. nivalis*. I agree with Boott and Kreczetowicz that it is a distinct species. Griffith's 142, collected in the same locality, Koh-i-Baba, also belongs to this species.

The other plant cited above, collected by Dr. G. M. J. Giles on the Gilgit Expedition in Kashmir, is described below as a new species.

***Carex Gilesii* Nelmes**, sp. nov.; affinis *C. Griffithii* Boott, sed spicis cylindricis fastigiatis numquam androgynaeceis, squamis brevioribus, utriculis elliptico-obovatis differt.

Rhizoma stoloniferum. *Culmi* 50-65 cm. longi, subvalidi, laeves, triquetri, inferne foliati, basi vaginis aphyllis brunneis paucis circumdati. *Folia* e basi culmi aggregatim orta, culmo multo breviora, 4-7 mm. lata, plerumque plana sed interdum conduplicata, rigidiuscula, longe attenuata. *Spicae* 4, superiores 1-2 ceteris breviores et graciliores, semper fere omnino masculae, 1.5-2 cm. longae, ceterae femineae, 2.5-3.5 cm. longae, circiter 5 mm. latae, infima longissime pedunculata, superiores pedunculatae vel subsessiles, fastigiatae, cylindricae, densiflorae, basi graciliores et

sublaxiflorae, cernuae; pedunculis laevibus et filiformibus. *Bracteae* inferiores breviter foliaceae, spicis multo breviores, longi-vaginant, superiores brevissimae et squamiformes, vix vaginantes. *Squamae* anguste oblongae, 3.5-4 mm. longae, acuminatae, brunneo-purpureae, carina pallida excurrente. *Utriculi* plerumque squamis longiores, 4 mm. longi, circiter 2 mm. lati, elliptico-obovati, superne castaneo-purpurei, inferne albidii, papyracei, compressi, enerves, in rostrum breve albidum leviter flexuosum laeve ore leviter bilobum abrupte contracti. *Nux* parvula, stipitata, in utriculi parte inferiore sita. *Stylus* longus. *Stigmata* 3, in utriculo paullum inclusa.

INDIA. Kashmir: Tui Pass, Gilgit, 3600-4200 m., Giles 475 (Kew).

II.

"*C. nivalis* Boott forma 2. *cinnamomea* (Boott) Kükenth.—*C. cinnamomea* Boott in Trans. Linn. Soc. xx. (1846) 136, neque Olney neque Cheesem.—*C. Oliveri* Boeck. in Flora LXIII. (1880) 455.—*Squamae* cum utriculis cinnamomeae. *Utriculi* marginibus virentes ore bidentuli.—Afghanistan: Kuram Valley (Aitchison n. 1242!). Karakorum (C. B. Clarke n. 30254!). Westhimalaya: Kashmir (C. B. Clarke n. 29921!); Tibet (Schlagintweit n. 5682!, Thomson!); Gurwhal (Schlagintweit n. 10022!)."

There appear to be several species included in this second of Kükenthal's forms.

1. *C. cinnamomea* Boott was described from a specimen collected by Royle in India, which came to Kew with Boott's Herbarium. It is, in my opinion, specifically distinct from *C. nivalis*, differing principally in its much smaller and differently shaped utricle.

2. *C. Oliveri* Boeck. was based on Aitchison's plant (no. 1242) from Afghanistan, and is quite distinct from all its relatives, but is nearer to *C. Griffithii* and *C. Gilesii* than it is to *C. nivalis* and *C. cinnamomea*.

3. Clarke's no. 30,254 is, I believe, merely a colour form of *C. luteo-brunnea*, a species described below, but the remainder of the plants cited by Kükenthal under f. *cinnamomea* seem to belong rather to *C. nivalis* proper.

III.

"*C. nivalis* Boott forma 3. *luteo-brunnea* Kükenth. form. nov.—*Squamae* cum utriculis luteo-brunneae.—Karakorum (C. B. Clarke n. 30,448!) Tibet (Schlagintweit n. 5450!, 6089!)."

Clarke's 30448 is, in my opinion, specifically distinct from all the other plants cited in this paper, and I describe it below, choosing as the type another number of Clarke's from the Karakorum (30,235) which is identical with it, but represented by better specimens. Schlagintweit's numbers appear to belong here, as their spikes are similar in colour to those of the western plant, but their fruits are immature.

Carex luteo-brunnea (Kükenth.) Nelmes, sp. nov.; affinis *C. Oliveri* Boeck. sed foliis latioribus, squamis marginibus albo-hyalinis, utriculis latioribus in rostrum minus brevius magis abrupte contracti praecipue differt.

Culmi 80 cm. alti, subvalidi, inferne laeves, superne scabriusculi, foliati, subrigidi. *Folia* culmo paullo breviora, usque 8 mm. lata, planiuscula, subrigida, longe attenuata. *Spicae* 5, raro 6, superiores 1-3 gynaeandreae, ceterae femineae, fastigiatae vel infima subdistans, nutantes, 3-5.5 cm. longae, 5-7 mm. diametro, cylindricae, densiflorae sed basi laxiores, infima basi breviter ramosa, superiores breviter inferiores longe pedunculatae (pedunculi parce scabri). *Bractae* inferiores breviter foliaceae, spicis multo breviores, vaginantes, superiores squamiformes, evaginantes. *Squamae* anguste oblongo-obovatae, 4 mm. longae, luteo-brunneae, marginibus anguste albo-hyalinae, apice subacutae, carinatae, mucronulatae. *Utriculi* squamis longiores et latiores, 5.5-6 mm. longi, circiter 2.5 mm. lati, elliptico-obovati, papyracei, compressi, inferne albidii, superne luteo-brunneae, 2-nerves, tenuibus submarginalibus, basi vix stipitati, apice interdum hispiduli, in rostrum brevissimum gracile leviter flexuosum ore albo-hyalinum inaequaliter bilobum abrupte contracti. *Nux* parvula, in utriculi parte inferiore sita. *Stigmata* 3.

INDIA. Karakorum, 4200 m., 9 August 1876, (*Clarke* 30,235 (type, Kew); 12 August 1876, (*Clarke* 30,448 (Berlin).

XXXVIII—NOTES ON CAREX: X. E. NELMES.

NEW AUSTRALIAN SPECIES AND RECORDS.

During recent years, through the enthusiastic exertions of Messrs. Raleigh A. Black and S. T. Blake, several interesting *Carices* have been discovered in Australia, some of which are new to science and others hitherto unrecorded for this continent.

Notes on these plants are arranged geographically below.

TASMANIA.

Of the twenty *Carices* forming Section 65, *Echinochlaenae* Th. Holm, in Kükenthal's monograph in Das Pflanzenreich, sixteen are endemic to New Zealand, one each to Tasmania and Western Australia, and the remaining two are South American. The Tasmanian plant, which Kükenthal had described five years earlier (Bull. Herb. Boiss. Sér. 2, 4, 59: 1904) as *Carex tasmanica*, is, as might be expected, of closer affinity to the New Zealand representatives than are the Western Australian and South American plants. It is worthy of note that no member of this strong New Zealand Section has been recorded from the mainland of Australia, but under Victoria is described what appears to be an interesting link between this Section and a closely related one.

In Kew Bull. Add. Ser. 8, 83 (1908), a Tasmanian sedge was described posthumously by C. B. Clarke as *C. Richmondii* Boott.

Kükenthal's type of *C. tasmanica* has been borrowed from Berlin and compared with Clarke's plant, and in my opinion the two are conspecific. As *C. tasmanica* Kükenth. was described four years earlier than *C. Richmondii* Boott ex C. B. Cl., the latter name falls into synonymy.

C. tasmanica was based on two specimens collected by L. Rodway, one on the Derwent River and the other on Mt. Dromedary, and *C. Richmondii* on a gathering of A. F. Oldfield made "on the Coal River" at Richmond, near Hobart, Tasmania.

Mr. Raleigh A. Black has been very energetic, with the help of friends, in trying to rediscover *C. tasmanica* in Tasmania. I consider that his 1160-(1), collected on Mt. Direction in 1911, belongs to this species.

Before leaving Tasmania I have to record another interesting *Carex* received at Kew from Mr. Black, no. 1150-(4), and collected by him at Bellerive, in that island, in December 1917. Its identification has not been precisely determined, but it is either conspecific with our northern *C. divisa* Huds., or very closely akin to it. It differs sufficiently, I consider, from typical *C. divisa* to rule out the possibility of its being an introduction, and Mr. Black tells me that the nature of its habitat tends to confirm this view.

VICTORIA.

Both Mr. Black and Mr. Blake have sent interesting *Carices* from Victoria, but this being Mr. Black's State he has had the larger haul.

His most outstanding discovery was collected last year on the road from Mt. Hotham to Omeo. It is evidently related to that rather common Australian sedge, *C. inversa* R. Br., but is at once seen to differ in its chestnut-coloured blunter glumes and much less strongly nerved utricles.

Closer study of this plant showed that it agreed still more nearly with the description under the name "*C. hypandra* F. Muell.", cited from Fragm. 8, 259 (1874), on page 190 of Kükenthal's monograph in Engl. Pflanzenr. IV. 20 (1909). Kükenthal cites specimens collected in Victoria by Mueller and by Maiden. When the Maiden specimens, determined by Kükenthal as *C. hypandra* Muell., were borrowed from Berlin they were found to have been collected on Mount Kosciusko, New South Wales. They exactly match specimens at Kew, collected by Mueller on Mt. Buller, and in the Moroka Valley, Victoria, which were determined by C. B. Clarke as *C. Colensoi* Boott, a closely related but distinct New Zealand sedge. At an earlier date Mueller had written up the Mt. Buller plants as *C. inversa* var. *alpina*, and Boott the Moroka Valley specimens as *C. hebes*.

Before discussing the true *C. hypandra* Muell. it will be well to define the position of and the relationship between Mr. Black's plant and that described by Kükenthal and erroneously identified

with *C. hypandra*. The two plants are, in my opinion, specifically distinct from each other. The former is described as *C. Raleighi*, in honour of the finder, and to the other is applied the epithet suggested by Boott but apparently never published.

Clavis specierum.

- Culmi 25–40 cm. alti, gracillimi; folia valde canaliculata, circiter 1 mm. lata; spicae 1–3; utriculi 3 mm. longi, 1 mm. lati, dorso tenuiter multinerves, ventre enerves vel obscure paucinerves *Carex Raleighii*
 Culmi 8–20 cm. alti, subgraciles; folia canaliculata, circiter 2 mm. lata; spicae 3–5; utriculi 3–5 mm. longi, 1–5 mm. lati, dorso obscure nervali ventre enerves *Carex hebes*

1. *Carex Raleighii* Nelves, sp. nov.

Rhizoma stoloniferum, lignosum, gracile. *Culmi* 25–40 cm. alti, gracillimi, laeves, curvati, basi vaginis aphyllis paucis fuscis circumdati. *Folia* circiter 1 mm. lata, curvata, culmum subaequantia, canaliculatissima, apice attenuata, circinata. *Spicae* 1–3, ellipsoideae, 5–9 mm. longae, gynaeandreae, densiflorae, in capitulum oblongum congestae, infima longibracteata. *Squamae* ovatae, subacutae, fusco-castaneae, marginibus albo-hyalinae, pallide carinatae. *Utriculi* ovato-lanceolati, circiter 3 mm. longi, 1 mm. lati, plano-convexi, membranacei, squamas aequantes, glabri, demum subpatentes, dorso tenuiter plurinerves, ventre enerves vel obscure paucinerves, substipitati, marginati, superne anguste alati hispiduli, in rostrum mediocre antice sulcatum latiusculum ore albido-hyalinum oblique sectum bidentulum sensim attenuati. *Stigmata* 2.

VICTORIA: Bogong County; Mt. Hotham—Omeo Road, 1800 m., 30 January 1938, *Raleigh A. Black* 1150(000)–(7) (Kew).

2. *Carex hebes* Nelves, sp. nov.

Rhizoma breviter stoloniferum, lignosum. *Culmi* 8–20 cm. alti, subgraciles, laeves, curvati, basi vaginis aphyllis paucis brunneis circumdati. *Folia* circiter 2 mm. lata, rigida, curvata, culmo longiora vel breviora, canaliculata. *Spicae* 3–5, ellipsoideae, 5–10 mm. longae, gynaeandreae, densiflorae, in capitulum oblongum congestae, bracteatae, bractea infima saepe subfoliacea. *Squamae* ovatae, acutae vel subacutae, castaneae, marginibus late albo-hyalinae, late viridi-carinatae, saepe breviter mucronulatae. *Utriculi* ovato-elliptici, circiter 3–5 mm. longi, 1–5 mm. lati, plano-convexi, membranacei, squamas aequantes vel paulo superantes, glabri, suberecti, utrinque enerves vel dorso obscure nervati, substipitati, marginati, superne anguste alati hispiduli, in rostrum mediocre latiusculum ferrugineum ore albido-hyalinum oblique sectum bidentulum sensim attenuati. *Stigmata* 2.

VICTORIA: Wonnangatta County; Mt. Buller, *Mueller* (type, Kew); Valley of the Maroka [Moroka], 1200 m. (Kew).

NEW SOUTH WALES: Wallace County; Mt. Kosciusko, 1800–2100 m., Jan. 1899, *Maiden* (Berlin).

Kükenthal apparently never saw the real *C. hypandra* F. v. Muell., which is represented at Kew by one good fruiting specimen.

In his *Fragmenta*, as cited above, Mueller mentioned this *Carex* as being very near to *C. bicolor* All., a native of northern Europe. He added that if it eventually proved to be distinct it could be called *C. hypandra*. This is a “nomen provisorium,” and as the plant was described under this name by Bentham in *Fl. Austral.* 7, 439 (1878), the correct citation is *Carex hypandra* F. Muell. ex Benth.

This species is in fact very distinct from *C. bicolor* and its two northern allies, *C. rufina* Drejer and *C. eleusinoides* Turcz., though it agrees with them in having a gynaeandrous terminal spike and in being distigmatic. This form of terminal spike is common in high altitudes. I consider that *C. hypandra* has a closer affinity with *C. Gaudichaudiana*, the Australian relative of the common European sedge *C. Goodenowii* Gay.

We now come to the Victorian *Carex* mentioned earlier as perhaps an interesting link between the New Zealand Section *Echinochlaenae* Th. Holm and that placed next but one before it by Kükenthal, *Spirostachyae* Drejer. The Australian representative of this Section is *C. Gunniana* Boott (closely related to our well known northern *C. distans* L.).

I had long suspected that the Victorian material of “*C. Gunniana*” in the Kew Herbarium was specifically distinct from the Tasmanian, and the receipt at Kew of good specimens of the former plant from Mr. Blake confirmed my suspicions. A printed copy of Boott’s description of *C. Gunniana* (*Trans. Linn. Soc.* 20, 143: 1846) is pasted down on a sheet of each of these two species, and Kükenthal (following Boott and Clarke) also considers that only one species is represented as he cites specimens from both Tasmania and Victoria. Boott described *C. Gunniana* from Tasmanian material collected by R. C. Gunn (no. 578), and I therefore separate the Victorian plant from it and describe it below. As will be noted it is considered to stand nearer to *C. tasmanica* Kükenth. than to *C. Gunniana* Boott, though it has some affinity with the latter species.

Carex Blakei Nelves, sp. nov.; affinis *C. tasmanicae* Kükenth., sed foliis planis latioribus, utriculis majoribus membranaceis minus nervatis dentibus strictis praecipue differt.

Rhizoma caespitosum. *Culmi* 30–40 cm. alti, subvalidi, obtuse triquetri, laeves, usque ad basin vaginis aphyllis atro-purpureis obtecti. *Folia* culmo plerumque breviora, 4–5–7 mm. lata, plana, rigida, coriacea, superne scabrida. *Spicae* 3–5, suprema mascula, pedunculata, lineari-cylindrica, 2–5–3 cm. longa, laterales femineae, oblongo-cylindricae, 1–5–2–5 cm. longae, crassae, densiflorae, superiores subapproximatae, subsessiles vel breviter pedunculatae, inferiores saepe remotae et pedunculatae interdum longissime pedunculatae.

Bracteae foliaceae, omnes culmum superantes, superiores vix inferiores longe vaginantes. *Squamae* late ovatae, apice obtusae interdum excisae, marginibus anguste albo-hyalinae, e dorso viridi trinervi carinatae, mucronatae. *Utriculi* plerumque squamas superantes, 3.5–4 mm. longi, late elliptici, subpatentes, trigoni, pallide virides, glabri, utrinque tenuissime plurinerves, in rostrum planiusculum latiusculum mediocri marginibus scabrum ore bidentatum (dentibus strictis) subsensim desinentes. *Nux* arcte inclusa, obovata, conspicue trigona, rostrata. *Stigmata* 3.

VICTORIA: Delatite County; Mt. Buffalo, in morasses at about 1350 m., 25 January 1935, *Blake* 7366 (type, Kew), 7368; Mt. Buffalo, edge of Lake Catani, 29 January 1938, *R. A. Black* 1163-004-(2) (Kew).

NEW SOUTH WALES: Selwyn-Wallace Counties; Munyang Mountains, 1877, *Mueller* (Kew).

QUEENSLAND.

The recent additions to the *Carex* flora of this State, though involving only one certain new species, are nevertheless of considerable interest. They are due almost entirely to the activities of Mr. S. T. Blake.

One of his new records for the Australian continent is a fairly typical specimen of *C. cryptostachys* Brongn., collected by him (no. 9757 A) on 2 October, 1935, in rain-forest at 200–300 ft. on Mt. Bartle Frere, Cook District, Queensland. This species has its centre of distribution in Malaya, and had not hitherto been found south of Java.

A second *Carex* recorded for the first time from Queensland is even more interesting. This plant belongs to a little known group of species which Ohwi, a Japanese authority, has designated the *Lageniformes*, from the unusual shape of the utricle. Blake collected this plant (no. 9757) with the other on Mt. Bartle Frere. It is perhaps conspecific with *C. breviscapa* C. B. Clarke, a Ceylon plant, *Thwaites* 3781, the only specimen recorded under the name. *C. lutchuensis* Ohwi (Mem. Coll. Sci. Kyoto Imp. Univ. ser. B, 5, 270: 1930), cited by Ohwi from Formosa and the Riukiu Islands, may also be the same species, judging from his description and the accompanying illustrations. Ridley's *C. Curtisii*, too, from the island of Penang, is extremely closely related.

Lastly, a new species of the Subgenus *Indocarex* Baill., has been collected by Mr. H. Flecker, of Cairns, at Campbell's Creek in north Queensland. *Indocarex*, which bears its spikes in panicles and is confined to the tropics, had hitherto been represented in Australia by only two recorded species, *C. Dietrichiae* Boeck., which has a near affinity with *C. indica* L., and, according to Kükenthal, *C. Rafflesiana* Boott, collected by St. Johnson on Mt. Bartle Frere. A description of the new species follows.

Carex Fleckeri Nemes, sp. nov., affinis *C. Dietrichiae* Boeck., sed foliis latioribus haud coriaceis, paniculis laxioribus, utriculis distincte trigonis ellipticis curvatis differt.

Rhizoma caespitosum, validum, lignosum. *Culmi* 80–90 cm. alti, subvalidi, inferne foliati, angulis scabriusculi. *Folia* 13–17 mm. lata, plana, haud coriacea, culmum subaequantia. *Inflorescentia* paniculata, interrupta. *Paniculae secundariae* circiter 6, oblongo-pyramidales, laxae, distantes, plerumque longe exserte pedunculatae; pedunculi scabriusculi. *Rhachis* hispida. *Bracteae* foliaceae, inflorescentiam longe superantes, suprema excepta longivaginantia. *Spicae* androgynaeceae (pars mascula parti femineae aequilonga), 1–1.5 cm. longae, demum divaricatae; bracteola squamiformis, longiaristata. *Squamae* albidae, oblongae, longe aristatae; arista recurva. *Utriculi* 4.5 mm. longi, plerumque squamas subaequant, distincte trigoni, elliptici, glabri, olivacei, subdivaricati, curvati, utrinque plurinerves, apice in rostrum longum conicum oblique sectum subabrupte contracti. *Stigmata* 3.

QUEENSLAND: Cook District; Campbell's Creek, near Cairns, crevices of rocky banks, 27 October 1935, *Flecker* 923 (Kew).

XXXIX—MISCELLANEOUS NOTES.

The Assistant for India.—The Government of India has selected Mr. K. N. KAUL, M.Sc., Demonstrator in Botany at the University of Lucknow, for appointment to the post of Assistant for India at the Royal Botanic Gardens, Kew. Mr. Kaul commenced work at Kew on July 1st. The appointment will take effect from January 1st, 1940, and until then Mr. C. E. C. FISCHER will continue to hold the post of Assistant for India, when he will be succeeded by Mr. Kaul.

Mr. C. V. B. Marquand.—Owing to continued ill-health, Mr. C. V. B. MARQUAND resigned his position as Botanist in the Herbarium on May 31st, 1939. Mr. Marquand was appointed in March 1923 and had charge of the Chinese Department and of the *Bryophyta* and *Charophyta*. He had specialized for some years on the genus *Gentiana*, and most of his published work has been on this genus.

Mr. A. A. Bullock.—Mr. A. A. BULLOCK, B.Sc., Assistant Botanist in the Herbarium, has been appointed by the Minister of Agriculture and Fisheries to the post of Botanist as from June 1st, 1939.

ALBERT MORRIS.—By the death of Mr. Albert Morris at Broken Hill, New South Wales, on January 9th, 1939, Australia has lost one of its keenest students of the botany of the interior of New South Wales and adjacent territories. He was born at Bridgewater, South Australia, on August 13th, 1886. He collected an herbarium

of over 5000 sheets mainly devoted to inland Australia and rich in *Acacia*, *Eucalyptus* and *Chenopodiaceae*. It is now held by the Zinc Corporation, a public company by whom he was employed and which has done much to encourage scientific endeavour in Broken Hill and district. Duplicates from his herbarium are well-represented at Sydney and Brisbane, and to a less extent in this country and abroad. He was always willing to assist botanists in other parts of the world with material and his specimens are frequently seen quoted in modern monographs dealing with Australian xerophytic families. He was keenly interested in the cultivation of native plants and was largely responsible for extensive planting operations about Broken Hill and Silverton. His wife helped him considerably with all this work and it is pleasing to know that the Zinc Corporation have arranged for her to carry it on. What pleased Morris most, perhaps, was the establishment of a regeneration area protected from stock and rabbits. Mrs. Morris writes that it is regrettable he did not live to see the results a good season would yield after only two years Acacias, Cassias, *Chianthus*, Epacrids, Dodonaeas and grasses have come back, and the area has responded remarkably well.

C. T. WHITE.

South African Forestry Association.—This Society has now started a Journal,* the first number of which appeared in October last. It will be published twice annually, and will contain general articles and research papers on forestry and allied subjects and will also serve for the exchange of views on all matters of interest to members. All articles will be published in the journal in the language in which they are submitted, though readers outside South Africa would no doubt much appreciate that important papers in Afrikaans should include a short summary in English.

From a very interesting historical sketch of the development of forestry in South Africa we learn that the forestry department dates from 1847, when a conservator and four rangers were appointed to prevent further destruction, which had been going on since the first settlers landed in 1652. Up to 1872 all that was attempted was control of the existing forests, and it was not until J. Storr Lister, of the Indian Forest Service, was appointed in 1875, that plantations were started to supplement the meagre natural timber resources of the country. It is interesting to learn that the first seeds of *Pinus insignis*, a tree now of major importance in the western and south western districts, were obtained in the Botanic Garden at Cape Town. Lister was also responsible for the successful reclamation of the sandy Cape Flats on which he sowed seeds of the Australian Acacias, *A. cyclopis* and *A. saligna*, converting barren waste land which now yields a steady revenue from the sale of fuel, besides reducing sand drift.

The late Sir David Hutchins, also of the Indian Forest Service, joined the Cape Forest Service in 1882, and vigorously tackled many problems needing attention. He it was who recommended the introduction of Mexican pines for the high veld of the Transvaal, and seeds of various species were tried, of which *Pinus patula* is a notable example and has become of major importance in the summer rainfall areas.

Several members of the forestry department since its inception made valuable collections for the Kew Herbarium, particularly Dr. Pappe, Dr. Fourcade, and Mr. Legat.

It is interesting to learn which of the many exotic trees tried have been the most suitable for South African forestry. The main coniferous trees now used are, in the Western Cape Province, *Pinus insignis*, *P. pinaster* and *P. canariensis*; in the Southern Cape Province, the same with the addition of *P. caribaea*; in the Eastern Cape Province, the same species and *P. patula*, *P. longifolia* and *P. taeda*; in the Transkei, *P. patula*, *P. longifolia*, *P. caribaea*, *P. canariensis* and *P. taeda*; and in Natal, Zululand, and the Transvaal, *P. patula*, *P. longifolia*, *P. caribaea*, *P. taeda* and *P. palustris*.

Hardwoods are represented by 50,220 acres of *Eucalyptus*, 25,378 acres of *Acacia cyclopis* and *A. saligna*, used as stated above for drift sand reclamation; 12,809 acres of tan wattles (*Acacia mollissima* and *A. decurrens*); and the balance of other species of trees.

It is satisfactory to note that "conservation in its widest sense has always been the key note of the forest service," and that long before the public began to take an interest in the preservation of the flora the forest service was doing so in an unobtrusive way by creating nature reserves in which no cutting of wood, gathering of flowers or shooting is permitted.

This historical sketch concludes with an appreciation of tree planting by private individuals. Simon van der Stel, first Governor of the Cape, was responsible for the planting of oaks which contribute so largely to the charm of many old homesteads in the Cape. Particularly mentioned are the gardens of the late Mr. Arderne at Claremont, and Cecil Rhodes at Groot Schuur, the latter now the official residence of the Prime Minister of the Union. In Natal an outstanding example is the estate called Benvie at Karkloof, to which the late Mr. Geike retired about 1870 and devoted himself to gardening and tree planting. Here may be seen rhododendrons and azaleas second to none in South Africa, and a wealth of trees from many parts of the world.

Other interesting papers on forestry matters make up the 66 pages of the first part of this Journal, which should fill an important rôle in South Africa.

J. HUTCHINSON.

* Journal of the South African Forestry Association, No. 1, October 1938 (Pretoria, Published by the Association; price to non members 6s. net).

BULLETIN OF MISCELLANEOUS INFORMATION

No. 7 1939

ROYAL BOTANIC GARDENS, KEW

XL—PROPOSED ADDITIONS AND AMENDMENTS TO THE INTERNATIONAL RULES OF BOTANICAL NOMENCLATURE.

The various proposals printed below have been contributed by the following botanists:

- H. K. Airy-Shaw (No. 5).
- H. K. Airy-Shaw and B. L. Burtt (Nos. 1, 11, 20).
- B. L. Burtt (No. 26).
- M. L. Green (Nos. 18, 22, 24).
- R. Melville (Nos. 9, 10).
- J. R. Sealy (No. 27).
- T. A. Sprague (Nos. 2, 3, 4, 6, 7, 8, 12, 13, 14, 15, 16, 17, 19, 21, 23).
- W. T. Stearn (No. 28).
- E. M. Wakefield (No. 25).

Responsibility for the separate proposals rests solely with their authors. They are published together merely for the sake of convenience. Many of the proposals consist of purely textual amendments, designed to make the wording of the provisions concerned clearer and more consistent. Others are designed to remove possible ambiguity in interpretation. No major change is included, the object of all the proposals being to make the present International Rules a more efficient working instrument.

T. A. S.

(1) ART. 5. "In the absence of a relevant rule, or where the consequences of rules are doubtful, established custom must be followed."

Replace by:

"In the absence of a relevant rule, established custom must be followed. Where the consequences of rules are doubtful, the matter should be immediately submitted to the Executive Committee, pending whose report no nomenclatural changes should be made."

H. K. AIRY-SHAW and B. L. BURTT.

(2) ART. 13. Replace the last sentence by the following:

"Names given to groups placed in categories denoted by misplaced terms are illegitimate."

The examples to read as follows:

"Examples of misplacement of terms of categories: a form divided into varieties, a species containing genera, a genus containing families or tribes: e.g. Huth (in Engl. Bot. Jahrb. XX,

Spore Discharge in Land Plants.*—In a short introductory chapter Dr. Ingold tells us that his interest in the subject of spore liberation and dispersal was first aroused through reading the first two volumes of Buller's "Researches on Fungi." Since then he has devoted considerable attention to observation of the various methods of violent spore discharge which are found in cryptogams, and this little book is an admirable epitome of present knowledge. The facts described are classified according to the type of mechanism involved, as water-squirting mechanisms, discharge due to the rounding-off of turgid cells, the drop-excretion mechanism of the *Basidiomycetes*, catapults, air-guns, hygroscopic and spiral-spring mechanisms, and so on. While the greater part of the work is concerned with *Fungi*, in which so many and varied types of spore-discharge occur, the *Pterodophyta* and *Bryophyta* are dealt with in chapters 7 to 10. The work of previous investigators is clearly summarised and correlated, but the whole is made alive by Dr. Ingold's own observations and comments, and by the very clear and beautiful illustrations from his own drawings. The final chapter summarises briefly the general problems of spore dispersal in land cryptogams, and at the end there is an appendix giving a classification of the seedless plants and notes as to the occurrence of violent spore-discharge observed in each group. The book is completed by a bibliography of over 60 titles.

Dr. Ingold is to be congratulated on having produced a most readable and stimulating account of the processes of spore-discharge, which will be invaluable to students and to all nature lovers. One leaves it with the impression that he has enjoyed writing it. The book should do much to bring about response to his plea that in University botanical courses "opportunity should be taken to study the organism in action rather than to concentrate on mangled corpses which have lain for years in pickle." "In the *Fungi* some of the time that is so often spent on the subject of sex, especially in *Ascomycetes*, might more profitably be spent in the study of spore discharge and spore dispersal."

E. M. WAKEFIELD.

* By C. T. Ingold. Oxford, The Clarendon Press, 1939. Pp. vi. + 178, 75 text figures. Price 7s. 6d.

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337-365: 1895) subdivided the subgenera and sections of *Delphinium* into 'tribes' (tribus), and the names *Delphinium* tribus *Involuta* Huth, tribus *Brevipedunculata* Huth, l.c. 365-368, etc. are accordingly illegitimate."

Remarks. The original wording "No classification is admissible which contains such alterations" is open to objection. It is not the classification into subordinated categories that is wrong, but the misapplication of the terms employed for those categories. If Huth, in the example cited under Art. 13, had used the terms "subsection" or "series" instead of "tribe" for the category concerned, then the names proposed by him for groups of that category would not have been ipso facto illegitimate.

T. A. SPRAGUE.

(3) ART. 21. The first phrase of the English text to read as follows:

"However, in order to avoid disadvantageous changes in the nomenclature of genera entailed by the strict application of the Rules of Nomenclature."

Remarks. The insertion of the words "in order" and "entailed" are purely textual amendments required in order to make the English text clearer. No change is required in the French and German texts.

T. A. SPRAGUE.

(4) ART. 27. Insert the following new paragraph (between the first and second ones) and example:

"Binary combinations of a specific epithet with the word *Anonymos* are illegitimate, since the word *Anonymos* is not a generic name (Art. 67 (1)). Such combinations are not taken into consideration for purposes of priority of the epithet concerned.

"Example: The binary combination, *Anonymos aquatica* Walt. Fl. Carol. 230 (1788), is illegitimate. The valid name for the species concerned is *Planera aquatica* J. F. Gmel (1791), and the date of the epithet *aquatica*, for purposes of priority, is 1791. The species must not be cited as *Planera aquatica* (Walt.) J. F. Gmel. If, however, it is desired to indicate that the epithet originated with Walter, the name may be cited as *Planera aquatica* [(Walt.) J. F. Gmel.]

Remarks. Under Art. 27 and Art. 67 (1) taken together, it seems clear that binary combinations under *Anonymos* are not legitimate names of species. As they have frequently been accepted as legitimate in the past, however, for example in Gray's New Manual of Botany, ed. 7 (1908) and Britton and Brown's Illustrated Flora of the Northern United States, ed. 2 (1913), it seems desirable to insert a special paragraph dealing with them.

Of the 45 binary combinations listed under *Anonymos* in the Index Kewensis, 42 are from Walter's Flora Caroliniana (1788). In that work Walter described, but failed to name, 28 new genera of plants, giving the "token" name *Anonymos* ("nameless") to each one, in place of a generic name. Under *Anonymos* he had 44 binary combinations, 43 for Phanerogamae and 1 for a Fungus.

The only reasons for making a special exception and treating combinations under *Anonymos* as legitimate names of species would be in order to retain the specific epithets given by Walter in his Flora and to associate them with Walter's name as author. An analysis (see p. 331) of the 43 names of Phanerogamae shows that 20 are synonyms of older names, and that 18 of Walter's epithets are still used for the species concerned, although ascribed to later authors. The specific epithet *pilosa* Walt. (Fl. Carol. 197) could not be taken up under *Liatris* as this would result in the creation of a later homonym of *Liatris pilosa* (Ait.) Willd. The identity of *Anonymos ramosa* Walt. (l.c. 198) and *A. uniflora* (l.c.) is doubtful, but both epithets were adopted by Gmelin in 1791 and may, in the absence of any obstacle, be retained when the two species are identified. Only two of Walter's epithets are lost through treating his combinations under *Anonymos* as illegitimate: *A. tinctoria* Walt. (l.c. 68) becomes *Lachnanthes tinctorum* (J. F. Gmel.) instead of *L. tinctoria*, and *A. pinnata* (l.c. 103) becomes *Petalostemum carolinense* (Lam.) instead of *P. pinnatum*. It is therefore clearly not worth while to make an exception to Art. 27 by treating binary combinations under *Anonymos* as legitimate.

T. A. SPRAGUE.

(5) ART. 28. To read:

"Epithets of subspecies, varieties, subvarieties, forms and subforms (and supplementary intercalated categories: vide Art. 12, second paragraph) are formed like those of species and follow them in order, beginning with those of the highest rank. When adjectival in form and not used as substantives they agree in gender with the generic name.

"The use of a binary nomenclature for subdivisions of species is illegitimate. But if a binary name is proposed by an author for a subspecies, in order to avoid name-changes the generic name is ignored and the resultant ternary combination is attributed to the original author.

"It is permissible to reduce more complicated names to ternary combinations."

"Examples: The name *Anemone alpicola*, published by Rouy and Foucaud (Fl. Fr. I, 42: 1895) for a subspecies of *A. alpina* L., is treated as equivalent to *Anemone alpina* subsp. *alpicola* Rouy et Fouc., and should be cited as such."

Remarks. The word "illegitimate" is substituted for the undefined phrase "not admissible." The paragraph on the regularisation of subspecific binary names is suggested both by convenience and by custom. It is clearly desirable not to outlaw the numerous names of this kind employed in standard works such as Rouy and Foucaud's "Flore de France" and Nyman's "Consp. Fl. Eur." Briquet was evidently of the same opinion. In his Prodr. Fl. Corse, I, 604 (1910) for example, he attributed "*Ranunculus Ficaria* subsp. *ficariaeformis*" to Rouy et Foucaud, who published it as

" subsp. *R. ficariaeformis* F. Schultz (pro specie)." Again, Briquet, op. cit. II (1), 94 (1913), adopted *Rapistrum rugosum* subsp. *Linnaeanum* Rouy et Fouc., originally published by those authors as " subsp. *R. Linnaeanum* Boiss. et Reut. (pro specie)" (Fl. Fr. II, 73 : 1895) ; he cited *R. rugosum* subsp. *hispanicum* Thell. (1907) as a synonym, and added a footnote that Thellung's nomenclature in this instance was contrary to Internat. Rules (ed. 2) Art. 49 (=ed. 3, Art. 58). He clearly regarded the form of Rouy's subspecific names as admissible (i.e. legitimate), though irregular, and accordingly regularised them.

H. K. AIRY-SHAW.

(6) REC. XVIII. The second sentence to read as follows :

" They should adopt the epithet of the type for that subdivision if it requires a new epithet."

Add the following Note :

" Note. The customary conventional terms, *typicus*, *genuinus*, *originarius*, etc., where already used in place of epithets, should be retained for the groups concerned, unless it is proved that these groups do not include the type, in which case the terms concerned should be rejected. The conventional terms *typicus* etc. are not epithets, and cannot serve as the basis of new combinations."

In the Examples, correct "*mollissimus*" (twice) to "*mollicomus*"

Remarks. Certain botanists regard the conventional terms *typicus* etc. (applied to subdivisions of species) as epithets, and accordingly consider that they are *transferable* from one specific name to another, in the case of union of two or more species—vide Bolle in Notizbl. Bot. Gart. Berlin, XIII, 524 (1938). As such transference would lead to absurd results (a var. *typica* under a specific name of which it does not include the type), it seems desirable to state clearly in the Rules that such terms are not epithets. Dr. Bolle (l.c. 530) mentioned that in a letter to him I had agreed to his interpretation of the Rules. This was only a provisional opinion *not intended for publication*, and was published without my authorisation. On further study of the question, I agree with the views expressed by Drs. Harms, Mattfeld and Pilger (op. cit. 530).

T. A. SPRAGUE.

(7) ART. 31. Omit the words " between species of the same genus."

Remarks. The provisions of Art. 31 are of a general nature, applying to all hybrids. The amendment makes this clear.

T. A. SPRAGUE.

(8) ART. 32. To read as follows :

" The name of a bigeneric hybrid (i.e. a hybrid between species of two genera) consists of a new ' generic ' name, usually formed by a combination of the names of the parent genera, and a ' specific ' epithet. All hybrids between the same two genera bear the same ' generic ' name. As the generic characters of the parent genera may be very variously combined in these hybrids, no useful purpose

would be served by attempting to supply a ' generic ' description. Hence, the ' generic ' name is considered as validly published if it is effectively published with a mention of the two genera concerned."

Remarks. If Art. 31 is amended as above so as to cover all hybrids, provisions (1) and (2) in Art. 32 concerning sexual and asexual hybrids will become superfluous, though the examples should be retained.

T. A. SPRAGUE.

(9) ART. 34. To read as follows :

" When different hybrid forms of the same parentage (pleomorphic hybrids, hybrids between different forms of a collective species, segregates, back-crosses, etc.) are grouped under a binary name, they are classed under the binary name like the subdivisions of a species under that of a species (see Arts. 28, 29, 30)."

Remarks. The rule (Art. 34) in its present form is open to misinterpretation, as is evidenced by two recent publications on Black Poplars (E. Houtzagers (1937), Het geslacht *Populus*, Wageningen ; G. S. Cansdale (1938), The black poplars and their hybrids, Oxford). The author, in each case, employs separate binary names for each of several segregates derived from the hybrid *Populus nigra* L. $\times$ *deltoides* Marsh., in violation of Art. 34. Direct mention of segregates and back-crosses in the rule, and reference to the rules dealing with the subdivisions of species, should prevent a recurrence of this breach of the rules.

R. MELVILLE.

(10) Insert the following Article after ART. 34 in order to provide for the nomenclature of hybrid segregates and back-crosses :

" Art. 34 bis. When it is desirable to give special names to segregates from hybrids of sexual origin and back-crosses of the F_1 , or of a segregate, with either of the parent species, they are classed as nothomorphs (*nothomorpha*, -ae; abbreviations, *noth.*, *nm.*) under the binary names of the hybrids, in the same way as subdivisions of a species are classed under the binary names of species. Terms such as ' variety ' and ' form ' must not be used.

" Examples : *Populus marilandica* Bosc ex Poir. *nothomorpha erecta* (Selys-Longchamp) Melville.

P. marilandica nm. aurea (Henry) Melville."

Remarks. Article 34 requires that different hybrid forms of the same parentage shall be classed under the binary name of the hybrid like the subdivisions of a species under that of a species, but does not indicate clearly how this should be done. Some authors have classed hybrid segregates as " varieties " or " forms " under the binary name of the hybrid (e.g. Rehder in his " Manual of Cultivated Trees & Shrubs "). Both " variety " and " form " are being used already for subdivisions of a species and their use for other groups is therefore undesirable. Objection to such a use has been expressed by Houtzagers (Het geslacht *Populus*, 1937) who maintains that it is " taxonomically and genetically incorrect to adopt a varietal

name for a hybrid which is only a single heterozygous individual propagated asexually." His solution of the problem is to give separate binomials to different hybrid segregates of the same parentage, but this is contrary to Art. 34. The real need is for a suitable term applicable to the forms of sexual hybrids— F_1 , segregates and back-crosses. The term nothomorph (nothomorpha, -ae, derived from $\nu\theta\omicron\varsigma$, nothos, a hybrid or cross-breed and $\mu\omicron\rho\phi\eta$, morphe, form) has been suggested by Melville (Proc. Linn. Soc. 16 Mar. 1939) for all hybrid forms of sexual origin. General adoption of this term, as provided for in the proposed rule, would obviate further trouble and facilitate the study of hybrids.

R. MELVILLE.

(11) ART. 35. Amend to read:

"Hybrids, forms and half-breeds among cultivated plants may receive fancy epithets, preferably in common language, as different as possible from the Latin epithets of species and varieties. When they can be attached to a species, a subspecies, a botanical variety or a named hybrid, the fancy epithet is appended to the scientific name.

"Examples: *Pelargonium zonale* 'Mrs. Pollock'; *Daphne Burkwoodii* [= *caucasicum* $\times$ *Cneorum*] 'Somerset'; *Rhododendron* 'Aladdin' [= *auriculatum* $\times$ *Griersonianum*]."

Remarks. The addition of interspecific hybrids and their forms to the categories covered by the article is suggested to avoid the necessity of giving Latin names to all the species-crosses in cultivation, which is undesirable except where the parentage has been scientifically investigated and is even then frequently unnecessary.

H. K. AIRY-SHAW and B. L. BURTT.

(12) ART. 36. Replace the words "or by distribution of these to specified representative botanical institutions" by "or by general distribution of these to important botanical institutions." Delete the footnote.

Remarks. The idea of a list of representative botanical institutions such as was suggested in Kew Bull. 1935, 89-90 was to validate the publication of important printed works not placed on sale, provided that at least 20 copies were presented to botanical institutions, one to a recognized institution in each of 20 geographical areas. As it seems impossible, under present international conditions, to reach agreement on such a list of institutions, a new wording is suggested. Alternatively, the provision conditionally validating works not placed on sale might be deleted.

T. A. SPRAGUE.

(13) ART. 37. Insert the words "(direct or indirect)" after "reference," and add the following example:

"Example. The publication of the new combination *Andropogon Martini* by W. Watson in Atkinson's Gazetteer N.-W. Prov. India, X, 392 (1882) is validated by the addition of the

number '309' which, as explained at the top of the same page, is the running-number of the species (*Andropogon Martini* Roxb.) in Steudel's Syn. Pl. Glum. I, 388 (1855). Although the reference to the synonym, *Andropogon Martini*, is indirect, it is perfectly unambiguous."

T. A. SPRAGUE.

(14) ART. 38, Note. Replace the word "legitimizes" by "validates the publication of."

Remarks. The names concerned may be either legitimate or illegitimate. Art. 38 does not make an illegitimate name legitimate. It merely treats the names concerned as *validly published*, whereas before the starting point for obligatory Latin diagnoses was altered to Jan. 1, 1935, such names were not validly published under the Rules and could therefore be ignored.

T. A. SPRAGUE.

(15) ART. 42, paragraph 1. Omit the words "under another name." Add the following example: "The publication of the generic name *Epipogium* R. Br. Prodr. 330, 331 (1810) is validated by Robert Brown's implicit reference to the excellent description of *Epipogon* in Gmelin, Fl. Sibir. I, 11 (1747). He attributed the name *Epipogium* to Gmelin."

Remarks. The publication of many Linnaean and post-Linnaean names is validated by references to pre-Linnaean descriptions. The omission of the words "under another name" is required in order to provide for those cases in which the post-Linnaean author adopted the same generic name. A detailed account of the publication of the name *Epipogium* is given in Kew Bull. 1937, 475.

T. A. SPRAGUE.

(16) ART. 43. The first phrase to read as follows:

"The publication of the name of a monotypic new genus based on a new species is validated. . . ."

Remarks. It is not the name which is validated, but its publication, as is recognized in the French version of Art. 43. The English and German texts, on the other hand, require textual amendment.

T. A. SPRAGUE.

(17) ART. 44. Omit the words "under another name."

Remarks. This omission is required in order to provide for the case of a pre-Linnaean binary specific name validly published by a post-Linnaean author with reference to the pre-Linnaean description.

T. A. SPRAGUE.

(18) Insert the following Article after Art. 49:

"ART. 49 bis. When the status of a group bearing a binary name is altered from species to hybrid or vice versa, the original author must be cited, followed by an indication of the original status in brackets.

"Examples: *Stachys ambigua* Sm. Engl. Bot. XXX, t. 2089 (1810), was published as a species. If regarded as a hybrid, it must be cited as $\times$ *Stachys ambigua* Sm. (pro sp.). The binary name

× *Salix glaucops* Anderss. in DC. Prodr. XVI, pt. II, 281 (1868) was published as the name of a hybrid. Later, Rydberg in Bull. N.Y. Bot. Gard. I, 270 (1899) altered the status of the group to that of a species. If this view is accepted, the name must be cited as *Salix glaucops* Anderss. (pro hybr.)."

Remarks. The hybrid sign "×" is not part of the name: it is placed *before* the name (Art. 31)—see *Chronica Botanica*, V, 210 (1939). Hence the name of the author remains the same when a plant originally published as a species is treated as a variety or vice versa. In order to avoid the false impression that the original author was responsible for the new status, however, an indication of the original status must be added in brackets. M. L. GREEN.

(19) REC. xxx. Insert at the end of the first sentence: "(F. Muell. for Baron Ferdinand von Mueller, not F. v. M. or F. v. Muell.)."

Remarks. It seems desirable to supply this example in order to draw attention to the frequent non-observance of Rec. XXX in this and similar cases. T. A. SPRAGUE.

(20) REC. xxxiv. Amend to read:

"When several genera are united under one generic name, under which they are treated as subgenera or sections, the subdivision including the type of the generic name used should bear that name unaltered (e.g., *Anarrhinum* sect. *Anarrhinum*; *Hemigenia* sect. *Hemigenia*) or with a prefix (*Anthriscus* sect. *Eu-Anthriscus*) or a suffix (*Stachys* sect. *Stachyotypus*), if no earlier name is available."

Remarks. The current text might give the impression that it was unnecessary to look for earlier subdivisional names not falling into the categories mentioned, and the meaning of the final sentence is problematic.

The wording of the first phrase is altered, as it was ambiguous; the genera are kept distinct as subgenera.

H. K. AIRY-SHAW and B. L. BURTT.

(21) REC. xxxv. Amend to read:

"When several species are united under one specific name, under which they are treated as subspecies or varieties, the subdivision which includes the type of the specific epithet adopted should be designated by the same epithet unaltered, unless an earlier one is available. The customary conventional terms, *typicus*, *originarius*, *genuinus*, *verus*, *veridicus*, etc., where already used in place of epithets should, however, be retained for the groups concerned, unless it is proved that these groups do not include the type of the specific epithet, in which case the terms concerned must be rejected. Such conventional terms are not epithets and cannot serve as the basis of new combinations.

Remarks. The adoption of the specific epithet for the subdivision which includes the type makes it possible to retain that epithet when the subdivision is transferred to another species.

Experience has shown that the use of the conventional terms, *typicus*, *genuinus*, etc., is open to grave objection: in some cases they have been applied to subdivisions which do not include the type, and as shown in the remarks under Proposal (6) (Rec. XVIII) they are *not transferable* when the subdivision is transferred to another species.

T. A. SPRAGUE.

(22) ART. 70. Add the following Note:

"Note 2 bis. The use of the terminations *i* or *ae* instead of *ii* and *iae*, prescribed in Rec. XL (b) and XLI, is treated as an unintentional orthographic error which may be corrected.

Examples: *Dioscorea Lecardi* De Wild. may be corrected to *D. Lecardii*, and *Berberis Wilsonae* Hemsl. et E. H. Wils. may be corrected to *B. Wilsoniae*: the genitive forms derived from Lecard (m.) and Wilson (f.) prescribed by Rec. XL (b) and XLI are *Lecardii* and *Wilsoniae* respectively."

Remarks. The adoption of this note will enable those who loyally observe both the Rules and the Recommendations to apply Rec. XL (b) and XLI retrospectively, and so to obtain uniformity in the terminations of personal specific epithets in the genitive case. At present it is necessary to retain the original terminations of such epithets even where they are contrary to a Recommendation. This means that, in editing long lists of specific names, all those of this category have to be looked up to see whether they were originally spelt with *ii* (*iae*) or *i* (*ae*). Furthermore, the resulting want of consistency in spelling is not only a bibliographical blemish, but is a source of great trouble to horticulturists. M. L. GREEN.

(23) ART. 70. Add the following as examples of different names: *Podantha* and *Podanthes*, *Microlepis* and *Microlepis*.

Add the following generic names as "Examples of orthographic variants": *Asprella* and *Asperella*, *Cajan* and *Cajanus*, *Sesban* and *Sesbania*, *Parinari* and *Parinarium*, *Oxytheca* and *Oxythece*, *Kentranthus* and *Centranthus*.

Remarks. *Cajanus*, *Sesbania*, *Parinarium* and *Centranthus* were merely amended spellings of *Cajan*, *Sesban*, *Parinari* and *Kentranthus*, and are clearly orthographic variants for the purposes of Art. 70. The inclusion of these examples is desirable in order to make it clear that specific names published under *Parinarium*, for example, may be cited, *without change of author*, under *Parinari*.

T. A. SPRAGUE.

(24) REC. xl. The first sentence to read as follows:

"When a new specific or other epithet is taken from the name of a man it should be formed in the following manner (unless the personal name is already Latin or Greek, in which case the appropriate Latin genitive should be used, e.g., *Alexandri* from Alexander, *Francisci* from Franciscus, *Augusti* from Augustus, *Magni* from Magnus)."

REC. XL (b).

Delete the example of *Magnusii* from Magnus.

Remarks. It is clearly undesirable to form a new genitive for a Latin name of which a Latin genitive already exists, and this was doubtless never contemplated by the authors of Rec. XL. The textual amendment is required in order to make the position clear. The inclusion of the example *Magnusii* from Magnus seems to have been an error of judgment, since Magnus is a classical name.

M. L. GREEN.

(25) REC. XLIII. To read as follows:

"Specific (or other) epithets should be written with a small initial letter, except those which are derived from names of persons (substantives or adjectives) or are generic names (substantives or adjectives, whether in the nominative or in any oblique case).

"Examples: *Geranium molle*, *Rosa stylosa*, *Helleborus viridis* (descriptive epithets); *Ficus indica*, *Circaea lutetiana*, *Aster novibelgii* (geographical epithets); *Malva Tournefortiana*, *Phyteuma Halleri*, *Rosa stylosa* var. *Desvauxiana* (epithets derived from names of persons); *Lythrum Hyssopifolia*, *Brassica Napus*, *Puccinia Menihae* (epithets which are generic names, either in the nominative or in the genitive case). The epithet of *Phyllosticta hedericola* is written with a small initial letter, because *hedericola* is a compound word and not merely the generic name *Hedera*. Similarly the epithet of *Erysimum cheiranthoides* is a compound of the generic name *Cheiranthus* with the suffix *-oides*, and is accordingly spelt with a small initial letter."

Remarks. The expression "taken from generic names (substantives or adjectives)" has proved to be misleading, certain botanists having erroneously spelt epithets like *hedericola* with a capital initial letter on the ground that they were "taken from" a generic name, while others have spelt *Hederae* with a small initial letter on the ground that it is not a generic name, but the genitive of a generic name. The indication, after each set of epithets, whether they are descriptive, geographical, personal or generic will make the text clearer. It is not immediately obvious in the present text, for example, that *Hyssopifolia* is a former generic name.

E. M. WAKEFIELD.

APPENDIX III. 2. PHANEROGAMAE.

(26) Generic names proposed for conservation by B. L. BURTT.

(a) NAMES INVALIDATED BY EARLIER SYNONYMS.

3225 (Saxifrag.) *Brexia Noronha ex Thouars*, Gen. Nov. Madag. 20 (1806). Type-species: *B. madagascariensis* (Lam.) Thou. ex Ker-Gawl.

Nomen rejiciendum: *Venana* Lamarck, Ill. Gen. II, 99, t. 131 (1797).

Brexia is a small genus of some half dozen species confined to Madagascar and the neighbouring islands. It is usually referred to *Saxifragaceae*, and in Engler u. Prantl (Natürl. Pflanzenfam. 2 Aufl.

XVIII, 185: 1930) is the type genus of the subfamily and tribal names *Brexioideae* and *Brexieae*. Some authors have made it the type genus of a distinct family, *Brexiceae* (Baillon in Adansonia, VI, 15: 1865). No recent authors have adopted *Venana*, and in view of its wide usage the name *Brexia* is proposed for conservation.

9439 (Compos.) *Didelta* L'Héritier, Stirp. Nov. fasc. III, 55, t. 28 (1785 on the title page, but April 1786 according to Britten and Woodward in Journ. Bot. XLIII, 268: 1905). Type-species: *D. tetragonifolia* L'Hérit. (= *D. carnosa* (L. f.) Ait.).

Nomen rejiciendum: *Breteuillia* Buc'hoz, Grand Jard. Univ. t. 62 (1785).

Breteuillia is validated by a plate, with dissections, of *B. trianensis* Buc'hoz. The generic name has not been taken up by later authors and is rarely cited in synonymy. *Didelta* has been accepted by Harvey (Fl. Cap. III, 510: 1865; Gen. S. Afr. Pl. ed. 2, 205: 1868), Bentham and Hooker (Gen. Pl. II, 461: 1873), O. Hoffmann (in Engler & Prantl, Natürl. Pflanzenfam. IV, Abt. 5, 311: 1892), Thonner (Fl. Pl. Afr. 551: 1915), Phillips (Gen. S. Afr. Fl. Pl. 679: 1926) and other workers on the South African flora, and is a well-marked genus of 2-3 species. The specific epithets in *Didelta* date from 1781 and Buc'hoz's epithet *trianensis* will not in any case be adopted. *Breteuillia* is an excellent example of a name which has entirely dropped out of botanical literature, and the conservation of *Didelta* is therefore proposed.

(b) NAMES INVALIDATED BY EARLIER HOMONYMS.

6208 (Ericac.) *Pernettya Gaudichaud* apud Mirbeau in Ann. Sci. Nat. V, 102 (1825), as "*Pernettia*"; Voy. Freyc. Bot. 454, t. 67 (1826) as "*Pernettya*";—non *Pernettya* Scop. Introd. 150 (1777), "*Pernettya*" in indice. Type-species: *P. empetrifolia* (Lam.) Gaudich. (= *P. pumila* (L. f.) Hook.).

Pernettya Scop. is an illegitimate name for *Canarina* L. (*Campanulaceae*).

Pernettya Gaudichaud (*Ericaceae*) is the name of a well-known genus of evergreen subshrubs. Several species are widely cultivated and some 72 illustrations are quoted in *Index Londinensis*. The genus has recently been revised under this name (Sleumer in Notizblatt Bot. Gart. Berlin, XII, 626: 1936), and no other is available. The spelling "*Pernettia*" in Mirbeau's paper is probably a mistake, and was corrected to *Pernettya* by Gaudichaud himself in the following year. *Pernettya* Gaudichaud is therefore unhesitatingly proposed for conservation.

7800 (Gesneriac.) *Ramonda Richard* apud Persoon, Syn. I, 216 (1805)—non *Ramonda* Mirbel in Bull. Soc. Philom. II, n. 47, 179 (1801). Type-species: *R. pyrenaica* Rich. (= *R. Myconi* (L.) Reichb.).

Nomen rejiciendum: *Chaixia* Lapeyr. Hist. Abrég. Pl. Pyrén. Suppl. 38 (1818).

Ramonda Mirbel is an illegitimate name for two species of *Lygodium* Sw. (*Filices*)—Cf. Christensen, Ind. Fil. III, 611 (1906).

Ramonda Rich. (more often spelt *Ramondia*) is a well-known genus of *Gesneriaceae*, which, though only consisting of some 3 species, is frequently cited in phytogeographical discussion, being one of the best examples of a tertiary relict in the flora of the Pyrenees and Balkan Peninsula. It is also widely cultivated as a rock-garden plant and is the type genus of the tribal name *Ramondieae*. Lapeyrouse (Hist. Abr. Pl. Pyr. Suppl. 38 : 1818) was aware that both *Ramonda* Rich. and *Myconia* Lapeyr. (a name he had previously given this genus) were later homonyms and therefore proposed the new name *Chaixia* for the genus. *Chaixia*, however, was not adopted by other authors until a recent paper by O. Schwarz (Fedde, Rep. Sp. Nov. XLVI, 187 : 1939).

Ramonda Rich. has been used consistently by European botanists, including Grenier & Godron (Fl. Franc. II, 507 : 1850—the type genus of a new family name *Ramondiaceae*); Willkomm & Lange (Prodr. Fl. Hispan. II, 536 : 1870); Bentham & Hooker (Gen. Pl. II, pt. 2, 1024 : 1876); Nyman (Consp. Fl. Eur. 503 : 1881); Engler & Prantl (Natürl. Pflanzenfam. IV, 3B, 144 : 1893); Halácsy (Consp. Fl. Graec. II, 301 : 1902); Coste (Fl. Franc. II, 576 : 1903); Rouy & Foucaud (Fl. Franc. XI, 193 : 1909); Hegi (Ill. Fl. Mitt.-Eur. VI, 176 : 1914); Hayek (Prodr. Fl. Pen. Balcan. II, 227 : 1931). Schwarz rejects the idea of conserving *Ramonda* Rich. on the ground that it only includes 3 species and because all the facts were known to Lapeyrouse, who renamed it *Chaixia*. He ignores a resolution adopted at the last International Congress at Amsterdam (Proc. I, 361) which lays down that, directly the name of a well-known genus is found to be endangered, the case must be submitted to the Special Committee.

Schwarz has, therefore, attempted to prejudge the issue by adopting *Chaixia*, and has, I think, judged it wrongly. The importance of this genus in phytogeographic discussion and its familiarity in botanical and horticultural literature seem amply to justify its retention, and the name *Ramonda* Rich. is therefore proposed for addition to the list of *nomina generica conservanda*.

(27) Generic name proposed for conservation by J. R. SEALY. 1208 (*Amaryllidac.*) ***Hippeastrum*** Herbert, Appendix, 31 (December ?)* 1821. Type-species (Lectotype): *H. reginae* (L.) Herbert, l.c.

Nomen rejiciendum: *Leopoldia* Herbert in Trans. Hort. Soc. London, IV, 181 (Jan. 29–Feb. 1821).

The generic name *Hippeastrum* was proposed for conservation in Kew Bull. 1939, p. 67, the grounds for the proposal being:

(1) The genus consists of about seventy species, many of them well-known in cultivation.

(2) The name *Hippeastrum* has been in general use for the genus from 1821 to the present day, during which time it has been adopted in all monographic and floristic works, a selection of which follows:

Herbert, Appendix (1821); Herbert, *Amaryllidaceae* (1837); Kunth, Enum. V. (1850); Baker in Journ. Bot. XVI. (1878); Hemsley, Biol. Centr.-Amer. Bot. III. (1882–86); Benth. & Hook. f., Gen. Pl. III. (1883); Nicholson, Ill. Dict. Gard. (1884–88); Baker, Handb. Amaryll. (1888); Engler & Prantl, Nat. Pflanzenfam. II. 5 (1888); Donnell Smith, Enum. Pl. Guatemal. (1889–1907); Philippi, Pl. Nuevas Chil. (1896); Dyer, Fl. Trop. Afr. VII. (1898); Dalla Torre & Harms, Gen. Siphonog. (1901); Urban, Symb. Antill. (1903–1921); Rendle, Classif. Flow. Pl. I. (1904); Aschers. & Graebn., Syn. III. (1906); Pulle, Enum. Vasc. Pl. Surinam (1906); Boldingh, Fl. Dutch W. Ind. Isl. (1909–14) et Fl. Nederl. W. Ind. Eil. (1913); Bailey, Stand. Cycl. Hort. III. (1915); Hauman & Vanderv. Cat. Phanerog. Argent. (1917); Britton, Fl. Bermuda (1918); Olmsted, Standardized Pl. Names (1923); Bailey, Man. Cult. Pl. (1924); Rendle, Classif. Fl. Pl. ed. 2, I. (1930); Engler, Nat. Pflanzenfam. Ed. 2, XVa. 415 (1930); Small, Man. Southeast. Fl. (1933); Hutchinson, Fam. Flow. Pl. II. (1934); Macbride, Fl. Peru (1936); Standley, Fl. Costa Rica (1937).

Since 1837 it has been used in practically all botanical and horticultural literature, and nearly all the illustrations of the genus that have appeared since that year will be found under *Hippeastrum*.*

(3) The name *Leopoldia* Herbert has never been used for the genus. In those works (almost all before 1837) where the name *Hippeastrum* was not used, the species were included under *Amaryllis*.

No type was indicated by Herbert and no lectotype has been chosen hitherto so far as can be ascertained. *H. reginae* (L.) Herb. is the only species of *Hippeastrum* definitely named by Linnaeus, and agrees well with Herbert's original description.

(28) Generic name proposed for conservation by W. T. STEARN. 1028 (*Liliac.*) ***Apicra*** Haworth, Suppl. Pl. Succ. 61 (1819)—non *Apicra* Willdenow in Ges. Naturf. Freund. Berlin, Mag. V. 271 (1811). Suggested lectotype: *A. pentagona* (Haw.) Haw.

The name "*Apicra* Willd." has been adopted by Haworth, Suppl. Pl. Succ. 61 (1819), Baker in Journ. Linn. Soc., Bot. XVIII, 216 (1880), Bentham & Hooker, Gen. Pl. III, 776 (1883), Engler & Prantl, Nat. Pflanzenfam. II. 5, p. 46 (1887), Baker in Fl. Cap. VI, 329 (1896), A. Berger in Engler, Pflanzenreich IV. 38, III. ii (33, *Liliac.-Asphodel.-Aloin.*) 115 (1908), Trelease in L. H. Bailey, Stand. Cycl. Hort. I, 309 (1914), Marloth, Fl. S. Afr. IV, 87 (1915), K. Krause in Engler & Prantl, Nat. Pflanzenfam. 2nd ed., XVA. 301

* The date was probably December, but it was certainly after May 1st.

* The Index Londinensis lists 87 illustrations under this name.

(1930), Hutchinson, *Fam. Fl. Pl.* II, 91 (1934), Stearn in *Cactus Journ.* VII, 39 (1938), L. Cutak in *Bull. Missouri Bot. Gard.* XXVII, 114 (1939), for a South African genus of Liliaceae distinguished from *Haworthia* Duval by its regular instead of bilabiate perianth. Both genera at one time formed part of *Aloë*. *Haworthia* was separated from *Aloë* by Duval in 1809, *Apicra* by Haworth in 1819. Haworth attributed the name *Apicra* to Willdenow but, as his definition of *Apicra* indicates, and as he himself definitely stated in his *Suppl. Pl. Succ.* 50 (1819), *Revis. Pl. Succ.* 45 (1821) and *Phil. Mag. n.s.* II, 34 (1827), he never saw the original description of *Apicra* Willd. in *Ges. Naturf. Freund. Berlin, Mag.* V. (1811). This explains Haworth's misapplication of the name. Reference to Willdenow's paper shows that Willdenow separated his *Apicra* from *Aloë* on account of its irregular, bilabiate perianth. Witness his diagnosis: "Corolla monopetala . . . limbo sexpartito bilabiato, laciniis tribus superioribus, totidemque inferioribus, concavis revolutis . . .". Diese Gattung ist durch den besondern Bau der Blumenkrone von den eigentlichen *Aloë* Arten beim ersten Blick zu unterscheiden" (Willdenow, 1811). That is the very character by which Duval in 1809 had defined his *Haworthia*: "Calyx petaloideus, rectus, superne revolutus in duo labia" (Duval, 1809). Moreover Duval's nine species of *Haworthia* are among twenty-eight species included by Willdenow in his *Apicra*. Thus, as A. J. A. Uitewaal has pointed out in *Cactussen en Vetplanten*, II, 90 (1936), *Apicra* Willd. (1811) is a synonym of *Haworthia* Duval (1809). In defining *Apicra* as a genus with a regular perianth unlike *Haworthia*, Haworth was really founding a new genus. For this genus, which comprises about 12 species and is well known to South African botanists and to growers of succulent plants both in Europe and America, the name *Apicra* has been in continuous use since 1880. No alternative name exists. *Apicra* Haw. is accordingly here proposed for conservation.

On account probably of a general resemblance in vegetative growth to his twenty-two species with irregular perianth, Willdenow erroneously included *Aloë pentagona* Haw. (together with five other then little-known species now referred to *Apicra* Haw., their perianth being regular) in the genus *Apicra* Willd. This species, which is well figured in *Bot. Mag.* t. 1338 (1810) and *Salm-Dyck, Mon. Gen. Aloes*, §1 t. 4 (1837), has, however, a regular perianth. When placed under *Apicra* Haw. it is cited as *Apicra pentagona* (Haw.) Haw. because (1) the generic name *Apicra* Willd. is here proposed for rejection and cannot be adopted in a specific combination, (2) the species does not belong to the genus *Apicra* Willd. as defined by Willdenow. The name *Apicra pentagona* (Haw.) Haw. (1819) can be used for this species since it is not a later homonym of *A. pentagona pentagona* Haw. (1804).

Analysis of binary combinations published under *Anonymos* by Walter, *Fl. Carol.* (1788). T. A. SPRAGUE.

5. ANONYMOS Walt. *Fl. Carol.* 2, 60 (1788) = *Tubiflora* J. F. Gmel. *Syst. Nat.* II, 19, 27 (1791) = *Elytraria* L. C. Rich. (1803), nom. conserv.

A. caroliniensis Walt. l.c. 60 = *Tubiflora caroliniensis* J. F. Gmel. l.c. 27 = *Elytraria caroliniensis* (J. F. Gmel.) Pers.

8. ANONYMOS Walt. l.c. 2, 62 = *Globifera* J. F. Gmel. l.c. 19, 32 = *Micranthemum* L. C. Rich. (1803), nom. conserv.

A. umbrosa Walt. l.c. = *Globifera umbrosa* J. F. Gmel. l.c. 32 = *Micranthemum umbrosum* (J. F. Gmel.) Blake.

21. ANONYMOS Walt. l.c. 4, 67 = *Heritiera* J. F. Gmel. l.c. 81, 113, non Ait. (1789) = *Gyrotheca* Salisb. (1812) = *Lachnanthes* Ell. (1816), nom. conserv.

A. tinctoria Walt. l.c. 68 = *Heritiera tinctorum* [sic] J. F. Gmel. l.c. 113 = *Gyrotheca tinctoria* Salisb. = *Lachnanthes tinctoria* Ell. Bot. S. Carol. 47 = *Lachnanthes tinctorum* (J. F. Gmel.), comb. nov.

23. ANONYMOS Walt. l.c. 4, 68 = *Vogelia* J. F. Gmel. l.c. 81, 107 = *Burmannie* L. (1753).

A. capitata Walt. l.c. 69 = *Vogelia capitata* J. F. Gmel. l.c. 107 = *Burmannie capitata* (J. F. Gmel.) Mart.

65. ANONYMOS Walt. l.c. 9, 86 = *Poiretia* J. F. Gmel. l.c. 213, 263 = *Houstonia* L. (1753).

A. erecta Walt. l.c. 86 = *Poiretia erecta* J. F. Gmel. l.c. 263 = *Houstonia caerulea* L.

A. procumbens Walt. l.c. 86 = *Poiretia procumbens* J. F. Gmel. l.c. 263 = *Houstonia procumbens* (J. F. Gmel.) Standley.

78. ANONYMOS Walt. l.c. 10, 91 = *Batschia* J. F. Gmel. l.c. 292, 315 = *Lithospermum* L. (1753).

A. caroliniensis Walt. l.c. 91 = *Batschia caroliniensis* J. F. Gmel. l.c. 315 = *Lithospermum Gmelini* (Michx.) Hitchc. = *Lithospermum caroliniense* (J. F. Gmel.) MacMill.

90. ANONYMOS Walt. l.c. 11, 98 = *Gelsemium* Juss. (1789).

A. sempervirens (L.) Walt. l.c. 98 = *Gelsemium sempervirens* (L.) Ait. f.

102. ANONYMOS Walt. l.c. 13, 102 = *Kuhnistera* Lam. *Encycl.* III, 370 (1791) = *Petalostemum* Michx. (1803), nom. conserv.

A. pinnata Walt. l.c. 103 = *Kuhnistera caroliniensis* Lam. l.c. = *Kuhnistera pinnata* Kuntze (1891) = *Petalostemum pinnatum* (Kuntze) Blake = *Petalostemum caroliniense* (Lam.), comb. nov.

108. ANONYMOS Walt. l.c. 13, 107 = *Cynoctonum* J. F. Gmel. l.c. 306, 443 (1791) (*Mitreola* R. Br., 1810).

A. sessilifolia Walt. l.c. 108 = *Cynoctonum sessilifolium* J. F. Gmel. l.c. 443.

A. petiolata Walt. l.c.=*Cynoctonum petiolatum* J. F. Gmel. l.c. 443=*Cynoctonum Mitreola* (L.) Britton.

109. ANONYMOS Walt. l.c. 13, 108=*Villarsia* J. F. Gmel. l.c. 306, 447 (1791)=*Limnanthemum* S. G. Gmel. (1791)=*Nymphoides Hill* (1756).

A. aquatica Walt. l.c. 109=*Villarsia aquatica* J. F. Gmel. l.c. 447=*Limnanthemum aquaticum* (J. F. Gmel.) Britton=*Nymphoides aquatica* (J. F. Gmel.) Kuntze.

113. ANONYMOS Walt. l.c. 14, 110=*Demidofia* J. F. Gmel. l.c. 307, 458 (1791)=*Dichondra* J. R. et G. Forst. (1776).

A. repens Walt. l.c. 110=*Demidofia repens* J. F. Gmel. l.c. 458=*Dichondra repens* J. R. et G. Forst. (1776).

152. ANONYMOS Walt. l.c. 18, 122=*Uvularia* L. (1753).

A. pudica Walt. l.c. 123=*Uvularia perfoliata* L. (1753).

161. ANONYMOS Walt. l.c. 19, 127=*Mattuschkia* J. F. Gmel. l.c. 528, 589 (1791)=*Saururus* L. (1753).

A. aquatica Walt. l.c. 127=*Mattuschkia aquatica* J. F. Gmel. l.c. 589=*Saururus cernuus* L. (1753).

176. ANONYMOS Walt. l.c. 22, 136=*Decodon* J. F. Gmel. l.c. 656, 677 (1791).

A. aquatica Walt. l.c. 137=*Decodon aquaticus* J. F. Gmel. l.c. 677=*Decodon verticillatus* (L.) Ell.

181. ANONYMOS Walt. l.c. 23, 139=*Vaccinium* L. (1753)+*Lyonia Nutt.* (1818), nom. conserv.

A. corymbosa Walt. l.c. 139=*Vaccinium corymbosum* L. (e descr.).

A. ligustrina Walt. l.c.=*Lyonia ligustrina* (L.) DC. (e descr.).

A. frondosa Walt. l.c.=*Vaccinium frondosum* L. (e descr.).

230. ANONYMOS Walt. l.c. 31, 160=*Lippia* L. (1753).

A. repens Walt. l.c. 160=*Lippia nodiflora* (L.) DC. (e descr.).

240. ANONYMOS Walt. l.c. 32, 163=*Glandularia* J. F. Gmel. l.c. 886, 920 (1791)=*Verbena* L. (1753).

A. caroliniensis Walt. l.c. 164=*Glandularia caroliniensis* J. F. Gmel. l.c. 920=*Verbena canadensis* (L.) Britton.

250. ANONYMOS Walt. l.c. 33, 167=*Pattersonia* J. F. Gmel. 888, 925 (1791)=*Ruellia* L. (1753).

A. caroliniensis Walt. l.c. 168=*Pattersonia caroliniensis* J. F. Gmel. l.c. 925=*Ruellia ciliata* Pursh (1814)=*Ruellia caroliniensis* (J. F. Gmel.) Steud.

254. ANONYMOS Walt. l.c. 33, 169=*Gerardia* L. (1753) (*Agalinis Raf.*+*Aureolaria Raf.*).

A. purpurea (L.) Walt. l.c. 170=*Gerardia purpurea* L. (*Agalinis purpurea* (L.) Pennell).

A. erecta Walt. l.c.=*Gerardia erecta* J. F. Gmel. l.c. 928 (*Agalinis erecta* (J. F. Gmel.) Pennell).

A. setacea Walt. l.c.=*Gerardia setacea* J. F. Gmel. l.c. (*Agalinis setacea* (J. F. Gmel.) Raf.).

A. flava (L.) Walt. l.c.=*Gerardia flava* L. (*Aureolaria flava* (L.) Farwell).

A. pedicularis [sic] Walt. l.c.=*Gerardia pedicularia* L. (*Aureolaria pedicularia* (L.) Raf.).

255. ANONYMOS Walt. l.c. 33, 171=*Afzelia* J. F. Gmel. 889, 927 (1791)=*Seymeria Pursh* (1814), nom. conserv.

A. cassioides Walt. l.c. 171=*Afzelia cassioides* J. F. Gmel. l.c. 927=*Seymeria tenuifolia* Pursh (1814)=*Seymeria cassioides* (J. F. Gmel.) Blake.

278. ANONYMOS Walt. l.c. 36, 180=*Crotalaria* L. (1753).

A. sagittalis (L.) Walt. l.c. 181=*Crotalaria sagittalis* L. (1753).

A. rotundifolia Walt. l.c.=*Crotalaria rotundifolia* J. F. Gmel. l.c. 1095.

279. ANONYMOS Walt. l.c. 36, 181=*Zornia* J. F. Gmel. l.c. 1076, 1096 (1791).

A. bracteata Walt. l.c. 181=*Zornia bracteata* J. F. Gmel. l.c. 1096.

288. ANONYMOS Walt. l.c. 37, 186=*Wisteria Nutt.* (1818), nom. conserv.

A. frutescens Walt. l.c.=*Glycine frutescens* L.=*Wisteria frutescens* (L.) Poir.

294. ANONYMOS Walt. l.c. 38, 188=*Falcata* J. F. Gmel. l.c. 1078, 1131 (1791)=*Amphicarpaea Ell.* (1818), nom. conserv.

A. caroliniensis Walt. l.c. 188=*Falcata caroliniana* J. F. Gmel. l.c. 1131=*Amphicarpaea monoica* (L.) Ell.

309. ANONYMOS Walt. l.c. 40, 196=*Laciniaria Hill* (1762)=*Liatris Schreb.* (1791), nom. conserv., etc.

A. pilosa Walt. l.c. 197=*Chrysocoma pilosa* J. F. Gmel. l.c. 1203=*Liatris pycnostachya Michx.* fide Pursh, Fl. Am. Sept. II, 507 (1814) (non *Liatris pilosa* (Ait.) Willd.).

A. ciliata Walt. l.c.=*Liatris pilosa* (Ait.) Willd. fide Pursh, l.c. 508.

A. graminifolia Walt. l.c.=*Liatris graminifolia Willd.* Sp. Pl. III, 1636 (1804) (*Laciniaria graminifolia* (Willd.) Kuntze).

A. ramosa Walt. l.c. 198=*Chrysocoma ramosa* J. F. Gmel. l.c. 1204=*Liatris aspera Michx.* fide Pursh, l.c. If this identification is correct, a new combination will be required embodying the epithet *ramosa* (J. F. Gmel.).

A. paniculata Walt. l.c.=*Chrysocoma paniculata* J. F. Gmel. l.c. =*Liatris paniculata* Michx. Fl. Bor.-Am. II, 93, 1803=*Liatris paniculata* (J. F. Gmel.) Willd. Sp. Pl. III, 1637 (1804)=*Trilisa paniculata* (J. F. Gmel.) Cass.

A. uniflora Walt. l.c.=*Chrysocoma uniflora* J. F. Gmel. l.c.=*Liatris bellidifolia* Michx. fide Pursh, l.c. 510=*Carphephorus bellidifolius* (Michx.) Torr. et Gray. If this identification is correct, a new combination will be required embodying the epithet *uniflora* (J. F. Gmel.).

A. odoratissima Walt. l.c.=*Chrysocoma odoratissima* J. F. Gmel. l.c.=*Liatris odoratissima* (J. F. Gmel.) Willd.=*Trilisa odoratissima* (J. F. Gmel.) Cass.

363. ANONYMOS Walt. l.c. 47, 229=*Planera* J. F. Gmel. l.c. 86, 150 (1791).

A. aquatica Walt. l.c. 230=*Planera aquatica* J. F. Gmel. l.c.

397. ANONYMOS Walt. l.c. 52, 246=*Dioscorea* L. (1753).

A. quaternata Walt. l.c. 246=*Dioscorea quaternata* J. F. Gmel. l.c. 581.

A. quinata Walt. l.c.=*Dioscorea quinata* J. F. Gmel. l.c.=*Dioscorea villosa* L. fide Pursh, Fl. Am. Sept. I, 251 (1814).

435. ANONYMOS Walt. 58, 263=*Lycoperdon* Pers.?

A. caroliniensis Walt. l.c. 263=*Lycoperdon* sp.?

XLI—CONTRIBUTIONS TO THE FLORA OF BURMA: XVI.* C. E. C. FISCHER.

The regions in brackets after each species are those from which it has been reported previously.

Illicium manipurense Watt ex King [Winteraceae].
(Manipur).

Bhamo District: Naru Bum, 2400 m., fls. March. *Maung Mya* 5327, "37 ft. high; stem grey; fls. white, sweet-scented." Myitkyina District: above Langyaw, 1800 m., C. W. D. *Kermode* 16693, "fls. pale-yellow"; Laikam-Humyetaung road, 2150–2500 m., fls. April, *Kermode* 17095, "fls. yellow-green; Hpare Pass, 2100 m., *Kermode* 17179, "shrub or small tree, fls. cream tinged with pink."

Mahonia calamicaulis Spare et Fischer [Berberidaceae].
(Assam).

Myitkyina District: on ridge East of Hpimaw running up to frontier at Pawseik Bum, 2800–3100 m., fls. April, *Kermode* 17069, "3–4 ft. tall, common in Rhododendron-Magnolia-Oak evergreen, fls. yellow; Hpare Pass, 2100 m., *Kermode* 17174, "2 ft. tall."

Mahonia lomariifolia Tak. [Berberidaceae].
(Yunnan, Formosa).

Myitkyina District: Laikam, 1800–2150 m., fls. April, *Kermode* 17087, "Shrub; fruit green tinged purple." When dry the fruit are darkish-purple and pruinose.

Polyspora axillaris (Roxb. ex Ker-Gawl.) Sweet—*Gordonia axillaris* D. Dietr. [Theaceae].
(S. China).

Myitkyina District: 8 miles from Kangfang, fls. Sept., *Naw Mu Pa* 17458, "20 ft. tall, fls. white." Bhamo District: Shangtai Lahpyckha, 2000 m., frt. March, *Maung Nya* 5322, "Stem dark-grey; young fruit greenish-pink, mature capsule brownish-grey"; Spur of Shangtai, 1900 m., fls. March, *Maung Mya* 5331, "Stem greyish-white; evergreen."

Geranium yunnanense Franch. [Geraniaceae].
(Yunnan).

Myitkyina District: 8 miles from Hpawte, fls. Aug., *Naw Mu Pa* 17440, 2 ft. high."

Tripterygium Wilfordi Hook. f. [Celastraceae].
(Yunnan to Formosa).

Myitkyina District: 4 miles from Kangfang, young frt. July, *Naw Mu Pa* 17437, "Creeper with red fruit."

Prunus campanulata Max. [Rosaceae].
(W. China).

Myitkyina District: above Langyaw, 1850 m., fls. end March, *Kermode* 16689, "60–70 ft. high and up to 6 ft. girth, fls. deep cherry-red."

Rubus calycinus Wall. ex D. Don [Rosaceae].
(E. Himalayas, China).

Myitkyina District: Lagwi-Htawgaw road, 1850 m., fls. April, *Kermode* 17017, "3–4 in. high, creeping and rooting at intervals, fls. white."

Rubus horridulus Hook. f. [Rosaceae].
(Bhutan, W. China).

Myitkyina District: near Panwa Pass, 2150 m., fls. early April, *Kermode* 17141, "Very straggling, almost prostrate, fls. pink."

Rubus lineatus Reinw. ex Bl. [Rosaceae].
(Sikkim, China, Java).

Myitkyina District: Langyaw-Lukpyi road, 2150 m., fls. end March, *Kermode* 17117, "4–6 ft. high; fls. greenish."

Eriobotrya tengyuehensis W. W. Smith [Pomaceae].
(Yunnan).

Myitkyina District: near Kangfang, 1500–1650 m., fls. April, *Kermode* 17258, "20 ft. high; fls. white."

Photinia mollis Hook. f. var. *angustifolia* C. E. C. Fischer var. nov. [Pomaceae]; a typo foliis anguste elliptico-lanceolatis, marginibus minute dentatis distincta.

A shrub 1–2.5 m. high. Leaves narrowly elliptic-lanceolate, acute or acuminate, base tapering, 6–12 cm. long, 1–2.2 cm. wide, margins minutely and rather distantly toothed, both surfaces densely white-tomentose when young, the tomentum soon vanishing from the upper surface and eventually from the lower also, midrib slightly

* Continued from K.B. 1939, 98.

impressed above, prominent, as are the 7-8 lateral nerves below, but not visible till the tomentum has disappeared; petioles 3-8 mm. long, white-tomentose.

Myitkyina District: Tanpangkha, about 3 miles from Seniku, on rocks beside the stream, 300 m., fls. white, March, *Kermode* 16608.

Saxifraga diversifolia Wall. [Saxifragaceae].

(W. Himalaya to Bhutan, W. China).

Myitkyina District: in jungle above Hpawte, fls. Oct., *Naw Mu Pa* 17470.

Saxifraga rufescens Balf. f. [Saxifragaceae].

(Yunnan).

Myitkyina District: 7 miles from Hpawte, on rocks, fls. white, Aug., *Naw Mu Pa* 17441.

Deutzia Hookeriana (Schneid.) Airy-Shaw [Hydrangeaceae].

(E. Himalayas, N. Burma, Yunnan—entered here as no precise locality in Burma was specified).

Myitkyina District: 2 miles from Hpawte, fls. white, May, *Naw Mu Pa* 17408, "Shrub 6 ft. high."

Hydrangea aspera D. Don [Hydrangeaceae].

(Kumaon to Sikkim, W. China).

Myitkyina District: 3 miles from Kangfang, frt. Sept., *Naw Mu Pa* 17466, "Shrub 6 ft. high."

Rhododendron eriogynum Balf. f. et W. W. Smith [Ericaceae].

(Yunnan).

Myitkyina District: 4 miles from Hpawte, fls. July, *Naw Mu Pa* 17426, "10 ft. high; fls. red."

Lysimachia trichopoda Franch. [Primulaceae].

(Yunnan).

Myitkyina District: 2 miles from Kangfang, on rocks, fls. end May, *Naw Mu Pa* 17413. One flower had 7 sepals and 7 petals.

Hackelia uncinata (Benth.) C. E. C. Fischer [Boraginaceae].

(Kashmir to Assam).

Myitkyina District: 6 miles from Hpawte, fls. June, *Naw Mu Pa* 17419.

Strobilanthes aenobarba W. W. Smith [Acanthaceae].

(S. E. Tibet).

Myitkyina District: above Hpawte, fls. Aug., *Naw Mu Pa* 17445, "2 ft. high; fls. purple."

Strobilanthes Wallichii Nees [Acanthaceae].

(Nepal to Bhutan).

Myitkyina District: 8 miles from Hpawte, fls. July, *Naw Mu Pa* 17427, "3 ft. high."

Luzula effusa Buchen. [Juncaceae].

(Sikkim, W. China).

Myitkyina District: Fengshuiling Pass, 2850 m., fls. April, *Kermode* 17226.

XLII—ACTINOCHEITA. A. A. BULLOCK.

Dr. F. A. Barkley(1) has published a further article, in conjunction with Mr. Merton J. Reed, on *Actinocheita*, in which he still maintains that *Rhus filicina* DC. is conspecific with *Actinocheita potentillifolia* (Turcz.) Bullock. Detailed reasons for the rejection of this conclusion have already been given by the writer(2), but the following dogmatic sentence from Dr. Barkley's second paper cannot be allowed to pass without comment: "One cannot but wonder that anyone might seriously suggest either that the description (even excluding the reference to the fruit) or illustration as referring [sic] to *Bursera bipinnata* when compared to a series of specimens of that species."

(1) Messrs. Barkley and Reed do not seem to be fully acquainted with the history(3) of the Mociño and Sessé specimens and drawings. They state that De Candolle "had seen the specimen" (of *Rhus filicina*). Sessé and Mociño's herbarium specimens, however, were sent to Spain, and when Mociño took asylum in Montpellier in 1813, he took with him only the manuscripts and the coloured drawings. It was on these drawings that the new Sessé and Mociño species published in the *Prodromus* were based, as is clear from the following extract from the preface to Alphonse De Candolle's 'Calques des dessins'(4): "Les botanistes qui font usage du *Prodromus*, en particulier ceux qui s'occupent des plantes du Mexique, ont sans doute remarqué combien il leur est difficile de reconnaître les espèces décrites d'après les *Icones florae mexicanae ineditae*." "On ne savait pas alors à quel point il est nécessaire de décrire les espèces nouvelles complètement au moyen d'échantillons qui restent dans les herbiers pour de futures explications ou vérifications." "à mesure que le *Prodromus* a avancé, l'emploi des dessins du Mexique est devenu de plus en plus rare." "Vers la fin du *Prodromus* les auteurs n'ont jamais employé ni même consulté ces dessins que les plantes sèches, recueillies dans les temps modernes, remplacent avec infirmité d'avantage."

As De Candolle had *not* seen a specimen of *Rhus filicina*, his statement, that it had imparipinnate leaves with pinnatifid leaflets, was based by him on examination of the drawing, and is not first-hand evidence as Barkley and Reed suppose.

(2) The statement that *Bursera bipinnata* has "a slender glabrous branch bearing bipinnate leaves with more or less alate rachi [sic], with leaflets remote and very sparsely pilose" suggests imperfect acquaintance with that species. The apical portions of the branchlets of *B. bipinnata* are frequently very pilose. The

uppermost part of the leaf is simply pinnate as depicted in De Candolle's copy of Sessé and Mociño's drawing. The leaflets are not "remote," indeed they very often touch or overlap at the middle, triangular spaces being left between their bases exactly as shown in the tracing (Calques, t. 189).

(3) The following sentence from Messrs. Barkley and Reed's paper shows confusion of ideas.—"While the author had in mind the biological entity including *Rhus potentillaefolia* Turcz. in the creation of the genus *Actinocheita*, it is necessary to point out that the type of the genotype is plate 189 of A. De Candolle's Calque[s] des Dessins . . . (not specimens of *Rhus potentillaefolia* Turcz. as has been erroneously assumed) so that if plate 189 of the Calque[s] . . . were to be proven other than conspecific with *Rhus potentillaefolia* . . . then the type of the genus would have been removed, so that it would seem a new name for the genus would have then been indicated rather than a new combination under the old genus name."

The type-method in botanical nomenclature is concerned with types of *names*, not with morphological (or other) types of *groups*, which fall under taxonomy. The expression "type of the genotype" (of *Actinocheita*) is equivalent to "type of the type-species of the generic name *Actinocheita*," i.e., a taxonomic, not a nomenclatural concept. A generic name is based on one or more species, which may or may not have been correctly identified. Dr. Barkley's generic description of *Actinocheita* appears to have been drawn up from a number of herbarium specimens. His description of the ovary and fruit could not have been taken from pl. 189 of the *Calques des Dessins*, since the details given by him are not shown in it. It follows, therefore, that the type of the generic name (genotype) is the *species* represented by the specimens concerned and, as admitted by Dr. Barkley, this is undoubtedly *Rhus potentillifolia* Turcz. Dr. Barkley's adoption of the epithet *filicina* depends upon his identification of *Rhus filicina* DC. with *Rh. potentillifolia* Turcz., an identification which he admits is doubtful and with which Engler, Hemsley and Bullock disagree. The undisputed fact that Calq. Dess. Fl. Mex. t. 189 is the type of the *specific* names *Rhus filicina* DC. and *Actinocheita filicina* (DC.) Barkley, does not make that drawing the type of the generic name *Actinocheita*. The type of a generic name is a *species*, not a *specific name*.

Regulations for determining types have not yet appeared, but most botanists would perhaps agree that the description of a group is very important in fixing the type of the name concerned. The description of *Actinocheita* applies in all respects to *Rhus potentillifolia*. Some weight may also be given to the origin of the name *Actinocheita* in fixing its application. It was derived (5) from "the ray-like pilosity of the fruit-coat," characteristic of *Rhus potentillifolia*. Why it should be thought necessary to find a new name for a genus merely because the author of the generic name used an

erroneous specific epithet for the type-species is difficult to understand.

REFERENCES.

- (1) BARKLEY and REED, "Actinocheita," in *Amer. Midl. Nat.* **21**, 368-377 (1939).
- (2) BULLOCK, "On the identification of *Rhus filicina* Sessé et Moc. ex DC." in *Kew Bull.* 1937, 440-441.
- (3) SPRAGUE, "Sessé and Mociño's Plantae Novae Hispaniae and Flora Mexicana," in *Kew Bull.* 1926, 417-425, with bibliography.
- (4) ALPH. DE CANDOLLE, "Calques des Dessins de la Flore du Mexique, de Mociño et Sessé," introduction and plate 189 (1874).
- (5) BARKLEY, "A new genus of Anacardiaceae," in *Ann. Missouri Bot. Gard.* **24**, 1-10 (1937).

XLIII—MISCELLANEOUS NOTES.

Miss E. A. Bruce.—Miss E. A. BRUCE, B.Sc., has been appointed Temporary Assistant Botanist to fill the vacancy caused by the death of the late Dr. E. G. S. Brown.

ARTHUR T. BOSCAWEN.—Kew mourns the loss of an old and valued correspondent and friend in the death of Canon A. T. Boscawen, Rector of Ludgvan, Cornwall, on 17th July, 1939.

The Rectory garden with its kindly owner was the Mecca to which many botanists and horticulturists turned when they wished to see new and unexpected plants, especially from New Zealand, flourishing under the skill and care of the Rector in the genial climate of S. Cornwall. Not only was the Canon a keen gardener, but he was also greatly interested in larger horticultural enterprises, for it was due to him that the cultivation of the *Anemone* was taken up in Cornwall, and he also played a prominent part in establishing the Broccoli industry in the county, both of which undertakings have been of great benefit to consumers and growers alike.

At Kew, however, we think of Arthur Boscawen's garden at Ludgvan as the place to which rare plants needing expert care and a favourable situation should be sent for trial. Among his many New Zealand plants *Nothopanax arborescens* was figured in the *Botanical Magazine*, t. 9280 (1932). The results he achieved amply showed that our confidence in the Rector's skill was not misplaced. He always enjoyed visits from his horticultural friends to whom he delighted to show his treasures.

Botanical Magazine.—The first part of volume 162 was published on July 8th, and contains the following plant portraits: *Nomocharis Farreri* (Evans) Harrow (t. 9557), a member of the section *Eunomocharis* Balf. f. which comes from N. E. Upper Burma and possibly extends to Yunnan; a long account accompanies the

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XLIV—EXPERIMENTS WITH PLANT GROWTH-SUBSTANCES FOR THE ROOTING OF CUTTINGS.
C. R. METCALFE (Royal Botanic Gardens, Kew) and
W. G. TEMPLEMAN (Jealott's Hill Research Station, Bracknell, Berks).

When the use of the so-called synthetic plant "growth-substances" was first recommended to facilitate the rooting of cuttings, very little information was available concerning the efficacy of these treatments for more than a very limited number of species and varieties. The early tests, and notably those carried out at the Boyce Thompson Institute in the U.S.A., demonstrated that the rooting of holly cuttings and of a certain number of other plants could be considerably expedited. These results were afterwards confirmed and amplified in this country by the work of Dr. M. A. H. Tincker at Wisley. Subsequently, in order to obtain optimum results, it has been found desirable to ascertain the correct concentration of the most suitable "growth-substance," duration of treatment and other conditions for each species or variety. It cannot be too strongly emphasized that, while very beneficial results can be obtained with a wide range of species by the use of "growth-substances," they do not provide a "cure" for all propagating difficulties. Practical skill and knowledge is as necessary in dealing with a cutting after it has been treated with a "growth-substance" as it is for one without previous treatment. The selection and preparation of the cuttings also require the knowledge of a skilled practical man. At the same time, provided the correct treatment is used for each species, a good propagator would undoubtedly secure better results than if he attempted to root cuttings of the same species in the ordinary way. It is well known that the advantages which may be expected are (1) earlier rooting of cuttings, (2) more roots per cutting, and (3) a higher percentage of "strikes." In spite of all the research work on the subject which has been done, however, there still remains a number of species, especially amongst those which are difficult to propagate by normal means, for which satisfactory treatments have not yet been devised.

Experiments conducted at Kew, in collaboration with the gardens staff, have yielded data concerning the propagation of a number of horticultural plants which it seems worth while to place on record. To facilitate easy reference, the plants have been arranged in alphabetical order under their botanical names, and the experimental results expressed in tabular form. No claim is

plate, together with a key to the allied species; *Schima argentea* Pritzl apud Diels (t.9558), a member of the family *Theaceae* found in open thickets and forests on hillsides in Assam, S. W. China and N. Siam; *Lithospermum oleifolium* Lapeyrouse (t.9559), a native of Catalonia, which has previously been figured, but has been figured again since the present plant differs considerably in the flowers, this being a case of heterostyly in which the difference in length of style is accompanied by differences in calyx and corolla as well as in the stamens; *Fritillaria citrina* Baker (t.9560), from S. Asia Minor; *Rhododendron ravum* Balf. f. et W. W. Sm. (t.9561), from Yunnan; *Cyananthus macrocalyx* Franchet (t.9562), collected by George Forrest in N. W. Yunnan, occurring also in E. Tibet and Szechwan; *Ptychogyne flexuosa* (Rolfe) Pfitzer (t.9563), a beautiful white-flowered orchid belonging to the *Coelogyninae* from the Dutch East Indies; *Buddleja Fallowiana* Balf. f. et W. W. Sm. (t.9564), a native of Yunnan; *Vitis Piasezkii* Maxim. (t.9565), distributed in northern and central China; *Chrysanthemum rubellum* Sealy (t.9566), an interesting species, formerly called *C. erubescens* and known only in cultivation; and *Jasminum dispernum* Wall. (t.9567), widely distributed in N. India from Chamba to Bhutan and Assam and in S. W. China.

Uganda Timber Trees.*—This work represents number four of "Forest Trees and Timbers of the British Empire," previous parts of which have already been noticed (K.B. 1932, 256; 1934, 140; and 1935, 588). It has been written along similar lines to part three, but many of the timbers which have been described are more familiar in Great Britain than some of those in previous numbers. They include various members of the *Meliaceae* such as the species of *Entandrophragma* and *Khaya* which yield the African mahoganies, iroko (*Chlorophora excelsa* (Welw.) Benth. & Hook. f.), and the African blackwood (*Dalbergia melanoxylon* Guill. & Perr.). The high standard of the anatomical descriptions has been well maintained. A feature which will be particularly welcomed by wood anatomists is the summaries of the anatomical differences between those species of *Khaya* and *Entandrophragma* which have been described. The authors have included information derived from published and unpublished results of physical tests which have been applied to many of the timbers at the Forest Products Research Laboratory, Princes Risborough. The Editors state that the first four parts of this work are of a convenient size for binding into one volume, for which reason an index to all of them has been included. Two appendices are included, one on cell dimensions and the other on the distribution of forests in Uganda. C. R. METCALFE.

* "Fifteen Uganda Timbers," by W. J. Eggeling and C. M. Harris, in collaboration with the Imperial Forestry Institute, Oxford. Oxford, at the Clarendon Press, 1939. Pp. 120. Plates 16, figs. 15. Price 7s. 6d.

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made that the treatments which have given good results are necessarily the best that can be devised. Probably with more experience it would be possible to effect further improvements. In our experiments, it has not always been possible to secure enough cuttings to enable a range of concentrations of each "growth-substance" to be tested on any one species. Even if it had been possible to prepare cuttings in sufficient numbers for this purpose there would still have been the difficulty of finding accommodation for them in the propagating frames. It is felt, however, that the results which have been secured so far may serve as a useful guide to those who are anxious to propagate any of the species on the list. If further interesting results are obtained in the future with the same or any other species it is proposed to record them.

EXPERIMENTAL METHOD.

The results given below were obtained in the propagating pits which are normally used for these species at Kew, the cuttings in most instances being struck in sand after treatment with the different solutions. Cuttings of Ericaceous plants, on the other hand, were mostly rooted in a mixture of peat and sand. The frames were supplied with bottom heat. The "growth-substances" were applied by placing cuttings in glass jars of solution overnight for a period of 17-24 hours, so that the basal $\frac{1}{4}$ to 1 inch of the cutting was immersed in the solution. This was generally done in a well lighted and ventilated potting-shed close to the propagating pits. The herbaceous species, however, were treated in the pit in which they were subsequently rooted.

Exact numerical classification of results for each treatment of each species are omitted to permit the report to assume reasonable length, but generally speaking there were about 10 cuttings in each treatment, and a similar number of controls.

The key to the letters denoting treatments is:

- A. Water.
- B. Beta-indolylacetic acid 20 mgm./litre (1 : 50,000)
- C. " " " 50 " " (1 : 20,000)
- D. Beta-indolylbutyric acid 20 mgm./litre (1 : 50,000)
- E. " " " 50 " " (1 : 20,000)
- F. Alpha-naphthylacetic acid 20 mgms./litre (1 : 50,000)
- G. " " " 50 " " (1 : 20,000)

Response to treatment means that cuttings rooted earlier and/or possessed better developed root systems and/or a larger proportion of cuttings rooted than the controls (Treatment A).

In the "Degree of Response" column:

D=Definite response.

M=Moderate response.

S=Slight response.

EXPERIMENTAL RESULTS.

The names recorded below have been checked at Kew and are correct according to the International Rules of Nomenclature.

Key No.	Species.	Date of treatment.	Date of examination.	Remarks.	Treatments showing no response.	Treatments showing response.	Degree of response.	Treatments showing best response.
182	<i>Abelia chinensis</i> R. Br.	27.9.38	20.10.38	Number of cuttings rooted and bulk of roots increased by all treatments. C & G are better than A.	—	C, E, G	{ D for C & E S " G	C ≡ E
64	<i>Abelia Schumannii</i> Rehd.	8.7.38	27.7.38, 25.8.38	Response in number rooted and bulk of root. Mostly dead.	—	C, G	M. for C & G	G
34	<i>Abeliophyllum distichum</i> Nakai	5.7.38	2.8.38	No effect. All dead.	—	C, E & G	D for C, E & G	C
75	<i>Acantholimon glumaceum</i> Boiss.	13.7.38	27.9.38	No effect. All dead.	C, G	—	—	—
	<i>Aegle</i> see <i>Poncirus</i> .							
84	<i>Alnus glutinosa</i> Gaertn. var. <i>aurea</i> Versch.	13.7.38	8.11.38	No effect. All dead.	C, G	—	—	—
889	<i>Alnus glutinosa</i> Gaertn. var. <i>imperialis</i> Petzold & Kirchn.	13.7.38	27.9.38	No effect. All dead.	C, G	—	—	—
90	<i>Alnus glutinosa</i> Gaertn. var. <i>laciniata</i> Willd.	13.7.38	8.11.38	No effect. All dead.	C, G	—	—	—
81	<i>Alnus glutinosa</i> Gaertn. var. <i>quercifolia</i> Loud.	13.7.38	27.9.38	No effect. All dead.	C, G	—	—	—
85	<i>Alnus hirsuta</i> Turcz. var. <i>sibirica</i> Schneid.	13.7.38	27.9.38	No effect. All dead.	C, G	—	—	—
88	<i>Alnus incana</i> Willd. var. <i>aurea</i>	13.7.38	8.11.38	No effect. All dead.	C, G	—	—	—
87	<i>Schelle f. variegata</i> Hort.	13.7.38	27.9.38	No effect. All dead.	C, G	—	—	—
	<i>Alnus incana</i> Willd. var. <i>pendula</i> Callier							
74	<i>Anihyllis Barba-Jovis</i> L.	13.7.38	3.8.38	Response in number rooted.	C	G	D for G	G
78	<i>Anihyllis Hermanniae</i> L.	13.7.38	2.8.38	No effect. All dead.	C & G	—	—	—
107	<i>Arctostaphylos Manzanita</i> Parry	19.7.38	27.9.38	No effect. All dead.	C, E, G	—	—	—
149	<i>Arctostaphylos Manzanita</i> Parry	8.9.38	27.9.38	Response in number rooted.	C & G	E	D for E	E
186	<i>Arctostaphylos Manzanita</i> Parry	27.9.38	29.11.38	No effect. Mostly dead.	C, E, G	—	—	—

Key No.	Species.	Date of treatment.	Date of examination.	Remarks.	Treatments showing no response.	Treatments showing response.	Degree of response.	Treatments showing best response.
23	<i>Atraphaxis Muschketowii</i> Krassn.	23.6.38	27.7.38	No effect. All dead.	B, D, F	—	—	—
76	<i>Betula nana</i> L. var.	13.7.38	2.8.38	Response in number rooted.	—	C & G	{ D for C S " G	C
168	<i>Betula pendula</i> Roth var.	8.9.38	8.11.38	No effect. All dead.	C, E, G	—	—	—
119	<i>Buddleja alternifolia</i> Maxim.	23.6.38	5.7.38	Definite response to C, G, & to E in number rooted and amount of root.	—	E, C & G	{ D for E & G M " C	E
94	<i>Carriera calycina</i> Franch.	13.7.38	8.11.38	No effect. All dead.	C, G	—	—	—
155	<i>Carriera calycina</i> Franch.	8.9.38	8.11.38	No effect. All dead.	C, E, G	—	—	—
79 & 80	<i>Ceanothus arboreus</i> Greene	13.7.38	27.9.38	No effect. Mostly dead.	C, G	—	—	—
106	× <i>Ceanothus Burkwoodii</i> Hort.	19.7.38	25.8.38	Response in number rooted and bulk of root.	G	C & E	M for C & E	C ≡ E
99	<i>Ceanothus</i> " Autumnal Blue "	19.7.38	25.8.38	Response in number rooted.	—	C, E & G	M for C, E & G	C ≡ E ≡ G
62	<i>Ceanothus</i> " Gloire de Versailles "	8.7.38	27.9.38	Response in number rooted.	—	C & G	M for C & G	C ≡ G
91	<i>Ceanothus</i> " Henri Defosse "	13.7.38	25.8.38	No effect. All equally rooted.	C & G	—	—	—
146	<i>Ceanothus thyrsiflorus</i> Eschsch.	8.9.38	20.10.38	Response in number rooted and bulk of root.	E, G	C	S for C	C
147	× <i>Ceanothus Veitchianus</i> Hook.	8.9.38	20.10.38	No effect. Mostly dead.	C, E, G	—	—	—
72	<i>Cerastostigma</i> 2715 G.S.	13.7.38	27.7.38	Response in number rooted and bulk of root.	G	C	D for C	C
102	<i>Chaenomeles Lagermaria</i> Koidz. var. <i>umbilicata</i> Hort. (<i>Cydonia Lagermaria</i> Lois. var. <i>umbilicata</i> Hort.)	19.7.38	25.8.38	Slight response in number rooted C & E. Definite ditto G.	—	C, E & G	{ D for G S " C & E	G

Key No.	Species.	Date of treatment.	Date of examination.	Remarks.	Treatments showing no response.	Treatments showing response.	Degree of response.	Treatments showing best response.
185	<i>Chimonanthus fragrans</i> Lindl. var. <i>luteus</i> Hort.	27.9.38	29.11.38	No effect. Mostly dead.	C, E & G	—	—	—
17	<i>Cistus</i> " Silver Pink "	23.6.38	13.7.38	No effect at 13.7.38. Response in number at 27.7.38.	G	E	{ D for E M " C	—
170	<i>Clematis montana</i> Buch.-Ham. var.	8.9.38	29.11.38	Response in number of cuttings rooted.	C, G	E	M for E	E
5	<i>Cornus florida</i> L. var.	21.6.38	27.7.38	Response in number of cuttings rooted.	E, G	C	S for C	C
150	<i>Cornus Kousa</i> Buerg. var. <i>chinensis</i> Osborn	8.9.38	20.10.38	Response in number rooted.	C	E & G	M. for E & G	E ≡ G
56	<i>Cornus macrophylla</i> Wall.	8.7.38	8.11.38	No effect. All dead.	C, G	—	{ D for G M " C	—
22	<i>Cornus Nuttallii</i> Audub.	23.6.38	27.7.38	Response in number rooted.	—	C, E & G	{ S " E	G
137	<i>Cornus Nuttallii</i> Audub.	3.8.38	27.9.38	No effect. All dead.	C, E, G	—	—	—
40	<i>Cornus Nuttallii</i> Audub.	5.7.38	2.8.38	No effect. Mostly dead.	C, E & G	—	—	—
52	<i>Cotinus americanus</i> Nutt. (<i>Rhus cotinoides</i> Nutt.)	5.7.38	2.8.38	No effect.	C, E, G	—	—	—
36	<i>Cotinus Coggynia</i> Scop. var. <i>purpureus</i> Rehd. (<i>Rhus Cotinus</i> L. var. <i>atropurpurea</i> Dipp.)	5.7.38	2.8.38	Response in number rooted.	—	C, E & G	M for C, E & G	E
55	<i>Coloneaster glabrata</i> Rehd. & Wils.	8.7.38	27.9.38	No effect. Equally rooted.	C & G	—	—	—
77	<i>Cydonia</i> see <i>Chaenomeles</i> .	13.7.38	8.11.38	No effect. All dead.	C, G	—	—	—
124	<i>Cytisus scoparius</i> Link var. <i>pendulus</i> Nichols.	26.7.38	25.8.38	Response in number rooted.	E	C & G	S for C & G	C ≡ G

Key No.	Species.	Date of treatment.	Date of examination.	Remarks.	Treatments showing no response.	Treatments showing response.	Degree of response.	Treatments showing best response.
95	<i>Daphne pontica</i> L.	13.7.38	25.8.38	Response in number rooted.	—	C, E & G	M for C, E & G	C ≡ G ≡ — E — D ≡ F
25	× <i>Dierilla hybrida</i> Klenert var. <i>styriaca</i> Klenert	23.6.38	5.7.38	Response in number rooted.	B	D & F	D for D & F	—
21	<i>Dipelta floribunda</i> Maxim.	23.6.38	19.7.38	Response in number rooted.	C	G & E	{ D for G S " E D for E, S for C & G }	G E —
118	<i>Ehretia thyrsoiflora</i> Nakai	26.7.38	27.9.38	Response in number rooted.	—	C, E & G	—	—
27	<i>Emmenopterys Henryi</i> Oliv.	23.6.38	27.7.38	No effect. All dead.	B, D & F	—	—	—
122	<i>Emmenopterys Henryi</i> Oliv.	26.7.38	27.9.38	No effect. Equally rooted.	C, E & G	—	—	—
180	<i>Erica arborea</i> L. var. <i>alpina</i> Dieck	27.9.38	29.11.38	No effect. Mostly dead.	C, E, G	—	—	—
70	<i>Erica australis</i> L. var.	8.7.38	27.9.38	No effect. Mostly dead.	C & G	—	—	—
29	<i>Eucyphia glutinosa</i> Focke	23.6.38	27.7.38	No effect. Mostly dead.	B, D & F	—	—	—
130	<i>Eucyphia glutinosa</i> Focke	27.7.38	27.9.38	No effect. All dead.	C, E & G	—	—	—
37	<i>Exochorda racemosa</i> Rehd.	5.7.38	2.8.38	Response in number rooted.	C & G	E	D for E	E
105	<i>Exochorda racemosa</i> Rehd.	19.7.38	25.8.38	Response in number rooted.	—	C, E & G	{ D for C & E M, " G }	C ≡ E
43	<i>Fabiana imbricata</i> Ruiz & Pav. f. <i>violacea</i> Hort.	5.7.38	2.8.38	No effect. Mostly dead.	C, E & G	—	—	—
156	<i>Fabiana imbricata</i> Ruiz & Pav. f. <i>violacea</i> Hort.	8.9.38	20.10.38	Response in number rooted.	C, G	E	—	E
69	<i>Feijoa Sellowiana</i> Berg	8.9.38	27.7.38	No effect. Mostly dead.	C & G	—	—	—
114	× <i>Forsythia intermedia</i> Zabel var. <i>spectabilis</i> Spaeth	26.7.38	25.8.38	Response in number rooted.	—	C, E & G	D for C, E & G	C ≡ E ≡ G

Key No.	Species.	Date of treatment.	Date of examination.	Remarks.	Treatments showing no response.	Treatments showing response.	Degree of response.	Treatments showing best response.
125	<i>Fothergilla Gardeni</i> Murr. var. <i>glauca</i> Hort.	26.7.38	25.8.38	Response in number rooted.	C	E & G	{ D for E M " G }	E
92	<i>Fothergilla major</i> Lodd.	13.7.38	25.8.38	No effect. All dead.	C & G	—	—	—
93	<i>Fothergilla monticola</i> Ashe	13.7.38	27.9.38	No effect. All equally rooted.	C, G	—	—	—
67	<i>Garrya elliptica</i> Dougl.	8.7.38	27.7.38	Response in number rooted.	G	C	S for C	C
61	<i>Genista horrida</i> DC. var. <i>erinacea</i> Hort.	8.7.38	25.8.38	Response in number rooted.	C	G	D for G	G
139	<i>Halesia carolina</i> L.	2.8.38	8.11.38	No effect. All dead.	C, E, G	—	—	—
136	<i>Halesia diptera</i> Eli.	2.8.38	1.12.38	No effect. Mostly dead.	C, E & G	—	—	—
141	<i>Hibiscus syriacus</i> L. var. <i>azureus</i> Hort.	3.8.38	27.9.38	No effect. Equally rooted.	C, E & G	—	—	—
142	<i>Hibiscus syriacus</i> L. var. <i>caerulea</i> Hort.	2.8.38	27.9.38	No effect. Mostly dead.	C, E & G	—	—	—
39	<i>Hydrangea integrifolia</i> Engelm.	5.7.38	2.8.38	No effect. All dead.	C, E & G	—	—	—
163	<i>Hydrangea integrifolia</i> Engelm.	8.9.38	20.10.38	Response in number rooted.	C, E	G	S for G	G
173	<i>Hydrangea macrophylla</i> DC. var. <i>Veitchii</i> Wils.	27.9.38	20.10.38	No effect. Equally rooted.	C, E, G	—	—	—
154	<i>Hydrangea paniculata</i> Sieb.	8.9.38	27.9.38	No effect. Equally rooted.	C, E & G	—	—	—
177	<i>Hypericum elatum</i> Ait. var.	27.9.38	20.10.38	Response in number rooted and bulk of roots for C & E. Bulk for G.	—	C, E, G	{ M for C S " E & G D for E & G M " C }	C G ≡ E
166	<i>Ilex crenata</i> Thunb. var. <i>nummularia</i> Yatabe (f. <i>crenata</i> Thunb. var. <i>Mariesii</i> Dallimore)	8.9.38	20.10.38	Response in number rooted.	—	C, E, G	—	—

Key No.	Species.	Date of treatment.	Date of examination.	Remarks.	Treatments showing no response.	Treatments showing response.	Degree of response.	Treatments showing best response.
60	<i>Kalmia latifolia</i> L.	8.7.38	27.9.38	No effect. All dead.	C, G	—	—	—
71	<i>Lepospermum scoparium</i> Forst. var. <i>prostratum</i> Hort.	8.7.38	8.11.38	No effect. All dead.	C, G	—	—	—
97	<i>Leucothoe populifolia</i> Dipp. (<i>L. acuminata</i> G. Don).	19.7.38	27.9.38	Response in number rooted and bulk.	C	E & G	S for E & G	E ≡ G
135	<i>Liriodendron Tulipifera</i> L. var. <i>fastigiata</i> Hort.	2.8.38	27.9.38	No effect. All dead.	C, E & G	—	—	—
83	<i>Lonicera pyrenaica</i> L.	13.7.38	8.11.38	No effect. All dead.	C, G	—	—	—
191	<i>Magnolia Dawsoniana</i> Rehd. & Wils.	27.9.38	29.11.38	No effect. Mostly dead.	C, E, G	—	—	—
159	<i>Magnolia Lensei</i> Topf	8.9.38	29.11.38	No effect. Mostly dead.	C, E, G	—	—	—
160	<i>Magnolia liliiflora</i> Desrouss.	8.9.38	29.11.38	Response in number of rooted cuttings.	C, G	E	D for E	E
32	var. <i>nigra</i> Rehd.	5.7.38	27.7.38	No effect. Mostly dead.	C, E, G	—	—	—
	<i>Magnolia salicifolia</i> Maxim.				C, E, G	—	—	—
127	<i>Magnolia salicifolia</i> Maxim.	27.7.38	8.11.38	No effect. All dead.	C, E, G	—	—	—
196	<i>Magnolia Sargentiana</i> Rehd. & Wils.	27.9.38	29.11.38	No effect. Mostly dead.	C, E, G	—	—	—
33	<i>Magnolia Sprengeri</i> Pamp.	5.7.38	27.7.38	No effect. All dead.	C, E, G	—	—	—
31	× <i>Magnolia Soulangeana</i> Soul. var. <i>superba</i> Hort.	5.7.38	27.7.38	Response in number rooted.	C & G	E	S for E	E
73	<i>Mahonia Nervii</i> Fedde	13.7.38	27.9.38	No effect. All dead.	C, G	—	—	—
96	<i>Meliosma dillenifolia</i> Wall.	19.7.38	8.11.38	No effect. All dead.	C, E, G	—	—	—
24	<i>Meliosma Veitchiorum</i> Hemsl.	23.6.38	25.8.38	No effect. All dead.	B, D, F	—	—	—
111	<i>Michelia excelsa</i> Bl.	19.7.38	27.9.38	Response in number rooted.	C & E	G	S for G	G

Key No.	Species.	Date of treatment.	Date of examination.	Remarks.	Treatments showing no response.	Treatments showing response.	Degree of response.	Treatments showing best response.
172	<i>Morus nigra</i> L.	27.9.38	29.11.38	Response in bulk of roots	C, E	G	S for G	G
100	<i>Nothofagus antarctica</i> Oerst.	19.7.38	8.11.38	No effect. All dead.	C, E, G	—	—	—
194	var. <i>utiginosa</i> Reiche <i>Nothofagus betuloides</i> Bl.	27.9.38	8.11.38	No effect. All dead.	B, D, F	—	—	—
13	<i>Nothofagus Dombevi</i> Bl.	21.6.38	13.7.38 27.7.38	No effect on 13.7.38. Response in number of rooted cuttings to G on 27.7.38.	C, E	G	S for G	G
151	<i>Nothofagus Dombevi</i> Bl.	8.9.38	29.11.38	No effect. Mostly dead.	C, E, G	—	—	—
101	<i>Nothofagus obliqua</i> Bl.	19.7.38	8.11.38	No effect. All dead.	C, E, G	—	—	—
42	<i>Nothofagus procera</i> Oerst.	5.7.38	2.8.38	No effect. All dead.	C, G	—	—	—
164	<i>Nothofagus procera</i> Oerst.	8.9.38	8.11.38	No effect. All dead.	C, E, G	—	—	—
30	<i>Nyssa sylvatica</i> Marsh.	23.6.38	8.11.38	No effect. All dead.	B, D, F	—	—	—
41	<i>Osmanthus Delavayi</i> Franch.	27.9.38	29.11.38	No effect. All dead.	C, E, G	—	—	—
119	<i>Oxydendrum arboreum</i> DC.	26.7.38	27.9.38	No effect. Equally rooted.	C, E, G	—	—	—
143	<i>Parrotia persica</i> C. A. Mey.	2.8.38	1.12.38	No effect. All dead.	C, E & G	—	—	—
109	<i>Peraphyllum ramosissimum</i> Nutt.	19.7.38	8.11.38	Response in number of rooted cuttings.	—	C, E & G	{ D for E M " C S " G	E
104	<i>Philadelphus " Glacier "</i>	19.7.38	27.9.38	No effect. All dead.	C, E, G	—	—	—
46	<i>Philadelphus microphyllus</i> Gray	5.7.38	2.8.38	Response in number rooted.	E, G	C	D for C	C
183	<i>Philadelphus microphyllus</i> Gray	27.9.38	20.10.38	Response in number rooted.	E, G	C	M for C	C
					C & G	E	M for E	E

Key No.	Species.	Date of treatment.	Date of examination.	Remarks.	Treatments showing no response.	Treatments showing response.	Degree of response.	Treatments showing best response.
103	<i>Picea Breweriana</i> S. Wats.	19.7.38	27.9.38	No effect. All dead.	C, E, G	—	—	—
68	<i>Pieris</i> 29002 F.	8.7.38	8.11.38	No effect. All dead.	C, G	—	—	—
128	<i>Pieris formosa</i> D. Don var. <i>Forrestii</i> Airy-Shaw	27.7.38	29.11.38	Response in number of rooted cuttings.	C, G	E	M for E	E
138	<i>Poncirus trifoliata</i> Raf. (<i>Aegle sepiaria</i> DC.)	2.8.38	27.9.38	Response in number rooted.	C, G	E	M for E	E
3	<i>Potentilla</i> 28575 F.	21.6.38	5.7.38	Response in number rooted to C. Less to E.	G	C, E	{ D for C S, " E S for C, E & G	C
49	<i>Potentilla fruticosa</i> L. var. "Bowles"	5.7.38	19.7.38	Response in bulk of roots.	—	C, E, G	—	C ≡ E ≡ G
116	<i>Prunus cerasifera</i> Ehrh. 682 L.	26.7.38	1.12.38	No effect. Mostly dead.	C, E & G	—	—	—
9	<i>Prunus subhirtella</i> Miq. var. <i>autumnalis</i> Mak.	21.6.38	13.7.38	No effect. Mostly dead.	C, E & G	—	—	—
132	<i>Prunus subhirtella</i> Miq. var. <i>autumnalis</i> Mak.	27.7.38	8.11.38	No effect. All dead.	C, E, G	—	—	—
26	<i>Prunus triloba</i> Lindl. var. <i>plena</i> Dipp.	23.6.38	13.7.38	Response in number rooted to D. No effect by B & F.	B & F	D	D for D	D
133	<i>Prunus triloba</i> var. <i>plena</i> Dipp.	27.7.38	25.8.38	Response in number rooted.	C	E & G	D for E & G	E ≡ G
110	<i>Purshia tridentata</i> DC.	19.7.38	8.11.38	No effect. All dead.	C, E, G	—	—	—
175	<i>Pyracantha coccinea</i> Roem. var. <i>Lalandii</i> Dipp.	27.9.38	20.10.38	Response in number rooted.	C	E, G	D for E & G	E
158	<i>Quercus Engleriana</i> Seemen	8.9.38	20.10.38	E gave much better callus. Remander dead.	—	E	S for E	E
152	× <i>Quercus kewensis</i> Osborn	8.9.38	8.11.38	No effect. All dead.	C, E, G	—	—	—
35	<i>Raphiolepis umbellata</i> Mak.	5.7.38	2.8.38	Response in number rooted.	C & G	E	D for E	E

Key No.	Species.	Date of treatment.	Date of examination.	Remarks.	Treatments showing no response.	Treatments showing response.	Degree of response.	Treatments showing best response.
193	<i>Raphiolepis umbellata</i> Mak.	27.9.38	20.10.38	Response in number rooted.	C	E & G	{ D for E M " G	E
12	× <i>Rhododendron altaclarens</i> Lindl.	21.6.38	27.7.38	No effect. All rooted.	C, E, G	—	—	—
10	<i>Rhododendron</i> "Davies II."	21.6.38	27.7.38	No effect. All dead.	C, E, G	—	—	—
11	<i>Rhododendron</i> "Dr. Chas. Bauman"	21.6.38	27.7.38	No effect. Mostly dead.	C, E & G	—	—	—
7	<i>Rhododendron</i> "Flamboyant"	21.6.38	27.7.38	No effect. Mostly dead.	C, E, G	—	—	—
57	<i>Rhododendron floccigerum</i> Franch.	8.7.38	8.11.38	No effect. All dead.	C, G	—	—	—
44	<i>Rhododendron hippophaeoides</i> I. B. Balf. & W. W. Sm. var. <i>roseum</i> Hort.	6.7.38	8.11.38	No effect. All dead.	C, E, G	—	—	—
15	× <i>Rhododendron impeanum</i> Hort.	23.6.38	27.7.38	No effect. Mostly dead.	C, E & G	—	—	—
117	× <i>Rhododendron impeanum</i> Hort.	26.7.38	8.11.38	No effect. All dead.	C, E & G	—	—	—
112	<i>Rhododendron indicum</i> Sweet var. <i>balsamiflorum</i> Nichols.	26.7.38	8.11.38	No effect. All dead.	C, E, G	—	—	—
115	<i>Rhododendron indicum</i> Sweet var. <i>balsamiflorum</i> Nichols.	26.7.38	8.11.38	No effect. All dead.	C, E, G	—	—	—
65	<i>Rhododendron mucronulatum</i> Turcz.	8.7.38	29.9.38	No effect. All dead.	C, G	—	—	—
2	<i>Rhododendron occidentale</i> A. Gray, Orange Red	21.6.38	27.7.38	Response in number rooted.	C & G	E	S for E	E
8	<i>Rhododendron occidentale</i> A. Gray, Pink	21.6.38	27.7.38	No effect. All dead.	C, E, G	—	—	—
1	<i>Rhododendron occidentale</i> A. Gray, White	21.6.38	27.7.38	Response in number rooted.	C & G	E	M for E	E
47	× <i>Rhododendron praecox</i> Carr.	5.7.38	29.11.38	Response in number rooted.	C	E, G	D for E & G	G

Key No.	Species.	Date of treatment.	Date of examination.	Remarks.	LITERATURE showing no response.	Treatments showing response.	Degree of response.	LITERATURE showing best response.
58	<i>Rhododendron russatum</i> I.B. Balf. & Forrest var. <i>roscum</i> Hort. <i>Rhus</i> see <i>Cotinus</i> .	8.7.38	8.11.38	No effect. All dead.	C, G	—	—	—
129	<i>Rhynchospermum</i> see <i>Trachelospermum</i> .	27.7.38	25.8.38	No effect. Equally rooted.	C, E & G	—	—	—
98	<i>Ribes sanguineum</i> Pursh "King Edward VII."	19.7.38	2.8.38	Response in number rooted.	—	C, E & G	{ D for E & G M " C	E
108	Rose. "Crimson Conquest"	19.7.38	25.8.38	No effect. All equally rooted.	C, E, G	—	—	—
192	Rose. "Golden Rambler"	27.9.38	20.10.38	No effect. All dead.	C, E, G	—	—	—
131	<i>Santolina Chamaecyparissus</i> L. var. <i>nana</i> Hort.	27.7.38	29.11.38	Response in number rooted.	G	C & E	S for C & E	C & E
4	<i>Schizophragma hydrangeoides</i> Sieb. & Zucc.	21.6.38	13.7.38	Response in number and bulk of root E & G, bulk only C.	—	C, E & G	{ D for E M " G S " C	E
134	<i>Sinowilsonia Henryi</i> Hemsl.	2.8.38	27.9.38	No effect. All dead.	C, E, G	—	—	—
126	× <i>Spiraea arguta</i> Zabel	27.7.38	8.11.38	No effect. All dead.	C, E, G	—	—	—
161	× <i>Spiraea arguta</i> Zabel	8.9.38	27.9.38	Response in number rooted.	—	C, E, G	M for C & E S for G	C ≡ E
162	<i>Spiraea prunifolia</i> Sieb. & Zucc. var. <i>plena</i> Schneid.	8.9.38	27.9.38	Response in number rooted.	G	C & E	S for C & E	C ≡ E
187	<i>Spiraea prunifolia</i> Sieb. & Zucc. var. <i>plena</i> Schneid.	27.9.38	20.10.38	Response in number rooted.	E	C & G	S for C & G	C ≡ G
16	<i>Stachyurus chinensis</i> Franch.	23.6.38	27.7.38	No effect. Mostly dead.	C, E & G	—	—	—

Key No.	Species.	Date of treatment.	Date of examination.	Remarks.	Treatments showing no response.	Treatments showing response.	Degree of response.	Treatments showing best response.
121	<i>Stachyurus chinensis</i> Franch.	26.7.38	27.9.38	No effect.	C, E & G	—	—	—
6	<i>Stewartia koreana</i> Nakai	21.6.38	19.7.38	Response in number rooted to E.	C, G	E	M for E	E
120	<i>Stewartia koreana</i> Nakai	26.7.38	8.11.38	No effect. All dead.	C, E, G	—	—	—
28	<i>Stewartia Malachodendron</i> L.	23.6.38	27.7.38	Response in number rooted.	B	D & F	S for D & F	F
59	<i>Syrax Hemsleyana</i> Diels	8.7.38	29.11.38	No effect. All dead.	C, E, G	—	—	—
176	<i>Syrax philadelphoides</i> Perkins	27.9.38	29.11.38	Response in number rooted and bulk of roots.	C, E	G	D for G	G
82	<i>Teucrium fruticans</i> L.	13.7.38	2.8.38	Response in number rooted.	—	C, G	D for C & G	G
38	<i>Trachelospermum jasminoides</i> Lem. (<i>Rhynchospermum jasminoides</i> Lindl.)	5.7.38	2.8.38	Response in number rooted.	—	C, E & G	{ D for G M " E S " C	G
165	<i>Tsuga Jeffreyi</i> Henry	8.9.38	20.10.38	No effect. All dead.	C, E, G	—	—	—
145	<i>Ulex europaeus</i> L. var. <i>plenus</i> Schneid.	2.8.38	8.11.38	No effect. All dead.	C, E, G	—	—	—
86	<i>Viburnum grandiflorum</i> Wall.	13.7.38	25.8.38	Response in number rooted.	—	C, G	{ D for C S " G	C
50	<i>Viburnum tomentosum</i> Thunb. var. <i>Mariesii</i> Veitch	5.7.38	19.7.38	Response in number rooted and in bulk of root.	G	C, E	D for C & E	C & E

Of the 168 species tested, approximately 45 per cent. have responded to one or other of the treatments. These include the following genera and species which are to be found in the list of plants which are difficult to propagate by means of cuttings which was prepared by the "Plant Hormone Committee" and recently published (Gard. Chron. 103, 433 : 1938). *Arctostaphylos Manzanita*, *Betula nana*, *Cornus Nuttallii*, *Cotinus Coggygia* (*Rhus Cotinus*), *Dipelta floribunda*, *Fothergilla* sp., *Garrya elliptica*, *Genista horrida*, *Magnolia Soulangeana* var., *Nothofagus* sp., *Philadelphus microphyllum*, *Parrottia persica*, *Poncirus trifoliata* (*Aegle sepiaria*), *Quercus Engleriana*, *Spiraea arguta*, *Stewartia* spp.

The following species, which were also included in the same list, failed to respond :

Acantholimon glumaceus, *Carrierea calycina*, *Cotinus americanus* (*Rhus cotinoides*), *Cytisus Battandieri*, *Erica arborea* var., *E. australis* var., *Feijoa Sellowiana*, *Kalmia latifolia*, *Lonicera pyrenaica*, *Meliosma* sp., *Nyssa* sp., *Osmanthus Delavayi*, *Tsuga* sp.

Besides the above experiments, tests were also made during January, February and March of 1938 on a number of herbaceous plants, using beta-indolylacetic acid at concentrations of 1 : 20,000 or 1 : 40,000. Beneficial results at the lower of these concentrations were obtained with the following species :

Artemisia arborescens L., *Helichrysum rupestre* DC., *Helichrysum italicum* G. Don var. *microphyllum* Cambess. *Senecio leucostachys* Baker, and *Sutera grandiflora* Hiern. It was possible to work with larger numbers of cuttings per treatment with these species than with the shrubby ones already described. For instance 90 cuttings of *Senecio leucostachys* were treated and 40-60 of each of the others. Working with these larger numbers showed that the results were not always entirely consistent, even when apparently similar batches of cuttings were given the same treatment but inserted in different pots of the same sand in the same propagating frame. This was shown especially by *Helichrysum italicum* var. *microphyllum*, 60 cuttings of which were treated in beta-indolylacetic acid and there were 60 controls which were placed in water. As a matter of convenience, however, the cuttings were inserted in pots of sand containing thirty each so that there were two pots of treated and two of untreated cuttings. When the cuttings were examined the results were as follows :

	Lot 1.	Lot 2.
Treated ...	29 well rooted	28 well rooted.
Controls ...	24 " "	5 " "

Thus, although a beneficial result was obtained in both cases, the superiority of the treated over the control cuttings was very much greater in one than in the other. No satisfactory explanation for this discrepancy can be suggested, but it seems to emphasize the importance in propagation of other factors besides the "growth-substances" themselves.

About 80 varieties of chrysanthemum were treated with beta-indolylacetic acid at a concentration of 1 : 40,000, and compared with controls. In most instances it was possible to deal with only 4 to 6 cuttings of each variety per treatment, so that there was difficulty in assessing the value of the results obtained. Generally speaking, however, it may be said that there was no very outstanding difference between the treated cuttings and the controls, although in many instances a slight benefit was recorded, and with a limited number of varieties the benefit was much more definite. Variations in the responses of different varieties were also found to exist when larger numbers of cuttings were available. For instance when tests were made with beta-indolylacetic acid at a concentration of 1 : 20,000 on 43 "Coacher's Bronze" and 64 "Model of Perfection" there was no appreciable difference between the treated cuttings and the controls. The variety "Lillie," on the other hand, of which there were 54 treated and untreated respectively, took root after treatment very much more effectively and rapidly than the controls. The results of these rather limited tests on chrysanthemums seem to suggest that there is plenty of scope for further experiments on different cultivated varieties of this genus in order to obtain optimum results.

Somewhat inconclusive results were obtained with a number of *Dahlia* varieties, many of which rooted very easily without any treatment.

While the results recorded in this paper were obtained under the conditions specified it is, nevertheless, quite possible that the results might have been quite different under certain circumstances. For instance, no record has been kept of such variable factors as the age of the cutting or parent plant, or of the part of the plant from which the cutting was taken. Whether the parent plant was in a starved or well nourished condition might have a considerable influence on the nature of the result obtained. The temperature, humidity and light intensity during the treatment of the cutting might also partially control the response. The results to date, however, indicate that "growth-substances" are definitely of importance for propagating plants by cuttings, and they may become widely used for crops of economic importance. There is evidence with plants such as coffee, rubber, etc., that they may eventually be used on a commercial scale, but it is only by trial of the different materials at a range of concentrations for each particular species that reliable data will be obtained. From the results given in this paper it may be concluded that reasonable evidence exists in favour of undertaking experiments of this kind.

SUMMARY.

The results recorded in this paper give details of the effects of treatment with solutions of synthetic plant growth-substances upon the rooting of a large number of trees, shrubs, and herbaceous plants.

The authors are very grateful for the invaluable assistance in making these experiments which has been afforded by members of the Gardens staff, without whose co-operation it would have been quite impossible to carry out this work.

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XLV—CONTRIBUTIONS TO THE FLORA OF SIAM. ADDITAMENTUM LII.*

Gongronema filipes Kerr (Asclepiadaceae-Marsdenieae); species inter congeneres inflorescentia umbelliformi pendula, corona conspicua distincta.

Suffrutex volubilis, innovationibus minute fusco-puberulis, cito glabrescens; caulis gracilis, teres, internodiis 7–14 cm. longis. *Folia* oblongo-ovata, basi rotundata vel leviter cordata, apice sat subito et longe acuteque acuminata, 8.4–11.5 cm. longa, 2.8–5 cm. lata, chartacea, glabra, siccitate supra olivacea, subtus pallide fulvo-cinerea obscure punctata et nervis fuscis reticulata, costa nervisque supra impressis subtus prominentibus, nervis lateralibus 3–4 paribus angulo 40°–45° e costa orientibus et 2–5 mm. a margine cum nervo undulato intramarginali conjunctis, rete venularum subconspicuo; petiolus gracilis, supra canaliculatus et apice ad laminae junctionem glandularum fasciculo instructus, minute puberulus. *Inflorescentia* multiflora, axillaris, umbelliformis, pedunculata, pendula; pedunculus gracilis, minute puberulus, 1.2–7 cm. longus; bracteae minutae, puberulae; pedicelli graciles, puberuli, 5–7 mm. longi. *Calyx* 5-lobatus, extra sparse puberulus, intus basi glandulis 5 minutis instructus; lobi late ovati, obtusi, circiter 1.5 mm. longi et lati. *Corolla* suburceolata, intus extraque glabra, lobis valvatis; tubus 6 mm. longus, medio parum inflatus, fauce intus leviter incrassatus; lobi subcarnosi, patuli, oblongi, obtusi, margine revoluti, 4 mm. longi et 2 mm. lati, siccitate intus nigro-brunnei extra pallide fusi. *Coronae squamae* basi tubi staminei adnatae, circiter 1 mm. longae, basi bicarinatae, apice acutae, incurvae. *Stamina* 3 mm. longa, appendicibus membranaceis 1.5 mm. longis stigma obtegentibus inclusis; pollinia erecta, caudiculis horizontalibus parum longiora; corpusculum ellipticum, pollinibus parum brevius. *Stigmatis caput* sat longe productum, apice minute bilobum. *Folliculi* ignoti.

Chiengmai, Doi Lang Ka, Put 3768 (*type*). Doi Angka, 1490 m., evergreen forest, Winit 1332.

The Angka plant differs from the type in that the nerves beneath are nearly concolorous with the leaf surface.

Lygisma flavum (Ridl.) Kerr, comb. nov. *Gymnema flava* Ridley in Journ. Str. Br. Roy. As. Soc. 57, 68 (1911). *Tylophora Ridleyi* Henderson in Gard. Bull. Straits Settlements, 7, 111 (1933).

* Continued from K.B. 1939, 150.

PATTANI. Betong, c. 200 m., in scrub, Kerr 7488!

An examination of the type number of this species shows that it is a *Lygisma*. As far as the flowers are concerned it is almost an exact match of *Lygisma angustifolium* Hook. f. as depicted in Hook. Icon. Pl. t. 1423. The leaves of the two plants are, however, quite different.

Lygisma inflexum (Cost.) Kerr, comb. nov. *Pilostigma inflexum* Cost. in Lec. Fl. Gén. Ind.-Chin. 4, 73, fig. 12 (1912).

PAYAP. Ban Na Gorge, 150 m., open grassy spots, Kerr 2177, 3041.

Thanks to the courtesy of Professor H. Humbert, Director of the Phanerogamic Division of the Natural History Museum, Paris, the writer has been enabled to examine the collection of Thorel on which Costantin founded his monotypic genus *Pilostigma*. In its floral characters *Pilostigma* agrees with J. D. Hooker's genus *Lygisma*, to which, accordingly, it is here proposed to reduce it.

As fruit and seeds do not seem to have been described, either under *Lygisma* or *Pilostigma*, the following description has been drawn up from fruit on Kerr 3041: *Folliculus* oblongus, subsuccosus, laevis, pruinosis, apicem versus parum attenuatus, circiter 6 cm. longus, basi 1 cm. diametro; semina complanata, ovalia, 9 mm. longa, 7 mm. lata, apice coma alba circiter 16 mm. longa praedita.

Lygisma nervosum Kerr (Asclepiadaceae-Marsdenieae); species *L. inflexo* (Cost.) Kerr affinis, foliis brevius petiolatis, inflorescentia multo brevior, inter alia, distinguenda.

Planta volubilis; rami graciles, dense breviterque crispato-pubescentes, internodiis saepius 6–8 cm. longis. *Folia* ovata, basi rotundata vel parum cordata, apice breviter acuminata, 3.8–8 cm. longa, 2.4–6 cm. lata, chartacea, supra pilis brevibus parce pubescentia, subtus densius crispato-pubescentia praesertim ad costam nervosque, costa nervisque supra subplanis vel leviter impressis subtus cum nervis transversis prominentibus, nervis lateralibus 3–5 paribus acute ascendentibus; petiolus saepius 4–10 mm. longus, dense pubescens, supra alte canaliculatus. *Inflorescentia* axillaris, cymosa, saepius folio dimidio brevior, omnino dense pubescens; pedunculus communis 6–8 mm. longus; pedicelli circiter 4 mm. longi. *Calyx* extra pubescens, intus basi glandulis 5 paribus praeditus, 5-partitus; lobi ovati, obtusi, 1.5 mm. longi. *Corolla* subrotata, 5-lobata, extra glaber; tubus 1.25 mm. longus, intus minute villosus; lobi lineares, circiter 3.5 mm. longi, 1 mm. lati, basin versus minute villosus. *Gynostegium* 1 mm. altum; coronae squamae minutae, antheris subaequilongae; pollinia corpusculo oblongo paullo longiora, fusiformia, fere horizontalia; stigmatis caput pentagonale, vertice leviter convexum et minute apiculatum. *Folliculi* immaturi ellipsoideales, subsuccosi, pruinosi, circiter 2.8 cm. longi.

Saraburi, Muak Lek, Put 1874.

Heterostemma gracile Kerr (Asclepiadaceae-Marsdenieae); inter congeneres foliis membranaceis caudato-acuminatis, coronae squamis stipitatis tubo corollae brevioribus distinguendum.

Frutex volubilis; rami graciles, lineis pilosis duabus ornati, juventute insuper minute puberuli, nodis leviter incrassatis interdum ciliatis, internodiis 10–15 cm. longis. *Folia* elliptica vel ovato-elliptica, basi cuneata, apice acute caudato-acuminata, usque 11 cm. longa et 6.3 cm. lata, plerumque 6–8 cm. longa et 2.5–4 cm. lata, membranacea, glabra nisi supra secus costam nervosque leviter crispatis pubescentia, siccitate supra olivacea, subtus pallidiora, costa nervisque lateralibus supra subplanis subtus prominulis, rete venularum supra sub lente manifesto subtus obscuro, nervis lateralibus 3–4 paribus, imo jugo prope basin oriente, marginem versus valde arcuatis anastomosantibusque; petiolus 2–5 cm. longus, gracilis, striatus, supra canaliculatus, canaliculi margine pubescens, supra ad laminae junctionem glanduliferus. *Flores* 3–7 in fasciculos axillares dispositi; bracteae cito deciduae; pedicelli filiformes, puberuli, 1.5–2 cm. longi. *Calyx* alte 5-partitus, extra puberulus, intus basi glanduliferus; lobi ovato-oblongi, apice obtusi, ciliati, margine hyalini, circiter 1 mm. longi. *Corolla* rotata, lutea, glabra, 10–12 mm. diametro; tubus explanatus, circiter 2.5 mm. longi; lobi late triangulares, circiter 3.5 mm. longi. *Coronae* lobi plani, stellatim patentes, oblongo-subhastati, basi breviter stipitati incrassatique, apice obtusi, circiter 1.7 mm. longi, sinus inter corollae lobos haud attingentes. *Gynostegium* brevissimum; antherae parvae, apice inflexae, appendicibus margine hyalinis; pollinia sessilia, ventricosa, margine interno recta hyalina apiculata; corpusculum subrhomboideum. *Stigmatis* caput subplanum, inclusum. *Folliculi* non visi.

Doi Chiengdao, circiter 1400 m., in scrub, Kerr 6535.

Heterostemma succosum Kerr (Asclepiadaceae-Marsdenieae); species *H. oblongifolio* Cost. affinis, foliis majoribus siccitate multo tenuioribus distinguitur.

Frutex scandens; rami sinistrorsum volubiles, minute puberuli et lineis pilosis bifariis praediti, siccitate fistulosi, nodis leviter incrassatis, internodiis circiter 12–18 cm. longis. *Folia* oblongo-ovata, basi rotundata, apice breviter acuminata mucronata, 11–22.7 cm. longa, 4.6–9.8 cm. lata, vivo succosa (ex Garrett), sicco membranacea, utrinsecus pilis minutis parce inspersa, costa nervisque lateralibus supra impressis subtus prominulis, subtus basin versus costa etiam leviter alata, nervis lateralibus 4–5 paribus angulo 35°–45° e costa ascendentibus; petiolus 2.6–3.5 cm. longus, anguste canaliculatus, minute puberulus, supra ad laminae junctionem glanduliferus. *Inflorescentia* axillaris, cymosa, pauciflora, pedunculo 3–6 mm. longo suffulta; bracteae cito deciduae; pedicelli usque 16 mm. longi, minute puberuli. *Calyx* alte 5-partitus, extra puberulus, intus basi glanduliferus; lobi oblongo-ovati, apice obtusi, circiter 2 mm. longi, 1 mm. lati. *Corolla* rotata, flava et

basin versus brunneo-maculata (ex Garrett), supra glabra subtus minute puberula, 17 mm. diametro; tubus explanatus, 3.5 mm. longus; lobi triangulares, 5 mm. longi, basi 4 mm. lati. *Coronae* squamae curvatae, parte basali suberectae, parte distali radiatopatentes, basi incrassatae, apice rotundatae, circiter 2 mm. longae. *Antherae* minutae, incurvae; pollinia sessilia, subrhomboidea, margine interno recta pellucida apiculata; corpusculum oblongum. *Carpella* glabra, cum stigmate circiter 1.75 mm. alta; stigmatis caput pentagonale, planum. *Folliculi* ignoti.

Chiengrai, Ban Tam Ta Kaw, circiter 440 metres, Garrett 191.

Dittoceras Garrettii Kerr (Asclepiadaceae-Marsdenieae); species *D. Andersonii* Hook. f. affinis, foliis majoribus oblongis apiculatis differt.

Frutex volubilis; rami robusti, siccitate fistulosi, sat dense crispatis cinnamomeo-pubescentes, internodiis 14–23 cm. longis. *Folia* oblonga vel ovato-oblonga, basi rotundata vel late cuneata, apice rotundata apiculata, 9–14 cm. longa, 5.3–8.5 cm. lata, papyracea, siccitate supra olivacea subtus flavo-brunnea, supra subtusque pilis brevibus basi bulbosis sat copiose induta, costa nervisque supra prominulis subtus subplanis, costa subtus basin versus parum alata, nervis lateralibus utrinque 4–5, marginem versus valde arcuatis anastomosantibusque; petiolus striatus, supra canaliculatus, apice glanduliferus, pubescens, 4–5.5 cm. longus. *Flores* 1–3 in fasciculos axillares dispositi; pedicelli graciles, 3–4.5 cm. longi. *Calyx* extra dense pubescens, intus glaber basi glanduliferus; lobi oblongi, apice obtusi, circiter 4 mm. longi, 2 mm. lati. *Corolla* rotata, lutea (ex Garrett), supra glaber, subtus pilis particuloratis dense fulvo-pubescent, 35 mm. diametro; tubus explanatus, circiter 7 mm. longus; lobi triangulares, circiter 11 mm. longi, basi 8 mm. lati. *Coronae squamae* stellatim patentes, apice breviter acuminatae, medio cornu parvo recurvo praeditae, basi contractae, 2.5 mm. longae, nigro-brunneae margine fulvae (ex Garrett). *Antherae* minutae, apice incurvae, margine pellucidae; pollinia sessilia, ventricosa, margine interna recta hyalina apiculata, corpusculo oblongo. *Carpella* brunneo-villosa, cum stigmate circiter 2.5 mm. alta; stigmatis caput vertice leviter convexum. *Folliculi* non visi.

Doi Angka, circiter 1740 metres, in evergreen, Garrett 534.

Dittoceras maculatum Kerr (Asclepiadaceae-Marsdenieae); a *D. Andersonii* Hook. f. floribus minoribus differt.

Frutex volubilis; ramuli striati pilis fulvis patentibus induti, nodis leviter incrassatis, internodiis 8–15 cm. longis. *Folia* ovata vel oblongo-ovata, basi leviter cordata, apice acute acuminata, 7.2 cm. longa et 4.2 cm. lata usque 13 cm. longa et 7.9 cm. lata, chartacea, siccitate supra viridi-fusca, subtus fulvo-cinerea, multo pallidiora, supra pilis brevibus adpressis copiose inspersa, subtus pilis fulvis basi bulbosis induta, costa nervisque lateralibus supra subtusque prominulis, subtus valde conspicuis, nervis lateralibus 4–5 paribus

arcuato-ascendentibus et sat longe a margine anastomosantibus; petiolus 2-3 cm. longus, sulcatus, pilosus, supra plano-convexus, apice glanduliferus. *Flores* in fasciculos axillares paucifloros dispositi; bracteae minutae; pedicelli 10-13 mm. longi, tomentosi. *Calyx* alte 5-partitus, extra flavo-tomentosus, intus basi glanduliferus; lobi oblongo-ovati, circiter 3 mm. longi, 1 mm. lati. *Corolla* rotata, lutea, purpureo-maculata, circiter 19 mm. diametro, extra pilis particoloratis sat dense fulvo-tomentosa, intus glabra; tubus explanatus, circiter 4 mm. longus; lobi triangulares, 6 mm. longi, basi 5-5 mm. lati. *Coronae squamae* radiato-patentes, oblongae, basi breviter stipitatae et callo obscure trilobato praeditae, apice obtusae. *Antherae* minutae, incurvae; pollinia sessilia, ventricosa, margine interno recta pellucida et apiculata, corpusculo oblongo. *Carpella* villosa, cum stigmate 2 mm. alta; stigmatis caput pentagonale, planum, inclusum. *Folliculi* haud visi.

Dan Sai, Pu Lom Lo, circiter 1400 m., in bamboo forest, *Kerr* 5776.

Though neither of the two species here assigned to *Dittoceras* have fruit, they seem to be rightly placed there on account of their comparatively large flowers and, more particularly, the character of the tomentum on the exterior of the corolla and the villous ovary. In both the Siamese species this tomentum is fairly dense and composed of hairs which show a reddish beading on a clear ground. On re-examining the type sheet of *D. Andersonii* the tomentum on the corolla was found to be similar to that of the two species described here, and the ovary was seen to be distinctly villous, a character not mentioned in the original description.

***Hoya erythrostemma* Kerr** (Asclepiadaceae-Marsdenieae); species *H. ellipticae* Hook. f. affinis, foliis majoribus acuminatis, corolla villosa, inter alia, differt.

Frutex volubilis; rami subquadrati, sat graciles, dispersim radicanes. *Folia* elliptica, basi acuta, apice leviter acuminata acuta, usque 10 cm. longa, 4 cm. lata, siccitate papyracea, glabra, costa cum nervis lateralibus et transversis utraque pagina praecipue supra prominulis, nervis lateralibus 5-6 paribus e costa angulo 60° abeuntibus et nervo marginali a margine 3-6 mm. distante conjunctis; petiolus sat robustus, glaber, 3-6 mm. longus, supra angustissime canaliculatus. *Inflorescentia* lateralis, umbellata; pedunculus glaber, circiter 14 mm. longus; pedicelli graciles, glabri, 12-14 mm. longi. *Flores* albi, corona sanguinea (ex *Kloss*), explanati circiter 10 mm. diametro. *Calyx* 5-partitus; lobi ovati, acuti, glabri, margine minute erosi, 1-5 mm. longi. *Corolla* 5-lobata, subrotata, sub anthesin reflexa, supra praecipue ad marginem et lobos sat longe villosa; tubus explanatus, circiter 2 mm. longus; lobi late ovati, breviter acuminati, circiter 3 mm. longi, 5 mm. lati. *Coronae segmenta* cartilaginea, nitentia, lateraliter valde compressa, 3 mm. longa, basi 1-75 mm. alta, apice exteriori acuta, apice interiore antheris paulo breviora. *Stigmatis caput* umbelliforme, apice umbonatum. *Folliculi* desunt.

Tasan, *Kloss*, 6909.

Parkinson 1680, from Thebyu Chaung, South Tenasserim, also belongs here. It differs from the type in its longer petioles, which are up to 2 cm. in length.

***Hoya graveolens* Kerr** (Asclepiadaceae-Marsdenieae); *H. ovalifoliae* Wight et Arn. affinis, foliis crassioribus, nervis obscuris distinguenda.

Suffrutex volubilis; rami subquadrati, cortice lenticellis rotundis elevatis asperso obtecti. *Folia* oblongo-elliptica vel oblongo-oblongata, basi late cuneata vel rotundata, apice breviter acuminata, margine plana, 5-8-3 cm. longa, 2-3-8 cm. lata, coriacea, glabra, costa supra impressa subtus subplana, nervis lateralibus 4-5 paribus angulo 60° ascendentibus saepius obscuris rarius aegre spectabilibus; petiolus 4-6 mm. longus, crassus, supra concavus, glaber. *Inflorescentia* lateralis, umbelliformis, pedunculata, 8-12-flora; pedunculus sat robustus, 1-8-3-8 cm. longus, glaber; rhachis crassa, accrescens, usque 5 cm. longa; pedicelli graciles, glabri, vel apicem versus pilis paucis obsessi, 1-4-1-8 cm. longi. *Flores* graveolentes. *Calyx* 5-lobatus, extra parce hirsutus, intus glandulis minutis praeditus; lobi anguste ovati, ciliati, circiter 2 mm. longi, basi 1 mm. lati. *Corolla* alba, rotata, extra glabra, intus puberula; tubus explanatus, 3 mm. longus; lobi ovati, acuminati, 5-5 mm. longi, basin versus 5-5 mm. lati. *Coronae segmenta* rosea, distaliter paulum surrecta, lateraliter leviter compressa, dorso convexa, 3 mm. longa, angulo externo obtusa, angulo interno in dentem acutum erectum producta. *Antherae* appendix coronae aequilonga; pollinia oblonga, corpusculo apice acuto multo longiora. *Stigmatis caput* disciforme, apice apiculatum, apiculo minute bifido. *Folliculi* 8-10 cm. longi, apicem versus sensim attenuati, siccitate leviter striati, vivo flavi nigro-purpureo-maculati; semina circiter 5-5 mm. longa, 1 mm. lata, compressa, minute punctata, apice comosa, basin versus pilis longis paucis praedita.

Sriracha, climbing on bushes near sea, flowers with an offensive smell, *Kerr* 4245 (type); Sriracha, on trees by shore, *Kerr* 4138.

The description of the fruit and seeds has been drawn up from *Kerr* 4138.

***Hoya oreogena* Kerr** (Asclepiadaceae-Marsdenieae); species *H. carnosae* R. Br. valde affinis, foliis minoribus ellipticis, coronae segmentis crassioribus distinguenda.

Suffrutex volubilis; rami subquadrati, sat graciles, juventute pilis brevibus patenti-deflexis basi bulbosis inspersi. *Folia* elliptica, basi cuneata vel anguste leviterque auriculata, apice subobtusata, margine plus minusve reflexa, 5-7 cm. longa, 1-8-2-9 cm. lata, coriacea, supra glabra, subtus pilis brevibus fulvis sat copiose induta, siccitate costa supra obscura subtus leviter prominula basin versus anguste alata, nervis lateralibus utrinque obscuris; petiolus

crassus, verrucosus, pilosus, 5–8 mm. longus. *Inflorescentia* lateralis, umbellata, multiflora; pedunculus sat robustus, pilosus, 5–11 mm. longus; pedicelli graciles, pilis crispis paucis inspersi, 15–24 mm. longi. *Calyx* alte 5-fidus, extra crispatis pubescens, intus glandulis minutis praeditus; lobi oblongi, obtusi, circiter 2.5 mm. longi. *Corolla* pallide rosea, rotata, extra glabra, intus loborum apicibus exceptis dense villosa, explanata circiter 18 mm. diametro; tubus circiter 4 mm. longus; lobi late ovati, acuti, margine et praesertim apice reflexi, 5 mm. longi, basi 5.5 mm. lati. *Coronae segmenta* radiato-patentia, nitida, anguste lanceolata, supra convexa, circiter 4 mm. longa, angulo externo acuto, angulo interno leviter sursum flexo acuto. *Antherae* appendix membranacea, acuta, coronam excedens; pollinia circiter 1 mm. longa; corpusculum panduriforme, 0.5 mm. longum. *Stigmatis caput* conicum, apice umbonatum; carpella glabra, circiter 2 mm. alta. *Folliculi* desunt.

Prachuap, Kao Luang, circiter 1200 m., *Kerr* 10857.

***Hoya pachyclada* Kerr** (Asclepiadaceae-Marsdenieae); *H. diversifoliae* Blume affinis, sed foliis floribusque majoribus, coronae segmentis subacutis recedit.

Frutex epiphyticus; rami robusti, subsuccosi, juventute minute fusco-puberuli, 6–8 mm. diametro. *Folia* obovata, basi cuneata vel subrotundata, apice brevissime obtuseque acuminata, 7.8–10.5 cm. longa, 5.2–6 cm. lata, crasse coriacea, utraque pagina pilis paucis brevibus dispersa, siccitate costa nervisque utrinque obscuris sed per lucem transmissum visis manifestis, nervis lateralibus 2 paribus a basi (vel fere ad basin) orientibus atque acute arcuato-ascendentibus fere apicem attingentibus; petiolus crassus, supra concavus, minute puberulus, 6–12 mm. longus. *Inflorescentia* lateralis vel subterminalis, umbellata, pedunculata, multiflora; pedunculus robustus, minute puberulus, 1.5–3.5 cm. longus; pedicelli graciles, puberuli, 2–3 cm. longi. *Calyx* alte 5-fidus, extra minute puberulus; lobi ovati, obtusi, minute ciliati, circiter 2 mm. longi. *Corolla* rotata, explanata circiter 17 mm. diametro, extra glabra, intus minute velutina; tubus circiter 2 mm. longus; lobi ovati, acuti, 7 mm. longi, basi 5 mm. lati. *Coronae segmenta* radiato-patentia, elliptica, circiter 4 mm. longa, dorso parum concavo medio umbonato, angulo externo subacuto vel leviter bifido, angulo interno brevi obtuso antherae appendice brevior. *Corpusculum* apice subulatum, pollinibus multo brevius. *Stigmatis caput* membranaceum, alte 5-lobatum, apice apiculatum, apiculo minute bifido. *Folliculi* desunt.

Kawnken, Pu Wieng, circiter 300 m., on trees in deciduous *Pentacme-Shorea* forest, *Kerr* 20007.

In another collection of this species (Kanburi, Sisawat, *Kerr* 10221) the peduncles are very much longer than in the type, reaching a length of 12 cm.

***Hoya rigida* Kerr** (Asclepiadaceae-Marsdenieae); species a congeneribus (§ *Euhoyae*) foliis rigidis 5-plinerviis, calycis lobis lineari-lanceolatis distinguenda.

Suffrutex volubilis, glaber; rami sat robusti, teretes vel subquadrati. *Folia* ovata vel ovato-elliptica, basi rotundata vel late cuneata, apice longe acuteque acuminata, margine anguste revoluta, 12–14 cm. longa, 4.5–6.3 cm. lata, siccitate rigide coriacea, durissima, supra nigro-brunnea, subtus fusca, utrinque opaca, e basi 5-plinervia, nervis utrinque plano-convexis, nervis transversis interdum prominulis; petiolus crassissimus, supra plano-convexus, 1.2–2 cm. longis. *Inflorescentia* lateralis, 25-flora vel ultra, umbelliformis, pedunculata; pedunculus robustus, circiter 2 cm. longus; rhachis usque 1.5 cm. producta, vel ultra; pedicelli graciles, glabri, ad 2.7 cm. longi. *Calyx* alte 5-fidus, glaber, extra basin versus minute papillosus, intus minute glanduliferus; lobi lineari-lanceolati, subacuti, 6 mm. longi, basi 1.5 mm. lati. *Corolla* rotata, interdum parum reflexa, explanata circiter 20 mm. diametro, extra glabra, intus velutina; tubus explanatus 3 mm. longus; lobi lanceolati, acuti, explanati circiter 8 mm. longi, 7 mm. lati. *Coronae segmenta* radiato-patentia, utrinque acuta, dorso leviter concava medioque parum carinata. *Antherae* appendix coronam leviter superans; pollinia oblonga, circiter 1 mm. longa, corpusculo rhomboideo multo longiora. *Stigmatis caput* membranaceum, 5-lobatum, apice minute bifidum; carpella glabra, 2 mm. alta. *Folliculi* ignoti.

Krat, Kao Kuap, *Put* 3034.

***Dischidia calva* Kerr** (Asclepiadaceae-Marsdenieae); a *D. Scortechinii* King et Gamble, cui affinis, foliis minoribus, corollae lobis intus glabris nec villosis distinguitur.

Herba glabra; caulis gracilis, exsiccatus longitudinaliter rugosus. *Folia* elliptica vel lanceolato-elliptica, basi et apice acuta, 2–2.8 cm. longa, 0.6–1.1 cm. lata, costa nervisque obscuris; petiolus crassus, 2–4 mm. longus. *Inflorescentia* axillaris, subsessilis vel pedunculata; pedunculus usque 3 cm. longus; pedicelli circiter 1 mm. longi. *Calyx* submembranaceus, lobis ovatis obtusis 0.75 mm. longis. *Corolla* urceolata, alba; tubus circiter 1.8 mm. longus, intus extraque glaber; lobi anguste triangulares, intus incrassati, circiter 0.8 mm. longi, intus extraque glabri. *Coronae segmenta* late stipitata, semilunata, apice haud emarginata, brachiis brevibus, gynostegio breviora. *Antherarum* appendices appendiculatae; pollinia caudiculis parum longiora, corpusculo multo longiora. *Stigmatis caput* apice apiculatum. *Folliculi* ignoti.

Pang-nga, Kaw Kalat, on limestone rocks by the sea, *Kerr* 17314.

***Dischidia rimicola* Kerr** (Asclepiadaceae-Marsdenieae); species inter congeneres ob radicem primariam lignosam, caules pubescentes radices adventitias haud vel rarius parientes, distinguenda.

Planta epiphytica; radix lignosa in arborum rimis affixa; caules saepius caespitosi, erecti vel leviter volubiles, graciles, pilis albis crispis brevibus leviter induti. *Folia* ovata vel lanceolata, basi cuneata vel rotundata, apice acuta, 1.4–2.1 cm. longa, 0.9–1.1 cm. lata, coriacea, subtus glabra, supra pilis brevibus parce inspersa, costa supra obscura subtus prominula et leviter alata, nervis lateralibus 2–3 paribus acute ascendentibus supra subtusque obscuris nisi subtus in foliis immaturis subprominulis; petiolus 1–2 mm. longus, crassus, pilis brevibus parce inspersus. *Inflorescentia* axillaris, sessilis, 3–5-flora; pedicelli circiter 1.5 mm. longi, pilis paucis inspersi. *Calyx* membranaceus, extra pilis parcissime inspersus; lobi ovati, obtusi, 0.8 mm. longi. *Corolla* urceolata; tubus subglobosus, intus extraque glaber, circiter 2.25 mm. longus; lobi anguste triangulares, extra glabri, intus villosi, circiter 1.75 mm. longi. *Coronae segmenta* sagittata, apice obtusa, brachiis stipite aequilongis. *Pollinia* oblonga, caudiculis aequilonga, corpusculo anguste elliptico multo longiora. *Folliculi* ignoti.

Krat, Kao Kuap, Put 2984.

***Dischidia tricholoba* Kerr** (Asclepiadaceae-Marsdenieae); species *D. tubuliflorae* King et Gamble affinis, foliis basi cuneatis nec rotundatis, floribus minoribus, inter alia, distinguitur.

Planta epiphytica. *Caulis* scandens, gracilis, glaber. *Folia* elliptica vel ovato-elliptica, basi subacute cuneata, apice subacuta vel leviter rotundata, margine plana, 2.5–3 cm. longa, 0.8–1.3 cm. lata, subcarnosa, glabra, siccitate costa et nervis lateralibus supra obscuris nisi foliis junioribus prominulis, subtus prominulis, nervis lateralibus 3–4 paribus imo pari prope basin oriente et acute ascendente; petiolus 2–4 mm. longus, rugosus, supra alte canaliculatus, glaber. *Umbella* axillaris, 2–5-flora, floribus apice rhacheos crassae tuberculatae 1–2 mm. longae dispositis; pedunculus 1–2 mm. longus; pedicelli circiter 1.5 mm. longi, glabri. *Calyx* membranaceus, glaber; lobi ovati, circiter 1 mm. longi. *Corolla* anguste urceolata, alba, extra glabra, circiter 5 mm. longa; lobi anguste triangulares, intus parte media dense villosi, circiter 2 mm. longi; tubus intus glaber. *Coronae segmenta* membranacea, pertenuia, stipitata, erecta, semilunata, bibrachiata, brachiis recurvis stipite aequilongis. *Antherae* appendix oblonga, apice minute apiculata; pollinia oblonga, caudiculis aequilonga vel parum breviora; corpusculum anguste ellipticum, caudiculis multo brevius. *Stigma* alte 5-lobata, apice apiculata. *Folliculi* ignoti.

Pattani, Kao Kalakiri, c. 900 m., in evergreen forest, Kerr 7775.

***Ceropegia jucunda* Kerr** (Asclepiadaceae-Ceropegieae); *C. trichanthae* Hemsl. valde affinis, foliis floribusque majoribus differt.

Planta scandens; caulis gracilis, teres, glaber, internodiis 9–16 cm. longis. *Folia* oblongo-lanceolata, basi cuneata vel fere rotundata, apice longius acute acuminata, 6.2–9 cm. longa,

1.2–2.1 cm. lata, membranacea, margine minutissime scabro-ciliata, ceterum glabra, costa supra leviter impressa, subtus prominula, nervis lateralibus 5–6 paribus supra subtusque conspicuis patentibus et arcuato-anastomosantibus; petiolus 0.6–1.2 cm. longus, supra alte canaliculatus, apicem versus minute ciliatus. *Inflorescentia* pedunculata, 2–4-flora; pedunculus 3.8–4.8 cm. longus, glaber; bractee subulatae, 1–1.5 mm. longae, glabrae; pedicelli graciles, glabri, 1.5–1.8 cm. longi. *Calyx* alte 5-fidus, glaber; lobi subulati, 6.5 mm. longi. *Corolla* glabra; tubus circiter 2 cm. longus, basi globoso-dilatatus, sursum tubiformis deinde infundibulo-amplius, cinereus, brunneo-maculatus; lobi e basi triangulari filiformes, apicem versus denuo ampliati, apice cohaerentes, purpurei, pilis candidis longis crispulis induti, 2.3 cm. longi. *Coronae segmenta* externa 10, triangularia, ciliata; segmenta interna 5, duplo longiora et ultra, ciliata. *Folliculi* ignoti.

Sriracha, Nawng Kaw, c. 30 m., evergreen forest Kerr 2074.

***Ceropegia siamensis* Kerr** (Asclepiadaceae-Ceropegieae); species *C. lucido* Wall. valde affinis, sed foliis basi rotundatis vel leviter cordatis, haud cuneatis, supra breviter pilosis distinguitur.

Planta scandens; caulis gracilis, teres, glaber, internodiis vulgo 10–15 cm. longis. *Folia* ovata, basi rotundata vel leviter cordata, apice longe attenuata, acuminata, acuta, 6.2–10.6 cm. longa, 1.8–3.6 cm. lata, membranacea, supra breviter appressequae pilosa, subtus glabra, margine breviter ciliata, costa supra subtusque prominula, nervis lateralibus 5–6 paribus supra inconspicuis subtus prominulis arcuato-ascendentibus; petiolus 1–1.7 cm. longus, glaber. *Inflorescentia* pedunculata, 2–6-flora; pedunculus 1.7–2.5 cm. longus, glaber; bractee subulatae, circiter 1 mm. longae; pedicelli 1–1.5 cm. longi, glabri. *Calyx* lobi subulati, glabri, 5 mm. longi. *Corolla* viridis, sanguineo-maculata; tubus saepius parum curvatus, circiter 2.2 cm. longus; basi leviter dilatatus, sursum infundibulo-amplius; lobi 1.6 cm. longi, basi triangulares, sursum versus attenuati, apice longe ciliati praecipue apicem versus. *Coronae segmenta* cohaerentes, longe ciliata, 1.8 mm. longa; segmenta interna fere duplo longiora, glabra. *Folliculi* fere horizontaliter patentes, laeves, graciles, glabri, 17–19 cm. longi; semina linearia, complanata, pallide marginata, 7 mm. longa, coma alba.

Chiangmai, Me Teng, c. 500 m., evergreen forest by stream, Kerr 6470.

XLVI—RESEARCHES ON *SILENE MARITIMA* AND *S. VULGARIS*: XXIV*.

E. M. MARSDEN-JONES AND W. B. TURRILL.

STUDIES ON NON-BRITISH POPULATIONS OF *S. VULGARIS*.

In K.B. 1931, 118, we dealt with plants and populations of *S. vulgaris* in and from various parts of Great Britain. In this

*Continued from K.B. 1939, 304.

present paper we record the analyses of samples of populations from non-British localities, grown from seed collected in the wild. The following samples and families are included here:—

P.1. Norway: Eidsfjordvand.

N.115=P.1 plant 11 selfed.

P.2. Switzerland: Schinige Platte.

N.108=P.2 plant 12 selfed.

N.113=P.2 plant 11 selfed.

N.114=P.2 plant 14 selfed.

N.128=P.2 plant 6 selfed.

P.3. E. Switzerland: Glärnisch.

N.139=P.3 plant 6 selfed.

N.141=P.3 plant 12 selfed.

N.142=P.3 plant 22 selfed.

N.158=P.3 plant 3 selfed.

P.1. Grown at Potterne from seed collected in Norway: by Eidsfjordvand, Hardanger, 4 to 5 miles inland, by rocks and along roadside, August 1929, Miss S. Dunn. Scored 22 June, 1931. 9 plants in the sample.

Habit: compact with ascending stems; stems from 2.5–4.8 dm. long, mean length 3.3 dm.; anthocyanin in vegetative parts, much 1: medium 7: little 1; overwintering “barren” shoots none.

Indumentum: glabrous.

Leaves: fairly uniform for all plants, linear-oblongate, strongly acute, ranging from 7 cm. long and 8 mm. broad to 6 cm. long and 1 cm. broad, for well-developed leaves.

Inflorescence: 8 to 32 flowers, mean 19; flowers all zygomorphic. *Calyx*: inflated 3: subinflated 4: narrow 2; anthocyanin much 1: medium 8.

Corolla: all white; neither petals nor segments overlapping; all bilobed; all $\frac{3}{4}$ lobing; small scale 5: boss 4; anthocyanin blotch present 2: absent 7.

Sex: hermaphrodite 2: hermaphrodite and female 1: female 6.

Filaments: 3 purple; anthers 3 purple.

Stigmata: all purple; immature seeds all white.

Mature capsules: all broadly ovoid and with reflexing teeth.

Mature seeds: all armadillo.

The plants were badly attacked by *Marssonina*. The plants tended to be short-lived under cultivation.

N.115. P.1 plant 11 selfed. 48 plants in the family.

P.1 plant 11 had stems 3.0 dm. high, much anthocyanin in vegetative parts and in calyx, up to 17 flowers per inflorescence, calyx subinflated, small scale, anthocyanin blotch absent, and hermaphrodite flowers.

Habit: as parent.

Indumentum: all glabrous.

Leaves: as parent.

Inflorescence: up to 27 flowers; flowers all zygomorphic.

Calyx: all subinflated; anthocyanin much 46: medium 2.

Corolla: all white; neither petals nor segments overlapping; all bilobed; all $\frac{3}{4}$ lobed; small scale 11: boss 37; anthocyanin blotch present 13: absent 35.

Sex: hermaphrodite 27: hermaphrodite and female 2: female 19.

Filaments: purple 29; anthers purple 29.

Stigmata: all purple; immature seeds all white.

Mature capsules: all broadly ovoid and with more or less reflexing teeth.

Mature seeds: all armadillo.

The material dealt with as P.1 and N.115 is of very considerable interest since it is composed of plants showing character combinations not clear-cut for either *S. vulgaris* or *S. maritima*. We determine it as *S. vulgaris* verging in some characters towards *S. maritima*. The characters by which we place the plant in *S. vulgaris* are: complete absence of overwintering “barren” shoots, many-flowered inflorescences, calyx shape, neither petals nor sepals overlapping in any of the plants, flowers zygomorphic, absence of well-formed coronal scales, immature seeds white, and high susceptibility to *Marssonina*. On the other hand, the compact habit (recalling that of *S. maritima* A.21 from Brecknock Beacons), the capsules with reflexing teeth, and the seeds all armadillo are *S. maritima* characters so far as the two species are represented in the British Isles. The height is an intermediate character. It should be noted that segregation did not occur for: habit, life-form, indumentum, leaf-shape, flower orientation, flower colour, absence of overlapping in petals and segments, lobing and depth of lobing of petals, colours of filaments, anthers, stigmata, and immature seeds, capsule shape, and testa pattern. Fluctuating characters are stem height (showing the range for the F_1 of *S. vulgaris* $\times$ *S. maritima*), flower number (showing the range for some populations of British *S. vulgaris*), small scale to boss (generally to be found in large *S. vulgaris* populations), and sex. Characters not regarded of specific importance are: anthocyanin in vegetative parts and calyx, absence of indumentum, corolla white, lobing and depth of lobing, anthocyanin blotch, colour of filaments, anthers, and stigmata, and sex. In N.115, from a selfing of a plant without anthocyanin blotch, the ratio of absent 3: present 1 was obtained. This suggests that P.1 plant 11 was heterozygous for a blotch inhibitor.

P.2. Grown at Potterne from seed collected Switzerland: Schinige Platte, c.2050 m., 1929, Dr. W. Lüdi, comm. Dr. A. Becherer. Scored 23 June, 1931. 14 plants in the sample.

Habit: stems more or less spreading (more or less compact in No. 14), ascending at ends, from 4.0 to 6.2 dm. long, mean length

4.9 dm.; anthocyanin in vegetative parts much 2 : medium 7 : little 5; overwintering "barren" shoots none.

Indumentum : short dense 11 : glabrous 3.

Leaves : fairly uniform for all plants, narrow lanceolate to oblanceolate, ranging from 4 cm. long and 1.2 cm. broad to 5 cm. long and 2.2 cm. broad, for well-developed leaves.

Inflorescence : 10 to 23 flowers, mean 15; flowers all zygomorphic.

Calyx : inflated 13 : subinflated 2; anthocyanin much 1 : medium 13.

Corolla : all white, except for very slight and fluctuating flushing in 5 plants; petals not overlapping or contiguous; segments overlapping or contiguous 8 : not overlapping or contiguous 6; all bilobed; all $\frac{3}{4}$ lobing; all small scale; anthocyanin blotch present 13 : absent 1.

Sex : hermaphrodite 11 : hermaphrodite and female 3.

Filaments : all purple; anthers all purple.

Stigmata : all purple; immature seeds purple 13 : white 1.

Mature capsules : broadly ovoid 8 : obloid 6; all of the *S. maritima* type in having capsules with reflexing teeth.

Mature seeds : all tubercled.

N.108. P.2 plant 12 selfed 4 plants in the family.

P.2 plant 12 had short dense indumentum, medium anthocyanin in vegetative parts, calyx inflated with medium anthocyanin, segments overlapping, anthocyanin blotch present, and hermaphrodite flowers.

Habit : spreading and ascending at ends; anthocyanin in vegetative parts much 1 : medium 3; overwintering "barren" shoots none.

Indumentum : short dense for all.

Leaves : mostly oblanceolate, and relatively uniform.

Inflorescence : up to 22 flowers; flowers zygomorphic.

Calyx : inflated 3 : subinflated 1; anthocyanin much 1 : medium 3.

Corolla : all white; petals none overlapping; segments overlapping 3 : not overlapping 1; all bilobed; all $\frac{3}{4}$ lobing; all boss; anthocyanin blotch present 1 : absent 3.

Sex : hermaphrodite 2 : hermaphrodite and female 1 : female 1.

Filaments : purple 3; anthers purple 3.

Stigmata : purple 4; immature seeds purple 2.

Mature capsules : none set.

Mature seeds : none set.

N.113. P.2 plant 11 selfed. 15 plants in the family (4 not scorable for flower characters).

P.2 plant 11 had short dense indumentum, medium anthocyanin in vegetative parts, calyx inflated with medium anthocyanin, segments overlapping, anthocyanin blotch absent, hermaphrodite and female flowers, and obloid capsules.

Habit : spreading and slightly ascending at ends; anthocyanin in vegetative parts medium; overwintering "barren" shoots none.

Indumentum : short dense 12 : glabrous 3.

Leaves : narrow lanceolate to oblanceolate, relatively uniform for the family.

Inflorescence : up to 30 flowers; flowers zygomorphic.

Calyx : 11 inflated; anthocyanin medium 11.

Corolla : white; petals 11 not overlapping or contiguous; segments 11 overlapping or contiguous; 11 bilobed; $\frac{3}{4}$ lobing 9 : $\frac{3}{8}$ lobing 2; boss 9 : small scale 2; anthocyanin blotch absent 11.

Sex : hermaphrodite 5 : hermaphrodite and female 2 : female 4.

Filaments : purple 7; anthers purple 7.

Stigmata : purple 11; immature seeds purple 7.

Mature capsules : obloid 11 : broadly ovoid 2; teeth reflexed.

Mature seeds : all tubercled.

N.114. P.2 plant 14 selfed. 32 plants in the family (7 not scorable for flower characters).

P.2 plant 14 had short dense indumentum, medium anthocyanin in vegetative parts, calyx inflated with medium anthocyanin, segments overlapping, anthocyanin blotch present, hermaphrodite and female flowers, and obloid capsules.

Habit : rather compact and ascending; anthocyanin in vegetative parts much 20 : medium 5; overwintering "barren" shoots none.

Indumentum : short dense 28 : glabrous 4.

Leaves : narrow lanceolate to oblanceolate, fairly uniform and rather narrower than in N.108 and N.113.

Inflorescence : up to 27 flowers; flowers zygomorphic.

Calyx : inflated 8 : subinflated 17; anthocyanin much 20 : medium 5.

Corolla : 25 white; petals 25 not overlapping; segments overlapping 23 : not overlapping 2; bilobed 22 : multilobed 2; $\frac{3}{4}$ lobing 22 : $\frac{3}{8}$ lobing 2; boss 22 : small scale 2; anthocyanin blotch present 3 : absent 21.

Sex : hermaphrodite 14 : hermaphrodite and female 2 : female 8.

Filaments : purple 16; anthers purple 16.

Stigmata : purple 24; immature seeds purple 9 : white 3.

Mature capsules : obloid 20 : broadly ovoid 9; teeth reflexed.

Mature seeds : tubercled 25.

N.128. P.2 plant 6 selfed. 12 plants in the family (9 not scorable for flower characters).

P.2 plant 6 had short dense indumentum, little anthocyanin in vegetative parts, calyx inflated, with medium anthocyanin, segments not overlapping, anthocyanin blotch present, and hermaphrodite and female flowers.

Habit : spreading and ascending at ends; anthocyanin in vegetative parts much 1 : medium 2; overwintering "barren" shoots none.

Indumentum : 12 short dense.

Leaves : narrow lanceolate to oblanceolate and fairly uniform for the family.

Inflorescence : up to 19 flowers ; flowers zygomorphic.

Calyx : inflated 2 : subinflated 1 ; anthocyanin much 1 : medium 2.

Corolla : 3 white ; petals and segments not overlapping 3 ; bilobed 2 : multilobed 1 ; $\frac{3}{4}$ lobing 3 ; boss 2 : small scale 1 ; anthocyanin blotch present 1 : absent 2.

Sex : hermaphrodite 2 : hermaphrodite and female 1.

Filaments : purple 3 ; anthers purple 3.

Stigmata : purple 3 ; immature seeds not scorable.

Mature capsules : none set.

Mature seeds : none set.

The material dealt with under P.2, N.108, N.113, N.114 and N.128 represents a high mountain stock from the Alps. The original seed was received under the name "*Silene vulgaris* ssp. *prostrata* (=ssp. *alpina*). All the plants are to be placed under *S. vulgaris* in the broad sense but they all show the character of reflexed capsule teeth, which is a character of *S. maritima*, as is also the high proportion of purple immature seeds. All the other characters are those of *S. vulgaris* except for the high proportion of small scales in P.1. Segregation occurred on selfing for : anthocyanin in vegetative parts and calyx, indumentum, calyx shape, overlapping of segments, lobing and depth of lobing of petals, corona, anthocyanin blotch, sex, and mature capsules. The indumentum is of a short dense type which we have not found amongst British material of *S. vulgaris* but which we know is not uncommon amongst Alpine plants of the *S. vulgaris* group. N.108 and N.128 showed a high degree of sterility. The original population was heterozygous for sterility-fertility factors.

P.3. Grown at Potterne from seed collected E. Switzerland : Glärnisch, 1500 m., on limestone rubble, 1930, by Dr. H. Jenny, comm. Dr. A. Becherer. Scored 23 June, 1932. 38 plants in the sample.

Habit : stems tend to be prostrate at base or at a low angle to the ground, then ascending ; stems from 3.2 to 5.7 dm. long, mean length 4.5 dm. ; anthocyanin in vegetative parts much 30 : medium 8 ; overwintering "barren" shoots none.

Indumentum : short dense 26 : glabrous 12.

Leaves : oblanceolate, fairly uniform for all plants, strongly acute, ranging from 4.7 cm. long and 1.1 cm. broad to 6.2 cm. long and 1.5 cm. broad, for well developed leaves.

Inflorescence : 6 to 21 flowers, mean 12.5 ; flowers all zygomorphic.

Calyx : inflated 5 : subinflated 33 ; anthocyanin all much.

Corolla : petals none overlapping ; segments overlapping or contiguous 8 : not overlapping or contiguous 30 ; bilobed 33 :

multilobed 5 ; all $\frac{3}{4}$ lobing ; scale 1 : small scale 35 : boss 2 ; anthocyanin blotch present 12 ; absent 26.

Sex : hermaphrodite 37 : female 1.

Filaments : purple 37 ; anthers purple 37.

Stigmata : purple 38 ; immature seeds purple 38.

Mature capsules : broadly ovoid 16 : obloid 22 ; all with reflexed teeth.

Mature seeds : tubercled 38.

N.139. P.3 plant 6 selfed. 22 plants in the family.

P.3 plant 6 had much anthocyanin in vegetative parts, short dense indumentum, calyx subinflated, with much anthocyanin, petals not overlapping, segments overlapping or contiguous, $\frac{3}{4}$ lobing, small scale, anthocyanin blotch absent, hermaphrodite flowers, filaments purple, anthers purple, stigmata purple, immature seeds purple, capsules obloid.

Habit : subspreading and subprostrate ; stems up to 4.2 dm. long ; anthocyanin in vegetative parts medium 17 : little 5.

Indumentum : all short dense.

Leaves : oblanceolate and fairly uniform for the family.

Inflorescence : up to 21 flowers ; flowers all zygomorphic.

Calyx : all subinflated ; anthocyanin medium 17 : none 5.

Corolla : petals overlapping or contiguous 8 : not overlapping or contiguous 14 ; segments overlapping or contiguous 10 : not overlapping or contiguous 12 ; bilobed 22 ; $\frac{3}{4}$ lobing 14 : $\frac{3}{8}$ lobing 8 ; scale 1 : small scale 8 : boss 13 ; anthocyanin blotch present 6 : absent 16.

Sex : hermaphrodite 9 : hermaphrodite and female 5 : female 8.

Filaments : purple 11 : white 3 ; anthers purple 10 : 4 yellow-green.

Stigmata : purple 19 : white 3 ; immature seeds purple 16 : white 4.

Mature capsules : obloid 17 ; with reflexed teeth.

Mature seeds : tubercled 17.

Fruits and seeds set badly, owing to self-sterility.

N.141. P.3 plant 12 selfed. 10 plants in the family.

P.3. plant 12 had much anthocyanin in vegetative parts, indumentum short dense, calyx subinflated with much anthocyanin, petals and segments not overlapping or contiguous, boss, anthocyanin blotch present, hermaphrodite flowers, filaments purple, anthers purple, capsules broadly ovoid.

Habit : subspreading and suberect ; stems up to 4.4 dm. long ; anthocyanin in vegetative parts medium 9 : little 1.

Indumentum : short dense 7 : glabrous 3.

Leaves : narrow lanceolate to oblanceolate and fairly uniform for the family.

Inflorescence : up to 20 flowers ; flowers all zygomorphic.

Calyx : all subinflated ; anthocyanin much 1 : medium 9.

Corolla : petals and segments none overlapping or contiguous ; bilobed 10 ; $\frac{3}{4}$ lobing 10 ; boss 10 ; anthocyanin blotch present 5 : absent 5.

Sex : hermaphrodite 4 : female 6.

Filaments : purple 2 : white 1 ; anthers purple 3.

Stigmata : purple 10 ; immature seeds purple 9.

Mature capsules : broadly ovoid 7 : obloid 3 ; with reflexed teeth.

Mature seeds : tubercled 10.

N.142. P.3 plant 22 selfed. 60 plants in the family.

P.3 plant 22 had medium anthocyanin in vegetative parts, indumentum short dense, calyx inflated with much anthocyanin, petals and segments not overlapping or contiguous, bilobed petals, $\frac{3}{4}$ lobing, small scale, anthocyanin blotch present, hermaphrodite flowers, capsules broadly ovoid.

Habit : subspreading and subprostrate ; stems up to 7.5 dm. long ; anthocyanin in vegetative parts medium 38 : little 22.

Indumentum : all short dense.

Leaves : oblanceolate and fairly uniform for the family.

Inflorescence : up to 35 flowers ; flowers all zygomorphic.

Calyx : inflated 20 : subinflated 40 ; anthocyanin medium 45 : little 2 : none 13.

Corolla : petals not overlapping or contiguous 60 ; segments overlapping or contiguous 8 : not overlapping or contiguous 52 ; bilobed 52 : multilobed 8 ; $\frac{3}{4}$ lobing 58 : $\frac{3}{4}$ lobing 2 ; small scale 4 : boss 56 ; anthocyanin blotch present 11 : absent 49.

Sex : hermaphrodite 58 : hermaphrodite and female 1 : female 1.

Filaments : purple 59 ; anthers purple 57 : yellow-green 2.

Stigmata : purple 57 : white 3 ; immature seeds purple 43 : white 17.

Mature capsules : broadly ovoid 8 : obloid 50 ; with reflexed teeth.

Mature seeds : tubercled 58.

N.158. P.3 plant 3 selfed. 25 plants in the family.

P.3 plant 3 had much anthocyanin in vegetative parts, glabrous stems and leaves, calyx subinflated with much anthocyanin, petals and segments not overlapping or contiguous, multilobed petals, small scale, anthocyanin blotch absent, hermaphrodite flowers, capsules obloid.

Habit : subspreading and subprostrate ; stems up to 5 dm. long ; anthocyanin in vegetative parts medium 1 : little 24.

Indumentum : all glabrous.

Leaves : narrow lanceolate to oblanceolate and fairly uniform for the family.

Inflorescence : up to 30 flowers ; flowers all zygomorphic.

Calyx : inflated 3 : subinflated 22 ; anthocyanin medium 24 : little 1.

Corolla : petals and segments none overlapping or contiguous ; bilobed 24 : multilobed 1 ; $\frac{3}{4}$ lobing 25 ; small scale 1 : boss 24 ; anthocyanin blotch present 3 : absent 22.

Sex : all hermaphrodite.

Filaments : all purple ; anthers all purple.

Stigmata : all purple ; immature seeds all purple.

Mature capsules : 24 obloid, with reflexed teeth.

Mature seeds : 24 tubercled.

Seeds and fruits set well.

The material dealt with as P.3, N.139, N.141, N.142, and N.158 was derived from E. Switzerland. We classify the plants under *S. vulgaris* s.l. but they show verging towards *S. maritima* in the high proportion of purple immature seeds and reflexing teeth of the capsules. The only characters that bred true for the original sample and the offspring families were reflexed capsule teeth and armadillo testas.

GENERAL DISCUSSION.

The populations, samples of which are analyzed above, are decidedly different from any British populations so far discovered. Under the alpha taxonomy which has to be used at present they are to be classified as *S. vulgaris* s.l. since they show mainly characters of that species. On the other hand, the high proportions of purple immature seeds and, especially the reflexing teeth of the capsules are, for British material of the group, *S. maritima* characters. It should also be noted that the average number of flowers per inflorescence is intermediate between that for *S. vulgaris* and for *S. maritima* as shown by British material grown at Potterne under similar conditions. There appear to be three possible interpretations of the results : 1. The populations accumulated and became pure for several mutations which give characters parallel to those of *S. maritima* ; 2. The populations at some time in the past received certain genes from *S. maritima* by hybridization and afterwards became homozygous for these genes : this is very improbable for the two Swiss populations ; 3. The character combinations shown by these populations represent more primitive combinations than those shown by either British *S. maritima* or British *S. vulgaris*. Data accumulating from many sources is suggesting that the last may be the true explanation.

SUMMARY.

In this paper plants grown from wild seed, and selfed offspring of certain of them from Norway and Switzerland (2 collections) are described for a general range of characters. These samples show peculiar combinations of characters which, it is suggested, may represent ancestral combinations from which *S. maritima* and more typical *S. vulgaris* have been derived.

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XLVII—ON THE FLORA OF THE NEARER EAST: XXI*.

ADDITIONS, ETC. TO THE FLORA OF CYPRUS.

A. K. JACKSON AND W. B. TURRILL.

Since the publication of the last series of new records for Cyprus (K.B. 1938, 460) further extensive collections have been received from Mrs. E. W. Kennedy and Mr. A. Syngrossides. Several species hitherto unrecorded from the island were found among the collections, and from the very complete material of *Sedum* sent by Mrs. Kennedy it has been possible to correct previous misconceptions of species in the section *Cyprosedum*. In addition to the records of species whose occurrence in the island was unknown, descriptions of two new species from Cyprus are included in the present paper.

Papaver Argemone L. Sp. Pl. 506 (1753) var. **glabrum** Koch Synops. Deutschl. Fl. ed. 1, 29 (1835).

Platres, 1150 m., igneous mountain, fallow land, petals dull red-purple, 15.5.38, *Kennedy* 1173.

The species is not recorded for Cyprus by Holmboe (Stud. Veg. Cypr. 1914). It is a plant of cultivated ground occurring throughout Europe and the Orient from Scandinavia to Persia. The var. *glabrum* is distinguished by its almost glabrous capsules and has been recorded from central Europe, Syria, and Persia.

Fumaria asepalae Boiss. Fl. Or. 1, 135 (1867).

Chionistra north, 1940 m., igneous mountain, on a bank built long ago across a gully to make a snow pit, 1.7.38, *Kennedy* 1177.

Widely distributed in Asia Minor, extending eastwards to Persia.

Arabis auriculata Lam. Encycl. 1, 219 (1784).

Xerokolymbos, 1340 m., rock in deep shade, above the stream, 6.4.38, *Kennedy* 1228; Kyros Potamos, 1200 m., shady rock, above the stream, 5.6.38, *Kennedy* 1229.

Occurs in central and southern Europe and in the Orient from Asia Minor to Persia. It has not apparently hitherto been found in Cyprus.

Sisymbrium orientale L. Amoen. 4, 322 (1759).

Platres, 1100 m., dry mountain-side among the bushes of the garigue, yellow flower, 26.4.38, *Kennedy* 1232.

The species is a native of southern Europe and the Orient.

Camelina sylvestris Wallr. Sched. 347 (1822).

Platres, 920 m., garigue between vineyards on the dry mountain-side, 9.6.38, *Kennedy* 1239.

Common in central and southern Europe and the Orient from Greece to southern Persia.

Gypsophila porrigens (L.) Boiss. Fl. Or. 1, 557 (1867); *Saponaria porrigens* L. Mant. 239 (1771).

Platres-Troödos, 1420 m., igneous mountain, in a soft bank of loose earth below the roadside, few plants, flowers pink, 20.6.38, *Kennedy* 1186.

The genus *Gypsophila* has not previously been recorded from Cyprus. This species is found in Asia Minor, Syria, Iraq, Persia, and Afghanistan.

Silene papillosa Boiss. Diagn. Ser. 1, 1, 39 (1842).

Kato Platres, 890 m., by a stream running between vine-covered hills down to Kokkinovouno, 7.5.37, *Kennedy* 357.

This species has only previously been collected in Asia Minor.

Medicago Gerardi Willd. Sp. 3, 1415 (1803).

Platres, 1150 m., fallow land, 27.4.38, *Kennedy* 1269; Platres, 1050 m., among the garigue on the dry mountain-side, 19.5.38, *Kennedy* 1271.

This species is widely distributed in the Mediterranean region extending into France and Central Europe in the north-west and to Persia in the south-east. It has not so far been recorded from Cyprus.

Trifolium hirtum All. Auct. 20 (1789).

Platres, 1230 m., among bushes of the garigue on a dry mountain-slope, flowers russet-pink, 26.4.38, *Kennedy* 1272; Platres, 1150 m., garigue on a dry mountain-slope, flowers russet-pink, 18.5.38, *Kennedy* 1286.

A common Mediterranean species.

Trifolium leucanthum M.Bieb. Taur. Cauc. 2, 214 (1808).

Platres, 1230 m., rocky ground under pine trees, flowers white, 13.5.38, *Kennedy* 1283; Platres, 1050 m., garigue on the dry mountain-side, 19.5.38, *Kennedy* 1284.

The species (sensu lato) occurs locally in the Mediterranean region.

T. striatum L. Sp. Pl. 770 (1753).

Platres, 1150 m., fallow land, 15.5.38, *Kennedy* 1280.

This widely distributed species occurs from southern Europe to Persia.

T. glomeratum L. Sp. Pl. 770 (1753).

Platres, 1150 m., fallow land, flowers white, 15.5.38, *Kennedy* 1281; Platres, 1230 m., among bushes under pine trees, 3.6.38, *Kennedy* 1279.

This species is common in western Europe, the Mediterranean Region, and the Orient.

Lotus angustissimus L. Sp. Pl. 774 (1753).

Locis subhumidis prope Prodromo in mt. Troödos, 30 junio 1880, *Sintenis et Rigo* 815.

Although collected as long ago as 1880 by Sintenis and Rigo, this species seems to have been overlooked by later investigators

*Continued from K.B. 1939, 193.

of the flora of Cyprus. It is widely distributed in Europe, the Orient, and Northern Asia.

Sedum cyprium A. K. Jackson et Turrill, sp. nov. a *S. Lampusae* et *S. microstachyum* floribus minoribus differt; a priore foliis radicalibus angustioribus inflorescentia breviori differt; a posteriore foliis radicalibus glabris facile distinguitur.

Herba annua vel biennis, erecta, 0.7-3.3 dm. alta, rhizomate crasso circiter 1 cm. diametro. *Folia* radicalia in rosulam usque ad 9 cm. diametro disposita, obovato-spathulata, apice rotundata vel obtusa, basi attenuata, 2-4.5 cm. longa, 0.5-1.2 cm. lata, glabra, crassa; caulina sessilia, elliptica vel obovato-elliptica, apice obtusa vel subacuta, 0.4-0.7 cm. longa, 0.3-0.5 cm. lata, glabra vel sparse pubescentia, margine glanduloso-ciliolata, decidua; floralia caulinis subsimiles sed minores, decidua. *Inflorescentia* subcylindrica vel pyramidata, e cymis superpositis composita, 0.5-2.2 dm. longa, basi usque ad 4.5 cm. diametro, tota plus minusve dense glanduloso-pubescentia. *Calyx* glanduloso-puberulus, dentibus lanceolato-triangularibus acutis 1-1.25 mm. longis circiter 0.5 mm. latis basi connatis. *Petala* lanceolata vel lineari-lanceolata, apice acuminata, 2.5-3 mm. longa, circiter 1 mm. lata, sordide brunneo-rubra, basi breviter connata. *Stamina* 10, circiter 1 mm. longa; filamenta puberula vel glanduloso-puberula. *Folliculi* maturi, plus minusve erecti, rubro-brunnei, 3 mm. longi, glabri vel sparse glanduloso-puberuli, stylo subulato saltem duplo longiores. *Semina* rubro-striata, elongato-obovoidea, vix 0.5 mm. longa.

Ad rupes Mt. Troödos, July 1st, 1880, *Sintenis et Rigo* 893 (as *Umbilicus Lampusae* Kotschy); In rupibus circa Fini montis Troödos et apud monasterium Kikku, solo schistaceo, July 1st, 1880, *Sintenis et Rigo* 895 (as *Umbilicus Lampusae* Kotschy); Cyprus, 1230 m., in clefts in rocks, July 1914, G. St. C. Feilden; Pedoulas, 1929, C. B. Ussher 75; Kalkopetria, 770 m., on rocky terraces, June 30, 1936, A. Syngrossides 1266; Phini, 920 m., on a steep hump of rock looking like a clinker, high above the village, facing north, December 13, 1936, *Kennedy* 531; Kryos Potamos, in rock high above the stream in colonies of small numbers, 860 m. 980 m., June 16, 1937, *Kennedy* 524 (type); Chionistra-south, 1650 m., in rock on steep bare mountainside, June 30, 1937, *Kennedy* 525; Kokkinovouno, 890 m., in earth between red rocks on the steep mountainside, July 6, 1937, *Kennedy* 528; Platres, 1230 m., stony slope under Pine trees in a gully, few plants, October 2, 1938, *Kennedy* 1252; Kryos Potamos, 920 m., rock 30 m. above the river, many plants, October 10, 1938, *Kennedy* 1253.

S. cyprium is apparently confined to the Troödos range, where it occurs in rocky places mainly below 1500 m. *S. microstachyum* (Kotschy) Boiss., its nearest affinity, is also a Troödos endemic but this species is found at higher altitudes, from 1500 m. to 1980 m., the highest point in the island. Our plant was first collected by P. Sintenis and G. Rigo nearly sixty years ago and was erroneously

determined as *S. Lampusae* (Kotschy) Boiss. This latter species has only been found on the northern range and differs from *S. cyprium* in several important characters as shown below. Under *S. Lampusae*, Holmboe (Stud. Veg. Cypr. 93: 1914) quotes three specimens—Kotschy's type specimen from Lapithos, Northern range, Sintenis and Rigo 895 from Fini, Troödos, and his own specimen from Kaminaria, Troödos (J.H. 1071). He does not appear to have seen Kotschy's type specimen of *S. Lampusae* for the Sintenis number 895 in Herb. Kew. is not *S. Lampusae* but *S. cyprium*, while J.H. 1071 (in Herb. Brit. Mus.) from Kaminaria is actually *S. microstachyum*.

Fröderström (The Genus *Sedum* pt. 3, 16, pl. 10: 1932) figures *Sintenis* 893, which is *S. cyprium* in Herb. Kew., as *S. Lampusae*, and there is no doubt from the plate that *S. cyprium* is the species actually represented. In the description, under *S. Lampusae*, the measurements of the flower are greater than in any of the specimens of *S. cyprium* in Herb. Kew but the remainder of the description mainly agrees with our plant.

Kotschy's type specimens of both *S. Lampusae* and *S. microstachyum* were received at Kew on loan from Vienna and our thanks are due to the Director of the Natural History Museum and to Dr. K. H. Rechinger for sending the specimens. Though unfortunately they have been mutilated, apparently by a previous borrower, the material is sufficient to show that our interpretation of the Cyprian species is correct. The type of *S. microstachyum* is a very diminutive specimen, 5 cm. in height, but the leaf shape and flower characters agree with the larger specimens at Kew quoted below. The flowering stem of the type of *S. Lampusae* is missing, but from the impression on the sheet it appears to have been about 3.4 dm. long. The basal rosettes have leaves up to 2.5 cm. broad. The material collected by Mrs. Kennedy on the Northern range, quoted below, undoubtedly belongs to this species.

Sedum Lampusae (Kotschy) Boiss. Fl. Or. 2, 787 (1872); *Umbilicus Lampusae* Kotschy, Insel Cypern 312 (1865).

Plant 2-5.7 dm. in height. Basal leaves obovate, up to 2 cm. broad, slightly narrowed at the base, slightly puberulous. Petals 4 mm. long, 2 mm. broad, ovate-lanceolate with many red veins.

Kyrenia, 300 m., in the precipice, limestone, 6.11.36, *Kennedy* 520; St. Hilarion, Kyrenia range, 730 m., walls of ruined castle, limestone mountain, plant bronze colour, 22.7.38, *Kennedy* 1047; Buffavento, Kyrenia range, south, 920 m., cracks of rock, 28.7.38, *Kennedy* 1048; Bellapais, Kyrenia mnts., north, 340 m., rocks, walls, stony ground and hard sun-baked earth, 28.7.38, *Kennedy* 1049; Yalia, northern range, 920 m., cracks of rock, limestone mountain, 13.8.38, *Kennedy* 1050.

Sedum microstachyum (Kotschy) Boiss. Fl. Or. 2, 787 (1872); Holmboe, Stud. Veg. Cypr. 93 (1914); *S. Lampusae* var. *microstachyum* Fröderström, The Genus *Sedum*, pt. 3, 17 (1932); *Umbilicus microstachyus* Kotschy, l.c. 311.

Plant 0.7–3.7 dm. in height. Basal leaves linear-spathulate, up to 1.2 cm. broad, narrowed at the base, usually glandular-hairy and ciliate. Petals 6 mm. long, 2 mm. broad, lanceolate, few veined.

Ad rupes montis Troödos, 8.7.1880, *Sintenis et Rigo* 720; Crome-Troödos, 1840 m., on rocky ground, Sept. 1930, *C. B. Ussher* 91; Kryos Potamos, 1690 m., in rock 100' above the stream, 24.6.37, *Kennedy* 526; Chionistra, south, 1690 m., in rock above a winter-time rivulet, 2.7.37, *Kennedy* 527; Chionistra 1940 m., in rock, facing north, 13.7.37, *Kennedy* 529; Troödos mnts., 1690 m., growing sparsely on igneous rocks amongst pines, July 1937, *C. H. Wyatt* 9; Kryos Potamos, 1690 m., on a flat rock, little above the stream, 9.10.37, *Kennedy* 530; Kryos Potamos, 1770 m., rock by the dry river bed, 22.6.38, *Kennedy* 1247; Kryos Potamos, 1750 m., cracks of steep rock by dry river-bed, plant green all over in the shade, turning blood-red in the sun, fading to bronze colour, red juice, 20.7.38, *Kennedy* 1051; Chionistra, 1910 m., 24.7.38, *Kennedy* 1052; Chionistra, 1820 m.–1910 m., rock on the northern slope, 9.8.38, *Kennedy* 1248; Valley of the Loumadho, E. of Chionistra 1540 m., 20.8.38, *Kennedy* 1254; Kryos Potamos, 1685 m., on rocks, 27.10.38, *Kennedy* 1249; Chionistra, south, 1640 m., 11.10.38, *Kennedy* 1251; Kryos Potamos, 1690 m., rock above the river, 30.10.38, *Kennedy* 1250.

***Asperula pycnantha* Boiss. var. *lasiocarpa* Boiss.** Diagn. Ser. 1, 10, 64 (1849).

Agios Andronikos (Karpas), 185 m., growing on borders of fields, wild, flowers yellow, 29.6.37, *Syngrassides* 1656.

This species has been previously recorded only from Syria.

***Tyrimnus leucographus* (L.) Cass.** in Bull. Soc. Philom. 168, (1818); *Carduus leucographus* L. Sp. Pl. 820 (1753).

Polis-Pomos, 30 m., in the basins and borders of a dry river, much branched, broad basal leaves, flowers rosy violet when fresh, 18.5.38, *Syngrassides* 1843.

The species is generally distributed in southern Europe, Asia Minor, and Syria.

***Salvia graveolens* Vahl**, Enum. 1, 273 (1805).

Between Ambelikon and Karavostasi, 150 m., on the left side, near a big rock on the main road, a plant growing up to 2 ft. high, and bushy. Flowers whitish. 8.5.37, *Syngrassides* 1613.

This species has hitherto only been found in Syria and Palestine.

***Herniaria micrantha* A. K. Jackson et Turrill**, sp. nov. ab *H. argaea* Boiss. floribus minoribus praecipue differt.

Planta perennis (?), caulibus prostratis ramosis herbaceis vel basem versus vix fruticulosus brevissime pubescentibus vel fere glabris 1.5–14 cm. longis. *Folia* spathulata, late obovata vel fere orbicularia, apice obtusa vel rotundata, 2–4 mm. longa, 1.5–2 mm.

lata, glabra vel plus minusve breviter hispido-pubescentia, margine pilis longis aliquando ciliata, saepe crassa; stipulae inconspicuae, triangulari-ovatae, acutae, margine leviter ciliatae. *Inflorescentiae* saepissime densae, glomerulis usque ad 15-floris, floribus parvis pentameris. *Calyx* 1–1.5 mm. longus, sepalis inferne connatis elliptico-oblongis apice obtusis saepissime circiter 1 mm. longis 0.5 mm. latis, plus minusve patule albido-hispidis interioribus membranaceo-marginatis viridibus (pilis exceptis). *Stamina* minutissima. *Ovarium* ellipsoideum; stigmata 2, brevia. *Semen* solitarium, rubro-brunneum bilenticulare, 0.5 mm. latum, margine acute carinatum (fere brevissime alatum).

Kryos Potamos, Troödos range, 1720 m., in gravel of dry river-bed, 3.6.37, *Kennedy* 419 (type); Chionistra, 1980 m., in gravel, facing north, 13.7.37, *Kennedy* 420; Chionistra, north, 1910 m., igneous mountain, rocky slope, 11.6.38, *Kennedy* 1163; Kanoures Springs, 1610 m., igneous mountain, northern slope, E. of Chionistra, damp black earth in deep shade, 2.7.38, *Kennedy* 1162; Kryos Potamos 1720 m., igneous mountain, in a crack of rock, under a juniper tree at the edge of the stream—now dry, 8.7.38, *Kennedy* 1164; Kryos Potamos, 1660 m., igneous mountain, wet ground by a spring, little above the river, 8.7.38, *Kennedy* 1165; Kryos Potamos, 1720 m., dry river-bed in rocks and stones and banks and ridges of gravel, 27.9.38, *Kennedy* 1224; Chionistra, 1940 m., northern flank, rocky slope, 3.10.38, *Kennedy* 1244; Kryos Potamos, 1720 m., 30.10.38, *Kennedy* 1245; Kryos Potamos, 1650 m., roadside and ditch above the river, 10.11.38, *Kennedy* 1255.

The oriental species of *Herniaria* are difficult to classify satisfactorily. The small flowers have invariably to be dissected in order to determine their characters. Boissier (Flor. Or. 1, 741 : 1867) described *H. argaea* from Mt. Argaeus, Cappadocia, from material collected by Balansa. This species is undoubtedly very similar to *H. micrantha* but has larger flowers. All the specimens from Cyprus quoted (over 80 plants, all from the Troödos range) agree with one another in essential floral characters. The leaf-shape and degree of indumentum on both leaves and calyces shows some variation. Some of the plants probably behave as over-wintering annuals and others as short-lived perennials. Some appear to have flowered a second time in the same year.

Certain specimens from Asia Minor also having small flowers, come very near to *H. micrantha*, and may eventually have to be included in the one species. Material from Sultan Dagh has a calyx which narrows at the base more acutely than the calyx of *H. micrantha*, and is often provided with two membranous ridges in the lower part of the calyx. Specimens from the Smyrna district and from Mt. Ida also have a calyx more acutely narrowed at the base but have not the membranous ridges or wings.

These Asia Minor specimens have been, in part, confused with *H. densiflora* Williams (Bull. Herb. Boiss. 4, 562 : 1896). This

species has, however, much larger flowers and appears, from the type specimen in the British Museum (Natural History), to be closely similar to *H. incana* Lam.

We desire to express our thanks to the Director of the Botanic Garden, Geneva, for the loan of the type material of *H. argaea*.

XLVIII—A NEW GENUS OF MELASTOMATACEAE FROM PERU. H. A. GLEASON.

Among the many rare and interesting plants collected last year by Mr. Christopher Sandeman on his travels in Amazonian Peru there was discovered a species of *Melastomataceae* which could not be referred to any known genus and is accordingly described as follows:—

Sandemania Gleason, gen. nov. (Tribus *Tibouchineae*). Flores numerosi, paniculati, 4-meri. Hypanthium herbaceum, leviter 8-costatum. Calycis tubus non productus; lobi breves lineares, dentibus exterioribus nullis. Petala acuta. Stamina paullo dimorpha; antherae graciles, subulatae, apice subrostratae, poro terminali dehiscentes; connectivum plus minus productum, basi antice appendiculo U-formi ornatum (ser. exter.) vel breviter bilobum (ser. inter.). Ovarium liberum, 2-loculare, glabrum. Stylus gracilis, ad stigma punctiforme angustatus.

Sandemania lilacina Gleason, sp. nov. Frutex bimetralis. Rami superiores subteretes, dense substrigosi et furfuracei, internodiis 1–2 cm. longis. Petioli 4–5 mm. longi, ut rami pubescentes. Laminae coriaceae, anguste oblongae, usque 50 mm. longae, 12 mm. latae, obtusae vel subacutae, integrae, basi obtusae, 5-nerviae, supra glabrae, subtus ad venas strigosae et furfuraceae ad paginam breviter hirtellae et minute et arctissime tomentosae; venae primariae supra alte impressae subtus elevatae; venulae obsoletae. Panicula terminalis floribunda, 1 dm. longa, axibus substrigosis et furfuraceis; bracteae late ovatae, 3 mm. longae; bracteolae ovatae vel lanceolatae, 1–2 mm. longae, ciliatae; pedicelli 1 mm. longi, villosuli. Hypanthium breviter cylindricum, 2.2 mm. longum, basi sparse hirtellum, setis intercalycinis brevibus. Sepala 0.7 mm. longa. Petala ovata, 3.5 mm. longa. Filamenta 5.2 vel 4.1 mm. longa, glabra; thecae leviter curvatae, 3.0 vel 2.6 mm. longae; connectiva 1.3 vel 0.4 mm. longa. Ovarium ellipsoideum, 1.4 mm. longum; stylus leviter sigmoideus, 3.9 mm. longus.

PERU. Dept. San Martin: Rioja, c. 900 m., Aug. 1938, C. Sandeman 170 (typus in Herb. Kew.); Jesus del Monte, near Moyobamba, c. 900 m., Aug. 1938, C. Sandeman sine no.

The publication of a new genus is always approached with diffidence, especially in a family whose numerous accepted genera might be presumed to cover all possible combinations of characters, or when based on a specimen without mature fruits or seeds, since the latter are necessary to confirm the tribal position of the plant. Nevertheless, long study of the American representatives of the

family has given me a certain degree of familiarity with all American genera and has convinced me that the accepted genera are almost without exception* well differentiated and easily recognized. The plant in question does not lie within the concept of any existing genus, nor can any concept be widened sufficiently to include it.

The character of its stamens, with two anterior basal lobes, refers it to *Microlicieae* or *Tibouchineae*, while its general aspect suggests the latter. Seeds are lacking to confirm its tribal position. In the former tribe, 4-merous flowers are found in several genera, but, except in *Siphanthera*, always in conjunction with short obtuse anthers; in *Siphanthera* half of the anthers are sterile or lacking and the whole vegetative aspect is different. Subulate anthers are found in various genera, but never in connexion with acute petals or 2-celled ovary. In the *Tibouchineae*, acute petals are typical of *Nepsera*, a monotypic genus with 5-merous flowers and different stamens. Four-parted flowers are found in *Acisanthera*, with different stamens and inflorescence, *Heterocentron*, with different stamens and foliage, *Arthrostemma*, with different stamens and hypanthium, *Ernestia* and *Appendicularia*, with entirely different stamens, *Brachyotum*, with different stamens and corolla, *Chaetolepis*, with different stamens and ovary, *Macairea*, with glandular filaments, *Pterogastra* and *Schwackea*, with winged hypanthium and setose ovary, *Pterolepis* and *Tibouchina*, with setose ovary and different pubescence, *Fritzschia* with different anthers and solitary flowers, *Marcetia* and *Aciotis*, with different stamens. Similar stamens are found in *Tibouchina* and *Pterolepis*, where the ovary is setose at the summit, and in *Comolia*; the glandular stamens of *Macairea* are also reminiscent of our plant in structure. In general aspect our plant most resembles *Macairea*, but differs in details of the connective, in the glabrous ovary, the non-glandular filaments, and the acute petals. From *Comolia* it differs in the connective, in its ample terminal panicle, and in its acute petals.

XLIX—MISCELLANEOUS NOTES.

The Vegetation of the British Isles.—"Types of British Vegetation," edited and partly written by A. G. Tansley, was published in 1911, and has long been out of print. It was a small octavo of 416 pages. The work† here under notice occupies over 900 pages of a large octavo size. A merely quantitative statement cannot, however, convey a correct impression of the great difference between the pioneer classic and the new volume which is intended to replace it. In the interval of nearly three decades ecology has come into its own, in the sense that the importance of both its

* For example, *Platycentrum*.

† "The British Isles and their Vegetation," by A. G. Tansley. Cambridge University Press, 1939. Pp. 930+xxxviii, 162 plates, 179 figures. 45s. net.

purely scientific and its applied aspects are now widely recognized. Probably no student of ecology will deny the need for an authoritative survey of recent ecological research on the vegetation of the British Isles. Such a survey has, of necessity, to be largely a compilation, but its success is to be judged not only by the degree of its accuracy and judicious selection of material but also by the general arrangement, the style, and the "readableness" of the completed work. As one expects from a British University press the format is excellent though two volumes in place of one would have had some advantages. It is impossible to do justice to this volume in a limited review and at rather short notice. First and general impressions only can be given.

The interesting preface should be read first and might well be followed by a reading of the author's presidential address to the British Ecological Society (Journ. Ecol. **27**, 513: 1939). There are nine parts with a total of forty-three chapters making up the body of the book. The physical feature and geological history, climate, soil, and the biotic factor have one or more chapters apiece. It is particularly in the treatment of the edaphic factors that one notes at once the great advances of recent years in our knowledge of the physical environment of plants. In 1911 such terms as podsol, brown earth, and soil profile were not even mentioned and the study of the soil with dynamic concepts had scarcely commenced. The chapter on the biotic factor suggests strongly the wide field for experimental research of which preliminary investigation has given us glimpses.

The history and existing distribution of vegetation are considered in part two in three chapters. The "history," as here understood, commences with the influence of the Ice Age. A general summary of modern knowledge of Late Tertiary vegetation would have been useful. The development and extension of the methods of the pollen-analysis of peat bogs is aiding greatly in tracing the post-glacial history of our flora and vegetation. Much yet remains to be done and until intensive studies, autecological and cytogenetical in the widest sense, have been made on a large number of species, interpretation of peculiarities of existing distribution must remain tentative.

The most theoretical part is concerned with the nature and classification of vegetation in part three. Vegetation is differentiated into more or less easily distinguishable units or *plant communities*. The recognition, diagnosis, delimitation, and classification of these communities is a major concern of plant ecologists and there is still a great diversity of opinion and practice. In Britain there have not developed definite "schools" of ecological method—perhaps because of peculiarities in British psychology, perhaps because of the limitations of our natural vegetation—and this has certain advantages. Prof. Tansley is thus without national or regional bias in laying particular emphasis on the dynamic system of Clements.

While, however, placing the greatest importance on plant succession as a process and as a basis for the classification of plant communities, he rejects or considerably modifies some of Clements's subsidiary concepts. For example, he rejects the concept of vegetation as an organism and extends the use of the terms "formation," "association," and "climax" to other than communities of the climatic climax. With this extension of climax to communities maintained relatively permanently in a given state by dominance of edaphic or biotic factors the distinction between "climaxes" and "sub-climaxes" seems none too clear. The synecologic importance of life-form is emphasized.

Parts four to nine deal with the communities of British plant-life, under the main headings (and in this sequence): woodlands, grasslands, the hydroses (freshwater, marsh, fen and bog vegetation), heath and moor, mountain vegetation, and maritime and sub-maritime vegetation. It is obvious that while the dynamics of vegetation are frequently referred to throughout the treatment of the different communities the classification is not strictly on a successional basis. Probably such a treatment is neither desirable nor possible at the present time, but one would have welcomed a summary of the main communities so arranged as to indicate their probable successional relationships so far as these are known or can be reasonably postulated.

The thirteen chapters dealing with woodlands (including scrub) give a relatively full account of the natural, semi-natural, and artificial woods of the British Isles. The dominant trees and the more important of the shrubs and woody climbers do not make a very long list, but floristic poverty is to some extent offset by the ecological interest of the high correlation between the kind of forest community and soil type. The oakwoods, beechwoods, ashwood, pine and birch woods, and alderwood are described with numerous examples and series of well-chosen photographs. Their variations, development, distribution, and particulars of the life-histories of their constituent members are given in sufficient detail to form the most comprehensive ecological survey of British woodlands that has yet been published.

The vast bulk of British grasslands, occupying a much greater area of country than any other type of vegetation, "are subclimax or (better) plagioclimax vegetation, i.e., vegetation stabilized by pasturing." A valuable general account of the grasslands is followed by three chapters on acidic, basic, and neutral grasslands respectively. The great economic value of grasslands and the fact that their proper treatment is a matter of economic importance is slowly being realized. Improvement can only follow ecological knowledge and this involves classification, description, and experiment. Such a summary of recent research as is presented by Prof. Tansley must be of the greatest use both for the actual information it gives and by indicating methods and directions for further research.

The fresh-water hydrosere include vegetation of ponds, lakes, rivers, marshes, fens, and bogs. The recent work on the Cumbrian Lakes by Pearsall and on fen and bog vegetation by Godwin and others is very adequately considered. Heath and moor vegetation are dealt with in two chapters and mountain vegetation in Part VIII which also consists of two chapters. The ecology of the Welsh and Scottish mountains still presents a wide field for research and one which might, in these days of cheap motor-cars, be well investigated by some of the younger ecologists.

Maritime and sub-maritime vegetation has naturally a great attraction for ecologists and around the British coasts there are still unspoilt salt-marshes, shingle beaches, and sand-dunes which show as wide a range of vegetation as can be found on any coasts of temperate regions comparable in length. In four chapters, the varied vegetation on mud, sand, and shingle is described, with special references to such classic areas as Blakeney Point, the Dovey Estuary, and the Chesil Beach. The vegetation of the sea and of the inter-tidal zones below the salt-marsh is not included.

An index of 28 two-column pages is provided and with the very adequate "Contents" at the beginning of the volume should provide a sufficient guide to the use of the volume as a book of reference. Lists of books and papers referred to in the text are given at the end of the chapters. It is, however, less as a work of reference than as a unified and fascinating account of British vegetation that the book will be appreciated. It will be read and pondered over rather than merely consulted and it should be accessible to and read by every botanist who wishes to obtain a well-balanced knowledge of the results and trends of a branch of his science with contacts which range from those with physiology to those with taxonomy.

W. B. TURKILL.

Botany of the Living Plant.*—Some sixteen years have elapsed since the second edition of Professor Bower's well known text-book "Botany of the Living Plant" was published. The recent appearance of a new edition will be welcomed by all who are familiar with the many excellent qualities of the old one, and, it is to be hoped, by many new readers as well. In these days when many botanists try to read or at least to glance through a spate of literature which is often badly written or ill considered, it is indeed refreshing to return to the simple exposition of the basic facts and concepts of botanical science given by a master of his subject. Professor Bower, as is well known, possesses the qualification, somewhat rare amongst scientists, of being able to express complex ideas and facts in such a simple way that they can be understood by all who are willing to learn about them. One

* By F. O. Bower, Sc.D., LL.D., F.R.S., with the assistance of Professor J. M. F. Drummond, M.A., F.R.S.E. and G. Bond, B.Sc., Ph.D., third edition. Macmillan & Co., Ltd., London, 1939. Pp. ix+700. Price 25s. net.

wonders, by way of contrast, whether some of the more modern writers believe that complexity is a necessary concomitant of scientific value! In preparing the third edition of his book, Professor Bower has been assisted by Professor J. M. F. Drummond and Dr. G. Bond. The general plan of the book has undergone but little change, but it is interesting to note that the most outstanding alterations are in those sections which deal with the physiological, cytological and genetical aspects of the subject, in which branches it will be generally agreed that most advances have taken place in recent years. The comparative lack of change on the morphological and anatomical side may be partly due to the fact that these branches of botany have meanwhile become relatively unfashionable, but it is also a tribute to the accuracy and careful observation of the older school of botanists who studied these subjects so well that their findings have required little modification. There is, however, an interesting new chapter on the Relation of Size and Form in Plants, in which the author quotes and discusses examples which support his working hypothesis that "Elaboration of form as the size of the individual increases is a means of maintaining the surface-volume ratio, which would otherwise tend to fall to a point of physiological inefficiency." Professor Bower admits that his views on this subject are not yet fully proved, but asks his readers at least to give them serious consideration and to maintain an open mind meanwhile. Other subjects dealt with in this edition for the first time include plant hormones, photoperiodism, the Psilophytales, and vitamins. The sections dealing with mycorrhiza, nitrogen fixation by the nodule bacteria of leguminous plants, alternation of generations, and the Equisetales have also been largely rewritten or amplified. As time passes on, interest in this or that branch of botany waxes or wanes, and there are corresponding differences of opinion concerning what a student should be taught. Professor Bower, as would be expected, has taken a wide view of the whole subject, so that the reader is enabled to see any one specialization in relation to the whole. One feels that a student who has thoroughly mastered the contents of this book and performed practical work in the laboratory and field at the same time will have received a firm grounding in his subject on which it would be difficult to improve.

C. R. METCALFE.

Hedges, Screens and Windbreaks.*—The author of this volume suggests on page 6 that the main reason for the use of hedges and screens in gardens is "protection against the unwanted intrusion of others and the desire for privacy." One of the first things that strikes a British visitor to eastern N. America, particularly in the neighbourhood of Boston, is the absence of hedges, fences and gates in the villa gardens. The publication of this book

* By Donald Wyman. The McGraw-Hill Publishing Company, Ltd., New York, 1938. Pp. 250. Illustrated. Price \$2.75.

in the United States may perhaps indicate that American feeling in this matter is changing; indeed, the author states that "the problem of retaining privacy on the homegrounds is becoming increasingly important."

The book is divided into three parts: hedges, screens and their general culture; hedge plants listed according to various uses; and description of hedge plants. More than 250 different kinds of plants are mentioned, and the beginner may find difficulty in choosing those best-suited to his requirements. It is surprising that no mention is made of such well-known British hedging and screening plants as *Cotoneaster Simonsii*, *Rosa rubiginosa*, *Ligustrum ovalifolium aureovariegatum*, *Aucuba japonica*, *Rhododendron ponticum* and *R. Cunningham's White*.

A "hardiness" map is given, divided into ten zones, based on temperature. This will certainly be useful to American readers. In some cases, however, it may prove to be misleading, as other factors besides temperature, such as soil, exposure, rainfall, etc., undoubtedly affect the hardiness of a species in a particular locality.

The publication of this useful volume should certainly stimulate interest in a neglected branch of American horticulture.

A. OSBORN.

A Flora of Assam.*—Volume 3 of this work has now appeared. The previous parts were reviewed in past issues of the Kew Bulletin (K.B. 1935, 586; 1937, 528; and 1938, 312). The present volume comprises the families from *Caprifoliaceae* to *Plantaginaceae*, as understood in the Genera Plantarum. More attention has been paid in this issue to correct nomenclature and there is a short discussion on the subject in the introduction.

C. E. C. FISCHER.

Edible Wild Plants.†—As North America has been bounteously endowed by Nature with edible wild fruits and other edible plant products it is fitting that a fairly detailed and comprehensive work devoted exclusively to them should have been prepared. The writer remarks that it would probably be difficult to find a piece of woodland or an abandoned field that did not some time during the season produce one or more species of wild fruits that are edible raw, or could be prepared in some way for the table. It is not surprising therefore, that a good proportion (90 pages) of a volume of this sort should be devoted to wild fruits, the term "fruits" being used of course in its popular sense.

A similar richness in species applies in the case of edible nuts, some of which, such as the hickories, are not found in any other

continent. The pecan (*Carya pecan*) is perhaps the best known of the indigenous American nuts and the one that has achieved most importance commercially, having now successfully invaded many oversea markets. Edible pine nuts, of which there are several, all on the western side of the continent, in themselves form an interesting group, being in this respect the equivalent of *Pinus Pinea* and *P. Cembra* in Europe. Pine kernels were of inestimable value as food to the North American Indians in days gone by. A short but interesting account of them is given.

Other sections of the book consist of—Edible Seeds and Seed Pods, Salad Plants and Pot-herbs, Edible Roots and Tubers, Beverage and Flavouring Plants, Sugars and Gums, and Mushrooms. These are followed by what are termed "finding indices," four in number and one for each of the four areas into which the author divides his territory. The object of these is to take the place of keys which the writer considers would have been too unwieldy to incorporate in a book of this sort. In them the species in the area in question are arranged alphabetically and their range, season and main characters briefly outlined. These "finding indices" do not take the place of, but are supplementary to a general index which serves the whole volume.

Probably the average adult of a civilized race to-day pays little attention to the wild fruits of his countryside, sharing the belief that "it takes a savage or wild taste to appreciate a wild fruit." This does not apply, of course, to small boys, those ever hungry mortals who relish fruits of all kinds in all stages of maturity. It is believed by some that interest in plants and therefore in botany is first aroused in a child when on excursions to the woods and fields in search of wild fruits and nuts, and that in plucking or gathering them children automatically become interested in the plants that produce them, where and how they grow, and their seasons. That this often is the case there can be little doubt. However, such fruits have other and more important uses. One which has come to the fore more and more in recent years is their great value in any comprehensive study of their cultivated descendants or prototypes among present-day food or crop plants, especially in the breeding and production of still better or more disease-resistant forms.

F. N. HOWES.

Common Water and Marsh Plants of India and Burma.*—A work of this nature should be welcomed, as there is no book on the subject which deals so extensively with the vegetation of the Indian freshwater lakes. Though written originally for the field worker of the Malaria Survey of the Government of India, it is more than a bulletin for this limited purpose. The introductory

* "Hand-Book of Common Water and Marsh plants of India and Burma," by K. Biswas and C. C. Calder. Malaria Bureau No. 11, Health Bulletin No. 24. Government of India. Manager of Publications, Delhi, 1937. Pp. xiii + 140; 6 photographs, 32 plates. Price Rs. 2-12 or 5s.

* By U. N. Kanjilal, A. Das, P. C. Kanjilal and K. N. De. Vol. 3. Published under the authority of the Government of Assam, 1939. Pp. x + 578. Price Rs. 12.

† By O. P. Medsger. The Macmillan Co., New York, 1939. Pp. 323, 19 photographs + line drawings. Price 16s. net.

BULLETIN OF MISCELLANEOUS INFORMATION No. 9 1939 ROYAL BOTANIC GARDENS, KEW

L—AFRICAN ORCHIDS: XI.* V. S. SUMMERHAYES.

Habenaria rhopalostigma Rolfe in Dyer, Fl. Trop. Afr. 7, 248 (1898). *H. nephrophylla* Schltr. in Engl. Bot. Jahrb. 51, 507 (1915).

An examination of the type gatherings of these two species shows that they are almost identical. There are no basal leaves in the material of Rolfe's species but the upper parts agree in all essential features with *Stolz* 1836, the type of *H. nephrophylla*. In *Carson* 31 the anterior petal-segments, the lateral lobes of lip and the spur are a little longer than in *Stolz* 1836 but since these parts are all over 5 cm. in length a difference of 1 cm. or so is to be expected in different individuals or gatherings. The shapes of the parts and relative lengths are the same in both gatherings.

Habenaria Dregeana Lindl. in Ann. Nat. Hist. 4, 314 (1840); Rolfe in Dyer, Fl. Cap. 5, iii, 135 (1912).

H. Petri Schltr. in Ann. Transv. Mus. 10, 245 (1924). *H. MacOwaniana* Kraenzl. in Engl. Bot. Jahrb. 16, 150 (1893); Rolfe, l.c. 136; non *H. MacOwaniana* (Rchb. f.) N. E. Br.

In "Flora Capensis" Rolfe pointed out some of the differences between the above two species, which Kraenzlin had considered identical in his Monograph. Schlechter also in his key to the South African species of Sect. *Diphyllae* uses the petal differences in the two species (see reference above). *H. Petri* differs from *H. Dregeana* in the anterior petal-lobe being distinctly longer than the posterior instead of much shorter, in the side lobes of the lip almost equalling the middle lobe instead of being considerably shorter, and in the spur being more slender and not so markedly thickened at the base. The species are undoubtedly closely allied agreeing in general habit, inflorescence and column structure.

Unfortunately in his citation of specimens Rolfe again confused the issue as many specimens are cited under the wrong species. The following is a corrected list of determinations of the specimens cited by Rolfe in "Flora Capensis" so far as I have seen them, together with others added to the Kew collection since.

H. Dregeana. Cape Province: *Bauer* 815; *Miss Pegler* 348, 1814; *Hutton* 42. Natal: *Gerrard* 1811; *Penther* 275; *Rudatis* 258; *Wood* 815, 1058; *Mrs. Fannin* 81; Mount aux Sources, Dooley Slopes, 6000 ft., Feb. 1926, *Bayer & McClean*. Basutoland: *Lérivé*, 1911, *Dieterlen* 487a. Transvaal: *Modderfontein*, March

* Continued from K.B. 1938, 153.

pages deal with the ecology of water plants in the tropical climate of India, which will be appreciated both by the layman and by the trained botanist. The main part of the work is written in the style of a flora, with keys to genera and species, the latter comprising full descriptions. Here and there short ecological and geographical notes are given which make the work still more interesting. The difficulty of technical terms is eliminated by avoiding them as far as possible and by adding a glossary of those used. A large number of plates are included, with figures of practically all the plants described.

The authors are to be congratulated on bringing out such a handy book, which will be used extensively by field workers in India, and which will help many young botanists to appreciate the vegetable life of our freshwater lakes and pools.

K. N. KAUL.

Biological Terms.*—From the botanical point of view, this dictionary is disappointing. Many of the definitions given are obsolete, incorrect or insufficient, and a number of terms used in plant ecology are omitted. A seed is defined as "a mature fruit containing an embryo ready for germination under suitable conditions"; phanerogam as "a phaenogam or plant with conspicuous flowers" ("phaenogam" omitted); cryptogam as "a plant without apparent reproductive organs," and other examples could be quoted. It would appear that the authors have not had access to Daydon Jackson's "Glossary of Botanic Terms," which must always serve as a basis for any lexicographer of botanical terminology. It is to be hoped that if another edition is called for, the botanical section will be brought up to date and carefully revised.

* A Dictionary of Scientific Terms: Pronunciation, Derivation, and Definition of terms in Biology, Botany, Zoology, Anatomy, Cytology, Embryology, Physiology." By I. F. Henderson, M.A., and W. D. Henderson, M.A., B.Sc., Ph.D., F.R.S.E. Third Edition, revised by J. H. Kenneth, M.A., Ph.D., F.R.S.E. Oliver and Boyd, Edinburgh & London, 1939. Pp. xii + 385. Price 16s.

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1896, *Conrath* 1084; Johannesburg, Houghton Estate, Feb. 1923, *Moss* 7566.

H. Petri. Cape Province: *MacOwan* 767; Queenstown, summit of Long Hill, 4400 ft., March 1893, *Galpin* 1501; *Penther* 111 (partly). Natal: *Allison* 24; Aug. 1887, *Sanderson*, comm. *Wood*; *Sanderson* 487. Orange River Colony: *Sankey* 261. Transvaal: *Doidge* 4806.

It will be seen that *H. Petri* is commoner and more widespread than appears from "Flora Capensis." The sheet in the Stockholm Herbarium of *Penther* 111, collected at Newmarket in Griqualand East, consists of 2 specimens of *H. Petri* and 3 specimens of *H. Tysoni* Bolus. Schlechter (l.c.) separates this latter species from the two species already dealt with on account of the supposed completely glabrous anterior petal-lobe and labellum in *H. Tysoni*. The co-type material of *Tyson* 1068 at Kew has these organs distinctly if shortly ciliate and this is also the case in the *Penther* specimens. In any case this character seems to be of little taxonomic value in this group since in both *H. Dregeana* and *H. Petri* the petal-lobes (anterior and/or posterior) as well as the lip may vary from very faintly papillose and virtually glabrous to distinctly shortly pubescent.

H. Tysoni may, however, be distinguished by its much broader and looser spike, larger flowers, relatively narrower and more acute dorsal sepal, quite differently shaped spur and larger rostellum middle-lobe.

***Habenaria epipactidea* Rchb. f.** in *Flora*, **50**, 100 (1867). *Orchis foliosa* Sw. in *Kongl. Vetensk. Acad. Handl. Stockh.* **21**, 206 (1800). *H. foliosa* (Sw.) Rchb.f. in *Flora*, **48**, 180 (1865), non A. Rich. *H. hircina* Rchb.f. in *Flora*, **50**, 100 (1867). *H. polyphylla* Kraenzl. in *Engl. Bot. Jahrb.* **16**, 214 (1892). *H. Schinzii* Rolfe in *Dyer, Fl. Trop. Afr.* **7**, 219 (1898). *H. perfoliata* Kraenzl. in *Bull. Herb. Boiss. sér. II.* **2**, 942 (1902). *H. Rautanenii* Kraenzl. l.c. **4**, 1008 (1904).

The above new synonymy is proposed as a result of an examination of type or authentic material of all the "species" mentioned. The oldest epithet for the species is *foliosa* proposed by Swartz in 1800, but owing to the existence of *Habenaria foliosa* A. Richard (1841) this epithet cannot be used. The species is characterised by the more or less orbicular-elliptical petals, the short and narrow lateral lobes of the lip, and especially by its remarkable column. Of this the large triangular conduplicate rostellum, rising well above and in front of the anther, is the most striking feature. A certain amount of variation occurs in the size of the flowers, in the shape of the petals, in the length of the lateral lobes of the lip and in the length of the spur, which in *Welwitsch* 736 (type collection of *H. hircina* Rchb.f.) is about twice as long as in any other specimen. There is, however, no apparent correlation between these variations, while the very characteristic column remains identical in all the specimens examined. The distribution

of the species is from Kilimanjaro in the north, southwards in Tanganyika Territory, Angola, South West Africa, Transvaal, Natal, Orange River Colony to the eastern Cape Province. It has not, however, yet been recorded from Nyasaland or Rhodesia.

***Disperis raililabris* Summerhayes**, sp. nov.; ex affinitate *D. crassicaulis* Rchb.f., a qua folio multo minore, bracteis angustioribus, tepalis angustioribus acutioribusque, labelli lamina simplici exappendiculata differt.

Herba terrestris, erecta, gracilis, usque ad 15 cm. alta, purpureo-violacea; tuber anguste ovoideum, 5–15 cm. longum. *Caulis* basi vagina ovata acuta circiter 1 cm. longa instructus, infra medium unifolius, apice saepissime uniflorus sed usque ad 4-florus, glaber sed superne $\pm$ rugulosus. *Folium* vaginiforme, ovatum vel lanceolato-ovatum, acutum, apice $\pm$ reflexum, 4–10 mm. longum. *Flores* subdistantes, erecto-patentes; bractee late lanceolatae, convexae, acuminatae, 5–8 mm. longae, 2–4 mm. latae, ovario pedicellato manifeste breviores. *Sepalum* intermedium valde incurvato-falcatum, lanceolato-ligulatum, acutum, convexum, 10 mm. longum, 2 mm. latum; sepala lateralia e basi angusta oblique semi-orbicularia, acuta, latere antico medio leviter dilatata, praeterea margines anticos medios versus breviter et obtuse calcarata. *Petala* sepalo intermedio adnata, galeam semisphaericam apice trilobam formantia, apice libera, incurvato-falcata, 10 mm. longa, longitudinaliter plicata, lateribus reflexis, latere postico leviter incrassato (sepalo intermedio adnato) 0.5 mm. lato, latere antico erecto-patente margine undulato 2 mm. lato. *Labellum* basi columnae per 2 mm. adnatum, unguiculatum; unguis ligulatus, in toto 3.5 mm. longus, 0.7 mm. latus; lamina valde reflexa, simplex vel obscure triloba, quadrilateralis, quadrantibus tribus superioribus angustata, apice obtuse breviter acuminata, 3.5 mm. longa, 2.5 mm. lata, apice excepto glabro omnino papillosa. *Columna* 2 mm. alta. *Anthera* 2.2 mm. longa; staminodia curvata, papillosa, ante antheram posita. *Rostelli* lobus intermedius late orbicularis; brachia lateralia circinatim incurvata, apice divergentia, obtusissima, spathulato-dilatata. *Ovarium* 6–7 mm. longum, longitudinaliter rugulosum, glabrum.

OUBANGUI-CHARI. Near Sougaya, 40 km. S. of Yalinga, in moist sandy plain, May 31st 1921, *Le Testu* 2804 (type in Herb. Le Testu). "Plante tout entière non verte, mais d'un pourpre $\pm$ violacé, atténué en jaunâtre au sommet."

This new species must be considered as belonging to the same group as *D. crassicaulis* Rendle, *D. Stolzii* Schltr., *D. katangensis* Summerh. and other similar species. It resembles most closely *D. crassicaulis* which agrees with it in possessing only one leaf which, however, is much larger than the small scale-like leaf of *D. raililabris*. In the latter species the lip, which, owing to its resemblance in shape to a flat-fish of the genus *Raia*, provides the specific name, is a very interesting structure. The lamina forms a kite-shaped quadrilateral with its broadest axis about a quarter of the

whole length above the base, and running out into a narrow blunt apex. The basal part is adnate to the claw in a similar manner as in *D. katangensis* but there is no apparent appendage. Presumably the flat apical "lamina" which is found in other species of this affinity is quite lacking. In *D. crassicaulis* this "lamina" is extremely small but bears a high vertical keel in its centre. It is possible that the lamina in *D. raiilabris* corresponds to the appendage in allied species since it is closely papillose all over except at the extreme apex, whereas in other species the appendage is the papillose part. (See Hooker's *Icones Plantarum*, tt. 3269-3271.)

Polystachya Bennettiana *Rchb.f.* *Otia Bot. Hamburg.* **2**, 113 (1881).

In Kraenzlin's monograph of the genus* the above species is placed as synonymous with *P. Steudneri* *Rchb.f.* which was published at the same time. Kraenzlin states that the original specimens of both species are very poor and that the descriptions are unsatisfactory. Examination of the type specimens in the Reichenbach Herbarium at Vienna shows that the two species are perfectly distinct, and, moreover, belong to two different sections of the genus! *P. Steudneri* seems naturally placed in sect. *Calluniflorae*, but *P. Bennettiana* is a close ally of *P. imbricata* Rolfe, *P. Rivae* Schweinf. and *P. stricta* Rolfe and should be placed in sect. *Caulescentes*, differing from most of its nearer relatives by the very slight blackening of the leaves on drying.

It is possible that Kraenzlin's mistake is connected with the mixture of the two species collected by Steudner under his number 702. I have seen three sheets of this number. That at Berlin, the Herbarium from which the material was distributed, contains seven specimens of *P. Steudneri* and two of *P. Bennettiana*. The sheet at Kew is evidently *P. Steudneri*, but that at Vienna contains two specimens of *P. Bennettiana* and none of *P. Steudneri*.

Polystachya stauroglossa *Kraenzl.* in *Engl. Pflanzenw. Ostaf. C.* **155** (1895). *P. graminoides* *Kraenzl.* in *Kew Bull.* 1926, 289.

A comparison of the type specimens of these two "species" shows that they are identical. The species seems to be common in Uganda. The narrow leaves and spreading panicles of small, almost globular flowers give it a characteristic appearance.

Polystachya (§ Elasticae) eurychila *Summerhayes*, sp. nov.; a ceteris speciebus sectionis latitudine labelli longitudinem suam fere duplo superante, labelli pulvinis pilorum nullis facile distinguenda.

Herba epiphytica vel saxicola, sub anthesi aphylla. *Caules* approximati, erecti, usque ad 20 cm. alti, inferne modice incrassati, carnosii, foliorum vaginis ± membranaceis arcte imbricatis fere omnino obtecti, basi vaginis paucis acutis instructi. *Folia* non visa. *Inflorescentiae* terminales, simpliciter racemosae, erectae vel ± nutantes, usque ad 5 cm. longae, subdense pluri- vel multiflorae;

pedunculus vaginis 1-2 acutis imbricatis instructus; rhachis sparsiuscule setuloso-pubescentis; bractae latissime deltoideo-ovatae, cuspidato-acuminatae, 1-2 mm. longae. *Flores* erecto-patentes, lilacino-rosei. *Sepalum* intermedium elliptico-oblongum, rotundatum vel minute emarginatum, 3.5-4 mm. longum, 1.7-2 mm. latum, trinervium; sepalae lateralia rotundato-triangularia, obtusa, interdum dorso sub apice breviter cuspidata, 4-5 mm. longa, basi 4-5 mm. lata, mentum conicum subacutum 3-3.5 mm. longum formantia. *Petala* ligulata vel spathulato-ligulata, circiter 3.5 mm. longa, 0.6-1.4 mm. lata. *Labellum* ex ungue brevi latissimum, trilobum, 3.5-4.5 mm. longum, 6-7 mm. latum; lobi laterales patentes, elliptico-oblongi, circiter 3 mm. longi, 2-2.5 mm. lati; lobus intermedius late triangularis, obtusus, 1-1.5 mm. longus, 1.5-2 mm. latus; labellum ecallosum, fere omnino farinaceo-puberulum. *Columna* circiter 2 mm. longa, fere teres; androclinii margo integer, hyalinus; anthera non visa; rostellum trilobum, lobis lateralibus tenuibus quadratis, intermedio porrecto carnosio; fovea stigmatica transverse elliptico-rectangularis; ovarium (cum pedicello brevi) 2-4 mm. longum. *Capsula* pyriformi-ellipsoidea, 6-8 mm. longa.

UGANDA. Mt. Elgon, between Butandiga and Bulambuli, 2400 m., arboreal, Jan. 1936, *Eggeling* 2438 (type); Butandiga, on rocky knoll, 2333 m., Jan. 1918, *Dummer* 3679. Chua, arboreal on *Acacia abyssinica*, Dec. 1935, *Eggeling* 2404.

A striking little species which agrees well with other members of sect. *Elasticae* in habit, the absence of leaves during flowering, the colour and texture of the flowers and the shape of the sepals. The lip, however, is completely devoid of the yellow hair-cushions characteristic of other species and is remarkable in being nearly twice as broad as long, the main part of the lip being formed by the large spreading lateral lobes. Both dorsal and lateral sepals are sometimes furnished with a very short dorsal cusp just below the apex, a feature which is much more prominently developed in other members of the section.

P. eurychila is interesting as being the first localised East African member of the section. *P. pseudo-Disa* *Kraenzl.* was described from a plant collected by M. T. Dawe, presumably in Uganda, but it has not been re-collected there. On the other hand a specimen has recently come to hand from Sierra Leone (coll. F. C. Deighton) where Dawe also collected. It is therefore still a little doubtful where Dawe's original specimen of *P. pseudo-Disa* really came from, although it is not by any means improbable that the species occurs in both Sierra Leone and Uganda. Such apparently discontinuous distributions are known in many African orchids and are probably only indications of our ignorance of the exact geographical distributions of African plants generally.

Polystachya calluniflora *Kraenzl.* in *Engl. Bot. Jahrb.* **28**, 166 (1900). *P. trigonochila* *Kraenzl.* l.c. 167.

* Fedde, *Repert. Spec. Nov. Beih.* **39**, 35 (1926).

Examination of authentic or type specimens, and comparison of the descriptions, of these two "species" shows that they are conspecific. Indeed there are no essential differences in the descriptions although in his comments Kraenzlin relates his species to quite different species-groups. In his monograph of the genus (Fedde, Repert. Nov. Spec. Beih. **39**, 13, 37: 1926) he even places them in distinct sections, *P. calluniflora* in sect. *Calluniflorae* and *P. trigonochila* in sect. *Caulescentes*, but for this latter choice there seems not the least justification.

Polystachya polychaete Kraenzl. in Engl. Bot. Jahrb. **17**, 50 (1893). *P. euspatha* Kraenzl. in Engl. Bot. Jahrb. **48**, 398 (1912).

I have examined the type specimens of the above two species as well as numerous specimens from the Gold Coast, Camerouns, Gabon, Uganda and Tanganyika Territory and can find no significant differences. The front lobe of the lip varies in breadth and in the shape of the apex, while the side lobes may be slightly recurved, strictly patent or slightly incurved with respect to the median line of the lip. In general habit, type of inflorescence, bracts and other floral parts there is remarkable uniformity, so that the species is easily distinguishable from all other species.

Polystachya Woosnami Rendle in Journ. Linn. Soc. Lond. Bot. **38**, 235 (1908). *P. longevaginata* Kraenzl. in Engl. Bot. Jahrb. **43**, 333 (1909).

Comparison of the two type specimens reveals their identity, but Rendle's name has a few months' priority over that of Kraenzlin. The vegetative and inflorescence characters are those of *P. Adansoniae* Rchb.f. and *P. Stuhlmannii* Kraenzl., but the flowers are larger with a much longer mentum while the lip is differently constructed, having a small orbicular middle lobe.

Polystachya Steudneri Rchb.f. Otia Bot. Hamburg. **2**, 113 (1881). *P. Beccarii* Rchb.f. ex Martelli, Florul. Bogos. **80** (1886). *P. Ellenbeckiana* Kraenzl. in Engl. Bot. Jahrb. **33**, 62 (1902).

Examination of the type specimens of the three above mentioned "species" shows them to belong to one species only. The structure of the inflorescence and flowers is characteristic and all three gatherings agree in these respects. The flowers in this species, however, open while the plant is in the leafless condition, the leaves developing later as the fruits ripen. The type of *P. Steudneri* represents a late stage with ripe fruits and fully-grown leaves, but in the other two specimens the leaves were only partially developed at the time of collection. In the Kew Herbarium are several gatherings of *P. Steudneri* from Mt. Elgon and Mt. Debasien to the north of it. These are all in the flowering stage but agree perfectly with the flowering material from Abyssinia. I have already referred to the confusion between this species and *P. Bennettiana* Rchb.f. under the latter species. The specimens of *P. Steudneri* at Berlin

and Kew under Steudner No. 702 exactly match the type specimen at Vienna (*Steudner* 704).

Polystachya ramulosa Lindl. Bot. Reg. **24**, misc. p. 76 (1838), var. **angustifolia** Summerhayes, var. nov.; a typo foliis angustioribus anguste oblanceolatis, inflorescentiis pro rata brevioribus, floribus albis, labelli lobis lateralibus antice truncatis recedit.

GABON. Upper Ngounyé River, between the R. Wano and Ditadi, on the route from Kembélé to Mbigou, in the moss on a felled tree, Nov. 21st 1925, *Le Testu* 5775.

In spite of the differences enumerated above the Gabon plants (14 pieces in all) agree so well in general vegetative and floristic characters with the other material at Kew that I do not feel able to separate them except as a variety. The whole of the material was apparently collected from a single tree so it may quite possibly represent clones of one original plant.

It is still a question as to whether *P. ramulosa* is better placed in sect. *Calluniflorae* than in sect. *Eupolystachya*. The species has the small flowers and long mentum of many species of the former section but in habit and inflorescence it is very like a small *P. odorata* Lindl.

Polystachya odorata Lindl. in Journ. Linn. Soc. Lond. Bot. **6**, 130 (1862). *P. usambarensis* Schltr. in Notizbl. Bot. Gart. Berl. **2**, 250 (1898).

Some years ago (Kew Bull. 1935, p. 198) I suggested that *Polystachya usambarensis* Schltr. was incorrectly placed by Kraenzlin in sect. *Elasticae*. An examination of the type specimen shows that this is actually the case and also that the plant was merely a small, poorly developed individual of the well-known *P. odorata* Lindl. This species has been found in Uganda but not elsewhere in East Africa. Whether Holst collected the original specimen of *P. usambarensis* in the wild state or whether it was a cultivated plant is not evident from the information available. It is possible that it was an introduction from West Africa.

Polystachya tessellata Lindl. in Journ. Linn. Soc. Lond. Bot. **6**, 130 (1862). *P. gracilis* De Wildem. Notic. Pl. Utiles Congo, 136 (1903). *P. latifolia* De Wildem. l.c. 138.

On examination *P. gracilis* is seen to be merely a small and poorly grown specimen of *P. tessellata*. On the type sheet there are also a number of leaves belonging to plants of *P. mukandaensis* De Wildem. which was collected by Gentil at the same locality and on the same occasion. The specimens of *P. latifolia* in the Brussels herbarium are all typical *P. tessellata* and it is difficult to appreciate the grounds on which *P. latifolia* was distinguished from Lindley's species; the characters mentioned by De Wildeman seem quite inadequate. Kraenzlin's reduction of *P. latifolia* to *P. odorata* Lindl. is incorrect, as the two have quite different inflorescences.

Polystachya mukandaensis De Wildem. in Notic. Pl. Utiles Congo, 139 (1903). *P. Huyghei* De Wildem. l.c. 315, cum fig. (1904). *P. Plehniana* Schltr. in Engl. Bot. Jahrb. 38, 8 (1905). *P. Dorotheae* Rendle in Cat. Talb. Niger. Pl. 103, t. 13, fig. 3, 4 (1913).

I have already, in the Flora of West Tropical Africa, 2, 432 (1936), reduced *P. Plehniana* and *P. Dorotheae* to *P. mukandaensis*. On examining the description and authentic material of *P. Huyghei* De Wildem., I find that it also cannot be separated from *P. mukandaensis*. The species is readily recognised by the linear-elliptical or linear-lanceolate leaves, and the labellum, which is trilobed only in the apical quarter, the short and broad middle lobe being furnished with a short keel or crest which is separate from the main crest on the disk of the lip. It is, however, clearly a member of sect. *Eupolystachya* allied to *P. tessellata* Lindl. and other similar species. Kraenzlin (Fedde Repert. Nov. Spec. Beih. 39, 52: 1926) considered *P. mukandaensis* as identical with *P. hypocrita* Rchb.f., but an examination of the type specimen of the latter species shows it to be quite different from *P. mukandaensis* and indeed the same as *P. tessellata*.

Polystachya golungensis Rchb.f. in Flora, 48, 185 (1864). *P. spiranthoides* Kraenzl. in Kew Bull. 1926, 294.

In a previous paper of this series (Kew Bull. 1935, 199) I published a note on this species and cited three synonyms. There is now a fourth, *P. spiranthoides* Kraenzl., to be included. This adds practically nothing to our knowledge of the species since the material described by Kraenzlin was cultivated, incomplete and of uncertain origin. Examination shows it to agree well with other authentic material of *P. golungensis*.

Polystachya (§ Eupolystachya) gabonensis Summerhayes, sp. nov.; affinis *P. dolichophyllae* Schltr., a qua foliis angustioribus, inflorescentiis folia usque ad duplo superantibus, floribus minoribus, sepalis lateralibus et labello pro rata latioribus, labello basi dense farinaceo-pilosulo ecalloso apice obtuso differt.

Herba terrestris, anthesi usque ad 55 cm. alta. *Caules* caespitiosi, erecti, carnosii, teretes, usque ad 15 cm. alti, inferne fere 1 cm. diametro, sursum sensim angustati, basi vaginis paucis obtusis instructi, sursum usque ad apicem foliis 4-6 laxiuscule vestiti. *Folia* adscendentia, e vaginis $\pm$ recurvata, lineari-oblonga vel anguste oblongo-lanceolata, apice obtusa vel acuta fere aequaliter obtuse vel subacute brevissime bilobulata, inferne conduplicato-carinata; lamina (supra articulum) usque ad 17 cm. longa, 8-20 mm. lata, infima saepius multo breviora; vaginae sublaxae, usque ad 6 cm. longae. *Inflorescentiae* erectae, rigidae, usque ad 45 cm. altae, simplices vel prope apicem pauciramosae, multiflorae; pedunculus teres, usque ad 30 cm. longus, vaginis circiter 3 complanatis acuminatis fere omnino obtectus; rhachis usque ad 15 cm. longa, subdense setuloso-pubescent; rami 1-4, suberecti, usque ad 5 cm.

longi; bractae triangulari-lanceolatae, acuminatae, 2-5 mm. longae; pedicelli cum ovariis 3-5 mm. longi, pubescentes. *Flores* flavi, erecto-patentes. *Sepalum* intermedium oblongo-ovatum, breviter acuminatum, 4.5-5 mm. longum, circiter 2.5 mm. latum, trinervium; sepala lateralibus oblique ovato-triangularia, breviter acuminata, latere antico (vel superiore) 5.5-7 mm. longa, pedicolum adnata mentum obtusum circiter 3.5 mm. longum formantia; sepala omnia extra pubescentia. *Petala* oblonga, inferne leviter angustata, obtusa, 4 mm. longa, 1.25 mm. lata, uninervia. *Labellum* medio vel supra medium breviter trilobatum, rhomboideo-quadratum, 5-6 mm. longum, circiter 5 mm. latum; lobus intermedius late rotundato-triangularis, apice brevissime apiculatus, 2-2.5 mm. longus, 3-3.5 mm. latus; lobi laterales leviter incurvati, semi-orbiculares, rotundati, 0.6-0.7 mm. longi, 0.8-1.1 mm. lati; discus dense pulverulento-papillatus (vel farinoso-pilosulus). *Columna* erecta, fere teres, 2.7 mm. alta; androclinium leviter excavatum; anthera rotundata, dorso breviter producta. *Capsulae* fusiformi-ellipsoideae, obtuse 6-costatae, 1-1.5 cm. longae.

GABON. Between the Rivers Woleu and Ntem, grassy spots on the rock between Salem and Elelem, Jan. 1933, *Le Testu* 8971 (type in Herb. Kew., isotypes in Herb. Le Testu); Akoum Mdomgou, near Oyem, April 1933, *Le Testu* 9084.

A species with a very distinct and easily recognizable facies on account of the rather crowded relatively narrow somewhat recurved leaves and the tall slender only slightly branched inflorescences, which stand out well above the leaves. The nearest relative is apparently *P. dolichophylla* Schltr. which has broader leaves, and larger flowers in much shorter inflorescences. The lip in *P. gabonensis* is broader and more obtuse and lacks the basal callus of *P. dolichophylla*; instead the disk is densely covered with mealy hairs. The inflorescences are somewhat reminiscent of *P. rhodoptera* Rchb.f. but that species has a very different habit and lip-structure.

Polystachya Ottoniana Rchb.f. in Hamburg. Gartenzeit. 11, 249 (1855). *P. glaberrima* Schltr. in Engl. Bot. Jahrb. 20, Beibl. 1, 11 (1895).

An examination of the type specimen of *P. glaberrima* Schltr. reveals several important errors in the original description and the notes following it. Schlechter states that the whole plant is glabrous and comments particularly on the rhachis and lip in this connexion, but in the type specimen both these parts are distinctly hairy, the hairs on each organ being similar to those in many other species of *Polystachya*. The lip is described (and also figured in Schlechter's dissections on the sheet) as "rhomboideum" and entire, but actually the flower he dissected has a trilobed lip, the side lobes, however, overlapping the middle lobe and thus apparently overlooked by him. Indeed comparison with specimens of the common *P. Ottoniana* Rchb.f. from the eastern Cape Province, Natal, and the Transvaal

shows that *P. glaberrima* is simply a form of Reichenbach's species in which the usual apiculus of the lip is more drawn out than generally; in other respects the plants are identical.

Polystachya (§ Affines) isochiloides Summerhayes, sp. nov.; affinis *P. Goetzeanae* Kraenzl. et *P. Shega* Kraenzl., ab illa floribus minoribus, labelli lobis lateralibus majoribus intermedio acutiore marginibus undulatis, ab hac caulibus longioribus, sepalis glabris, labello latiore basi callo lineari instructo distinguitur.

Herba epiphytica; caules approximati e rhizomate brevi exorientes, erecti, inflorescentiis inclusis usque ad 38 cm. alti, teretes, 1-3 mm. diametro, basi vaginis 1-2 arcuatis cincti, superne 3-4-foliati. *Folia* fere erecta, linearia vel ligulato-linearia, apice breviter obtuse vel subacute bidentata, 6-17 cm. longa, 2-6 mm. lata, superiora inflorescentiam saepius aequantia vel superantia. *Inflorescentia* simplex vel pauciramosa, usque ad 17 cm. longa, pluriflora; pedunculus usque ad 12 cm. longus, vaginis membranaceo-papyraceis omnino obtectus; rami 1 vel 2, usque ad 1 cm. longi; rhachis dense pubescens; bractae lanceolatae, acuminatissimae, membranaceae, 2-7 mm. rarius usque ad 1.5 cm. longae; pedicelli (cum ovariis) 5-7 mm. longi, sparsissime pubescentes. *Flores* adscendentes, cremei, fragrant. *Sepalum* intermedium incurvatum, lanceolatum, acutum, convexum, 10 mm. longum, 2.5-3 mm. latum, quinquenervium; sepala lateralibus subfalcatis lanceolato-triangularia, acuta, margine antico basi dilatata, circiter 10 cm. longa, basi 4-5 mm. lata, mentum subconicum leviter incurvatum, 3.5-4.5 mm. longum formantia. *Petala* curvatim ligulato-oblancheolata, acuta vel leviter acuminata, 8-9 mm. longa, 1.7-2 mm. lata, trinervia. *Labellum* basi breviter unguiculatum, supra medium trilobatum, 8.5-9.5 mm. longum, 6-6.5 mm. latum, recurvatum; lobus intermedius ovato-lanceolatus vel late oblongo-lanceolatus, acutus vel acuminatus, marginibus crispato-undulatis, 4 mm. longus, 2.75 mm. latus, valde recurvatus; lobi laterales fere semi-orbiculares, rotundati, circiter 1 mm. longi, 2 mm. lati; lobi omnes pubescentes vel rarius capitati (? glanduloso-) pubescentes; discus callo (vel carina) lineari laevi antice sensim dilatato apice ipso rotundato 3.5-4 mm. longo instructus. *Columna* leviter incurvata, 2 mm. longa, semi-teres; androclinium leviter excavatum; nec anthera neque pollinia visa; rostellum truncatum.

TANGANYIKA TERRITORY. Handeni District, Mgera, Nyogi Mts. near Kwediboma, c. 1333 m. alt., in forest margin facing great precipice, Sept. 1933, *Burt* 4870 (type). Mt. Armfield, Koboriani Range, c. 1677 m. alt., on *Acacia* in *Berlinia-Brachystegia* woodland, Sept. 1933, *Hornby* 541.

I am placing this species, together with *P. Shega* Kraenzl. and *P. Goetzeana* Kraenzl., provisionally in Kraenzlin's sect. *Affines*, with which they agree in floral structure, but in habit, leaves and inflorescence they differ to such an extent from typical members of sect. *Affines* as to suggest that they really should form a new section.

The slender stems, almost leafless at the base, recall sect. *Caulescentes* but in other respects there is little similarity with species in that section. The present species is strongly reminiscent of *Isochilus linearis* in general habit, hence the specific epithet.

Polystachya simplex Rendle in Journ. Bot. 33, 199 (1895). *P. aristulifera* Rendle in Journ. Linn. Soc. Lond. 37, 219 (1905). *P. pachyrhiza* Kraenzl. in Engl. Bot. Jahrb. 43, 334 (1909).

In floral and general vegetative features these three agree extremely well. The species belongs to sect. *Superpositae*, the vegetative parts being very similar to those of *P. fusiformis* (Thou.) Lindl., but the flowers considerably larger. The type collection of *P. simplex*, both at the British Museum and at Kew, consists of the uppermost component only of a superposed sympodium, but the remains of the component immediately below is evident in each case. I have now seen specimens of the species from Ruwenzori, the West Nile Province of Uganda, Mt. Elgon, the Kericho district of Kenya Colony, and Kilimanjaro. It is evidently generally distributed on the mountains of East Africa.

Eulophia flavopurpurea (Rchb.f.) Rolfe in Dyer, Fl. Trop. Afr. 7, 65 (1897). *Cyrtopera flavopurpurea* Rchb.f. in Otia Bot. Hamburg. 1, 68 (1878). *Lissochilus Millsoni* Rolfe, l.c. 79 (1897). *L. Sereti* De Wildem. in Ann. Mus. Congo, sér. 5, 3, 180, t. 35, fig. 11-14 (1910). *Eulophia Millsoni* (Rolfe) Summerhayes in Hutch. & J. M. Dalz. Fl. West Trop. Afr. 2, 446 (1936) et in Kew Bull. 1936, 225.

Examination of the type specimen of Reichenbach's species (*Schweinfurth* 3546) shows without doubt that the above cited names are synonymous, the epithet *flavopurpurea* having 19 years priority. This very widely distributed species must therefore in the future bear the name accepted above. So far properly developed leaves have been collected only in the type gathering and many collectors state that there are no leaves at the time of flowering. Since the scape and leafy shoot are separate in *Schweinfurth* 3546 it is possible that they really belong to two different species. The undeveloped leaves attached to flowering shoots in other collections seem likely to be much narrower when full-grown.

Eulophia Schweinfurthii Kraenzl. in Engl. Bot. Jahrb. 17, 54 (1893); Rolfe in Dyer, Fl. Trop. Afr. 7, 65 (1897).

Kraenzlin seems unaccountably to have misunderstood the floral structure of this species since he describes the sepals as orbicular and much larger than the petals. Rolfe, who had not seen the species, adopts Kraenzlin's interpretation in the "Flora of Tropical Africa." Examination of the type specimen shows that it is the petals which are the larger and indeed the plant is a typical member of the group which includes *E. orthoplectron* Summerh., comb. nov. (*Lissochilus orthoplectrus* Rchb.f.), *E. involuta* Summerh. and *E. bella* N. E. Br. In this group the sepals are more or less oblong-oblancheolate and much shorter than the orbicular, apiculate

petals, while the spur is relatively long and pointed. *E. Schweinfurthii* seems to differ from all the other species assigned to this group; but it is difficult to judge accurately the limits of species in this and other groups of yellow flowered *Eulophias* formerly included in *Lissochilus*.

Eulophia Wakefieldii (Rchb.f. & S. Moore) Summerhayes, comb. nov. *Lissochilus Wakefieldii* Rchb.f. & S. Moore in Journ. Bot. **16**, 136 (1878).

Since *Wakefieldii* is the earliest published epithet in this group of yellow-flowered *Eulophias* I have decided to make the above combination from *Lissochilus* although I have not yet worked out the status of all the forms concerned. So far as I can see *E. speciosa* (R. Br. ex Lindl.) Bolus, an allied South African species, differs in the lip shape and colour, in the bracts, and in the vegetative parts.

LI—GENETICS IN RELATION TO EVOLUTION AND SYSTEMATICS AT THE SEVENTH INTERNATIONAL GENETICAL CONGRESS, EDINBURGH, 1939.

W. B. TURRILL.

Although the strained and uncertain international situation, both before and during the Seventh International Genetical Congress at Edinburgh, added considerably to the difficulties of the officers and organizing committee and resulted in the curtailment of certain parts of the programme, much of value was obtained by members from the papers read, from the discussions, and from personal contacts. Of the nine sections into which the Congress was divided that of Genetics in Relation to Evolution and Systematics had perhaps the widest appeal since it covered a varied field. Some of the more important of the papers given before this section are briefly reviewed below.

In the Plenary Session of the Section five papers were read—two by zoologists and three by botanists. Th. Dobzhansky in a paper with the title "On the Genetic Structure of Natural Populations of *Drosophila*" pointed out that evolution in the main has not been observed directly but inferred from a great body of morphological data. According to genetic theory the pressure of the evolutionary factors such as mutation, selection, isolation, and migration is constant and unrelenting. A living species can hardly remain static for any length of time. Recent research has demonstrated the existence of a tremendous field of variation in the germ-plasm of sexually reproducing and cross-fertilizing species. This variation encompasses a wealth of mutant genes and of gene rearrangements (especially inversions). From the standpoint of a systematist or morphologist this concealed variation is potential rather than one actually available to the species, but it represents the store of evolutionary raw material from which evolutionary changes must spring if they are to occur at all. This hidden field of variation is only detectable by genetic and cytological means. The main part

of the paper was concerned with detailed investigations of the concealed genetic variation in the species *Drosophila pseudoobscura*. It was shown that this species is a dynamic system of local colonies which can pursue, within certain limits, independent evolutionary courses. The elementary evolutionary changes occur in colonies of small breeding sizes and only secondarily, through migration and selection of superior genotypes formed in such colonies, can the texture of the species as a whole become gradually altered. Evolutionary changes are clearly not identical in all species, and groups where asexual multiplication, self-fertilization, or polyploidy occur should not be confused with species of *Drosophila*. Other considerations also make it certain that evolutionary changes differ both in rate and in kind in very common and mobile species on the one hand and in rare and more sedentary ones on the other.

G. Tischler's paper, "Die Bedeutung chromosomaler Rassen-differenzen für Systematik und Pflanzengeographie," was a useful summary of the relationship between chromosomal differences (especially polyploidy) and geographical distribution in plants, with special reference to the flora of Schleswig-Holstein. At least 400 wild coenospecies of Angiosperms are known which contain races with chromosomal differences. Many species become capable of surviving in a climatically unfavourable environment, through polyploidy, but within these species many plants remain diploid. Occasionally, though rarely, we find species of which the polyploid races are widely spread in more favourable climates. Many polyploids have become world-wide weeds, while their corresponding diploids have only local significance. These and other generalizations were illustrated by reference to *Salicornia*, *Triticum*, *Honckenya*, *Festuca*, *Vicia*, *Empetrum*, *Tradescantia*, *Penstemon*, *Veronica*, *Phleum*, *Vaccinium*, *Jasione*, *Matricaria*, *Datura*, *Paris*, etc.

J. S. Huxley in a valuable general paper, "Systematics in relation to genetics," stated that the progress of taxonomy itself and its contacts with other branches of biology are converting it into the basis of the study of evolution in action. Cytogenetic analysis is shedding light on particular taxonomic problems; taxonomic advance is suggesting important questions for experimental analysis; a combination of all lines of approach is increasing both the scope and the precision of the general principles underlying taxonomy and making it possible to forecast the course of differentiation and evolution in different kinds of taxonomic groups. Not only cytogenetics but ecology and embryology must also co-operate with taxonomy. Numerous examples, mostly from the animal kingdom, illustrated the various generalizations. It is clear that a concerted attack on what may be called biotaxonomy or micro-evolution will yield valuable results. What are likely to prove fruitful lines of attack include: the accurate mapping of the distribution of species and subspecies; the study of range-changes, and consequent hybridization; the description and genetic analysis of clines; the

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tabulation of the occurrence of sharply contrasted phases, their ecological analysis, and the study of the spread of mutant types; population studies to determine the extent and the geographical and temporal variation of gene-mutants and sectional rearrangements in nature; studies on the degree of divergence (speciation and subspeciation) in relation to ecological peculiarities (e.g. ease of dispersal, reproductive habits) and to type of genetic machinery (e.g., polyploidy, presence or absence of asexual modes of multiplication). It is essential that a better liaison be established between taxonomy and other branches of biology, that the staffs of the great museums and herbaria be increased, and facilities provided in connexion with them for experimental and analytical work.

W. B. Turrill read a paper on "Taxonomy and cytogenetics in plants." He showed that while it is desirable for several reasons that the taxonomist should be relatively conservative the data made available by recent researches in other branches of biology often have an important bearing on taxonomic problems. Cytogenetic data are particularly important since they offer the chance of developing a more dynamic system of classification, though they may upset a static one considerably. There is a wide field of research of mutual interest to the cytogeneticist and to the taxonomist and the object of the paper was to suggest general and detailed lines of co-operative research. The following sub-headings were used: classification of characters; degree of correlation of characters; constitution of taxonomic groups; the study of polymorphic groups; geographical and ecological problems; hybridization in nature and experiment; problems of apomixis; problems of phylogeny; and general suggestions. The distinction between phenotypes and genotypes is important to the taxonomist, who, however, has largely failed to realize the importance of, or, at least, to put into practice, simple cultural experiments. The question of "splitting" or "lumping" can be clarified by cytogenetic data. The sufficiency or otherwise of the usually accepted taxonomic grades and their definition, the "breakdown" in correlation of taxonomically important characters, the taxonomic treatment of polyploids and of highly polymorphic groups, the relation of coenospecies, ecospecies, ecotypes, geographical "races," clines, hybrids, segregates, and other derivatives from hybrids, and apomicts to the orthodox taxonomic scheme of hierarchical groups are a few of the problems of common interest to the taxonomist and the cytogeneticist which urgently need solution. The frequently uncritical, and therefore unsatisfactory, assumption of phylogenetic speculation as a basis for classification was discussed at some length, and some of the phylogenetic problems whose solution might be aided by directed cytogenetic research were mentioned. The need for careful determination of material used in cytogenetic studies and the desirability of more extended work on wild species with stocks of known origin were emphasized.

S. C. Harland considered "Genetical studies in the genus *Gossypium* and their relation to evolutionary and taxonomic problems." The genus *Gossypium* is particularly suitable for studies in comparative genetics. It occurs in both the Old and the New Worlds and within it the genetical consequences of isolation for several millions of years can be traced. The most important results from work on species crossing in *Gossypium* are: (1) Genetical and cytological data provide a means of accurately delimiting the boundaries of the genus and of assessing relationships within it. (2) Species may be regarded as systems of modifiers. (3) The behaviour of selected mutants when crossed with a given species will reveal its taxonomic position in relation to other species. (4) Intercrossing of species results in the disintegration of the co-ordinated modifier systems possessed by each; the greater the disintegration the greater the taxonomic divergence. (5) Geographical isolation causes profound genic change. Many, and in some cases possibly most, loci exhibit new alleles, and homologous characters become genetically differently constructed. (6) Genes may become mutable when transferred to the genetical background of other species. (7) The number of alleles at a given locus differing only slightly in their reaction with the genetical background, e.g. in dominance potency, is probably large.

It is impossible, in a brief account of the activities of the section, to give adequate summaries of the papers read at the ordinary sectional meetings, but a few that seemed of special interest to botanists or to taxonomists may be mentioned. A. A. Boyden read a very significant paper on "Genetics and Animal Relationship." Its significance lies partly in the remarkable similarity of his conclusions to those reached by a few (perhaps unorthodox) botanical taxonomists in this country. Thus, he said that classifications are never really "based on phylogeny" much less on genealogy; rather both classification and phylogeny are based on similarities and differences in the organisms compared. A truly "natural" classification can result from putting essentially like things together, and in expressing their likeness in terms of *animal relationship*. This is wiser than to abuse the concept of genetic relationship by insisting on applying it to animals of the most diverse kinds where proof of real genetic relationship can never be obtained. S. W. Mansinkai gave an account of the cytology of the genus *Allium* in which he has examined 17 species, 11 diploids, 4 tetraploids, and 2 hexaploids. Evolution in the genus is taking place along three lines: (1) change in the number of chromosomes, (2) change in their structure, and (3) change in the genotype. R. E. Cleland and R. R. Gates summarized recent work on the analysis of wild-populations of *Oenothera* (subgenus *Onagra*). A. Müntzing dealt with incompatibility and fertility in experimental and natural polyploids, with special reference to barley, rye, and *Galeopsis*. M. Skalińska considered the origin of polyploidy in *Aquilegia*. T. J. Jenkin

showed that *Lolium* and *Festuca* are cytogenetically very closely related and were probably derived from a common prototype. R. D. Williams summarized his researches on incompatibility alleles in *Trifolium pratense*. Cultivated plants of the red clover carry a very large number of alleles for self and cross-incompatibility and these constitute a single series acting as oppositional factors.

Reference should be made to the very fine series of exhibits shown in the various laboratories of the King's Buildings of the University of Edinburgh. These exhibits mainly, but not entirely, illustrated papers read at the meetings. The exhibit of maize was particularly striking.

Many meetings for discussion were held—some being announced in the official programme and some arranged privately. Two were particularly valuable to taxonomists. One of these was an evening discussion on population problems and the methods of studying wild populations of animals and plants and the light such studies can throw on problems of taxonomy and evolution. The other was at an informal visit to the Scottish Plant Breeding Station, Corstorphine, when problems of coenospecies, ecospecies, and ecotypes were discussed with Dr. Gregor and his colleagues.

It is understood that papers read at the plenary sessions and abstracts of those read at the sectional meetings (so far as they have been supplied by the authors) are to be published in the "Journal of Genetics" as a special volume of Proceedings.

LII—ADDITIONS TO THE FLORA OF BORNEO AND OTHER MALAY ISLANDS: XIII.*

THE THEACEAE AND SYMPLOCACEAE OF THE OXFORD UNIVERSITY EXPEDITION TO SARAWAK, 1932. H. K. AIRY-SHAW.

For explanation of abbreviations, see K.B. 1939, 275.

THEACEAE.

Adinandra dumosa Jack in Mal. Misc. 2, no. 7, 50 (1822); Ridl. FMP. 1, 194.

Dulit Ridge, moss-forest, c. 1230 m., 8 Sept., Richards 1620: "Shrub, c. 3 m. high. Petals white, calyx pinkish. Leaves thick and leathery."

Adinandra plagiobasis Airy-Shaw, sp. nov., foliis oblique cordatis cum *A. cordifolia* Ridley comparanda, sed ceteris notis valde diversa atque *A. villosae* Choisy et *A. coarctatae* Craib (num hae revera distinctae?) ramulis foliisque patule pubescentibus magis approximata, foliis cordatis suboblongis angustioribus brevius petiolatis recedens.

Arbor 27 m. alta. *Ramuli* graciles, minute rugulosi, castanei, patenter pubescentes (pilis 1–1.5 mm. longis) et insuper minute patenter puberuli, novellis fulvo-sericeis. *Folia* oblonga vel

elliptico-oblonga vel sub lanceolato-oblonga, 6–17 cm. longa, 2–3.8 cm. lata, basi valde inaequilateraliter cordata, latere apicem ramuli versus spectante interdum rotundata vel vix cordata, altero latere valde cordata saepe auriculata, margine subintegra (revera minutissime et inconspicue serrulata), apice breviter acuminata, acumine obtuso, tenuiter coriacea, siccitate brunnea vel interdum (ut in *Symplocaceis*) supra laete viridia, supra ab initio glaberrima, subtus primum longe sericea, mox sparse patule pubescentia, satis dense nigro-punctata; costa supra impressa, subtus prominens, ut ramuli pube duplici vestita; nervi primarii laterales graciles, circiter 14–18 sed cum secundariis multis vix gracilioribus alternantes ideoque difficile numerandi, late patuli, fere recti, marginem versus valde irregulariter reticulato-anastomosantes, subtus prominuli, supra valde obscuri vix perspicui; petioli 3–5 mm. longi, costa vix crassiores, pube duplici induti. *Pedicelli* graciles, 1.5–2 cm. longi, indumento ut in ramulis, bracteolis caducissimis 3–5 mm. infra apicem sitis. *Sepala* ovata, circiter 1 cm. longa, crasse coriacea, basi connata, exteriora extra parce patulo-pubescentia, interiora extra adpresse sericea, omnia intus glabra. *Petala* late obovata, fere 2 cm. longa, 8–11 mm. lata, rotundata, dorso marginibus latis exceptis adpresse sericea, intus glabra. *Stamina* circiter 45–50: filamenta 2–3 mm. longa, basi connata corollaeque breviter adnata, dorso longe sericea; antherae lanceolatae, 4–6 mm. longae, acuminatae, acutae, dorso sericeae. *Ovarium* calyci breviter adnatum, sericeum, vertice truncatum, 5-loculare, placentis in quoque loculo bifidis, ovulis ∞ ; stylus simplex, 8 mm. longus, triente inferiore sericeus, ceterum glaber; stigma minutum. *Fructus* ignotus.

Dulit Trail, primary rain-forest on side of steep ridge, c. 500 m., 10 Aug., Richards 1191: "Tree, 27 m. high. Circumf. 1.73 m. at 1.5 m. from ground. No buttresses. Bark about 6 mm. thick, reddish, smooth, with very numerous lenticels arranged in transverse rows. Wood pale yellow; heart-wood suffused with purple. Leaves gland-dotted. Large gall common. Petals white. Anthers orange."

In spite of the striking character of the cordate base of the leaves, found elsewhere in the genus apparently only in *A. cordifolia* Ridley, the affinity of the present species is probably rather with *A. villosa* Choisy and *A. coarctata* Craib, with which it agrees in indumentum and general leaf-outline.

Adinandra subsessilis Airy-Shaw, sp. nov., ex affinitate *A. acuminatae* Korth., a qua foliis oblongis (nec ellipticis) angustioribus, ramulis petiolis costis patenter (nec adpresse) pilosis, floribus brevissime pedicellatis, fructu longe piloso recedit.

Arbor parva, ramulis teretibus usque 4 mm. diametro junioribus dense fulvo-tomentellis et insuper patenter pilosis ut videtur tarde glabrescentibus, innovationibus (foliis supra exceptis) longe sericeis. *Folia* oblonga vel elliptico-oblonga, 5–11.5 cm. longa, 1.5–3.5 cm. lata, basi angustata usque subrotundata, apice caudato-acuminata, acumine circiter 1–1.5 cm. longo gracili acutissimo, margine sub-

* Continued from K.B. 1939, 290.

integra, minutissime serrulato-denticulata, chartacea, supra glaberrima siccitate fusco-brunnescentia, subtus molliter longiuscule adpresso-pubescentia serius glabrescentia; costa supra leviter impressa, glabra, subtus prominens, tomentella et patenter pilosa; nervi primarii laterales 12-14, graciles, utrinque prominuli, late patuli vel subpatentes, circiter 2 mm. intra marginem anastomosantes, nervis lateralibus secundariis inter primarios frequentibus, omnibus cum venulis ultimis reticulum distinctum satis densum efformantibus; petioli 2 mm. longi, tomentelli et patenter pilosi. Flores axillares, solitarii; pedicelli brevissimi, 1 mm. longi, dense patule fulvo-pubescentes, bracteolis 2 ovatis 1 mm. longis dorso sericeis. Sepala deltoideo-ovata, jam alabastro patula vel patentia vel recurva, inaequalia, 2 extimis minoribus 3-5 mm. longis 2-3 mm. latis, 3 intimis majoribus 4-7 mm. longis 3-3.5 mm. latis, acuta, rigida, crassa, dorso longe sericea, intus glaberrima. Petala latissime obovata, 8-9 mm. longa, 7-8 mm. lata, apice rotundata minute cuspidata, basi rotundata vel subunguiculata, medio dorso sericea, ceterum glabra, albida. Stamina circiter 30, uniseriata, 4-6 mm. longa, basi breviter connata et petalis brevissime vel vix adnata, filamentis inferne nudis superne longe sericeis, antheris lanceolatis 2-3 mm. longis inferne (maxime dorso) sericeis ceterum glabris. Ovarium depresso-globosum, 2.5 mm. diametro, longe sericeum, biloculare, loculis 6-7-ovulatis, ovulis majusculis pendulis; stylus simplex, 5-6 mm. longus, glaber vel ima basi paucipilosus, stigmatibus minuto. Capsula (unica fracta tantum visa) subglobosa, circiter 8 mm. diametro, longe pilosa, bilocularis, loculis 1-spermis. Semina discoidea, 6-7 mm. diametro, 1-2 mm. crassa, castanea, nitidula.

Dulit Ridge, rain-forest on steep slope, 700-900 m., 19 Sept., *Native Collector* 1958: "Small tree. Petals whitish."

The interrelationships of the species of *Adinandra* are obscure, and a careful revision of the genus is much needed. The 1-seriate stamens, bilocular ovary, few ovules and 2-seeded fruit of *A. subsessilis* distinguish it very clearly from all other known species. It is less easy to indicate its closest affinity. It resembles *A. acuminata* and *A. rostrata* Merr. in foliage, *A. villosa* Choisy and *A. plagiobasis* Airy-Shaw in indumentum, *A. rostrata* and *A. Lamponga* Miq. (*A. macrantha* T. et B.) in the few seeds. The 1-seriate stamens indicate a passage from the more typical species of *Adinandra*, in which they are normally at least 2-seriate, towards the more specialised genera *Eurya*, *Patascoya*, *Visnea*, etc., in which they are always 1-seriate (cf. Airy-Shaw in Hook. Ic. Pl. 34, t. 3342 (p. 3): 1937).

Ternstroemia (Erythrochiton) microcalyx Airy-Shaw, sp. nov., *T. Robinsonii* Merr. et *T. penangiana* Choisy affinis; a priori, quacum foliorum forma et magnitudine optime convenit, pagina inferiore conspicue elevato-puncticulata differt; a posteriore calyce parvo praecipue distinguitur.

Arbor 24 m. alta, ramulis 4-8 mm. diametro, cortice cinereo irregulariter rugoso vel longitudinaliter striato lenticellis parvis numerosis inconspicuis notato. *Folia* late elliptico-vel oblongo-obovata, 12-21 cm. longa, 5-9 cm. lata, basi in petiolum cuneato-attenuata, apice subrotundata usque subacuta, brevissime obtuse subcuspidata, margine integro revoluta, glaberrima, subtus conspicue (supra leviter) elevato-puncticulata, modice coriacea, siccitate rubido-vel purpureo-brunnea; costa supra impressa, subtus elevata, satis robusta; nervi primarii laterales circiter 10-jugi, graciles, patuli, subrecti, prope marginem obscure anastomosantes, secundariis parallelis interjectis, subtus prominuli, supra vix prominuli; petioli 5-15 mm. longi. Flores (masculi tantum cogniti) 3-4, circiter 1 cm. infra folia hornotina dispositi. Pedicelli patuli usque subpatentes, recti, 3.5-4.5 cm. longi, inferne dorsiventraliter compressi, bicarinati, circiter 1.5 cm. infra florem lateraliter bibracteolati, supra bracteolas fere cylindrici, striati; bracteolae oblongae, patentes vel recurvae, 2 mm. longae, caducae vel persistentes. Calyx valde exigua, circiter 8 mm. diametro, sepalis suborbicularibus subaequalibus 3-4 mm. diametro sub anthesin reflexis. Petala late obovata, 1.2-1.4 cm. longa, 0.8-1.1 cm. lata, vix vel latissime unguiculata, brevissime connata, rotundata, intus inferne longitudinaliter laminato-striata, patentia, alba, crassiuscula, margine tenui. Stamina numerosissima, basi in annulum petalis adnatum breviter connata, 2-3 mm. longa, linearia, applanata, thecis lateralibus, connectivo apice cuneato-flabellato-expanso. Pistillodium nullum. Fructus ignotus.

Gunong Laiun, Sungei Balapau, Ulu Tinjar, rain-forest on crest of ridge, 900-1000 m., 2 Nov., *Richards* 2423: "Tree, 24 m. high. Corolla white."

This is admittedly very close to *T. Robinsonii*, of Amboina, of which, unfortunately, flowers are not yet known, and I have described it as distinct mainly on the basis of the geographical distribution. The difference in leaf-surface may not be a specific character, and it is conceivable that the calyx, even if equally small in the female flower, might enlarge to the size of *T. Robinsonii* (2-2.5 cm. diam.) in the fruiting stage.

Ternstroemia aneura Miq. Fl. Ind. Bat. Suppl. 477 (1860).

Forest Reserve, Marudi, "heath" forest, under 300 m., *Richards* 2658: "Tree, c. 12 m. high. Corolla white."

Vernacular name: *medang lawang*.

Ternstroemia (Euternstroemia) sp., aff. *T. Lowii* Stapf in Trans. Linn. Soc. ser. 2, 4, 132 (1894).

Dulit Ridge, open moss-forest on exposed peak, c. 1400 m., 17 Sept., *Richards* 1897: "Shrub, c. 3 m. high. Fl. buds creamy white. Leaves very thick and leathery, glaucous beneath."

This may be only a form of *T. Lowii*. It is in any case too young to describe.

Ternstroemia citrina Ridley in KB. 1938, 173.

Ulu Koyan, sandy forest, c. 800–900 m., 18 Sept., *Native Collectors* 1924: "Epiphytic shrub (?). On tall tree. Flower buds greenish white. Leaves very thick."

Schima crenata Korth. in Temm. Verhand. Nat. Geschied. Nederl. Overz. Bezitt. Bot. 143 (1839–42).

Ulu Koyan, sandy forest on ridge, c. 850 m., 15 Sept., *Richards* 1837: "Tree, 29 m. high, 86 cm. diam. Petals creamy white, one of them concave and incurved. Anthers bright yellow. Flowers sweet scented. No buttresses. Timber (Class 1 c). Numerous other trees in flower in neighbourhood."

Schima Lobbii (Hook. fil.) Pierre, Fl. For. Cochinch. 2, sub t. 121 (1887), in obs.; Airy-Shaw in KB. 1936, 498.

Gordonia Lobbii Hook. f. in Trans. Linn. Soc. 23, 162 (1860); Melch. in Engl. Nat. Pflanzenf. ed. 2, 21, 137 (1925).

Schima bancana Miq. in Ann. Mus. Bot. Lugd.-Bat. 4, 113 (1868–9); Melch. l.c. 139.

S. (?) *Beccarii* Warb. in Fedde, Rep. 18, 329 (1922).

Summit of Gunong Santubong (1st Division), low scrub on exposed mountain top, burnt ground, c. 800 m., Dec., *Richards* 2717: "Shrub, c. 1 m. high. Corolla white. Leaves glaucous beneath."

Schima aff. **rigida** Miq. in Ann. Mus. Bot. Lugd.-Bat. 4, 113 (1868–9).

Dulit Ridge, shady moss-forest, c. 1250 m. (also seen in light moss-forest and "transition" forest, but said not to occur at low altitudes), 11 Sept., *Richards* 1698: "Corolla white. Leaves somewhat bluish green, glaucous beneath. Tree, c. 12 m. high. Bark with strongly marked medullary rays."

Schima sericea Airy-Shaw in Hook. Ic. Pl. 34, t. 3309 (1936), q.v., et in KB. 1936, 498.

Synge 1614.

SYMPLOCACEAE.

Symplocos Henscheli (Mor.) Benth. ex C. B. Clarke in Hook. fil. FBI. 3, 588 (1882), emend. Brand in Engl. Pflanzenr. IV. 242 (Symploc.), 89 (1901).

Cordyloblaste Henscheli Mor. in Bot. Zeit. 6, 606 (1848).

Dulit Ridge, forest by waterfall, c. 1200 m., 10 Sept., *Richards* 1669: "Tree, c. 3 m. high. Perianth pure white. Fls. with strong sickly sweet scent."

Symplocos laetiviridis Stapf in Trans. Linn. Soc. Bot. ser. 2, 4, 205 (1894); Brand, Symploc. 53 (1901).

Ulu Koyan, sandy forest, 800–1000 m., 18 Sept., *Native Collectors* 1917: "Shrub, 2 m. Petals white. Calyx pale yellowish green, red at base."

The following is a description of the flowers, which were previously unknown:

Receptaculum (scil. ovarium inferum) oblongo-obconicum, 1–1.5 cm. longum, dense adpresse sericeum. *Calycis segmenta* 5 (2 vel 3 saepe fere usque ad apicem connata), deltoideo-ovata, 1.5–2.3 mm. longa, subacuta, extra sparsius sericea, intus glabra. *Petala* 5, basi brevissime connata, obovata, 4–5 mm. longa, 1.5–2 mm. lata, rotundata vel obtusa, extra parcissime sericea, intus glabra, alba. *Stamina* circiter 40: filamenta basi corollae brevissime adnata, filiformia, 2–5 mm. longa; antherae minimae, didymoglobosae, minutissime punctatae. *Stylus* 4–5 mm. longus, glaber, stigmatе parvo capitato.

LIII—ADDITIONS TO THE FLORA OF BORNEO AND OTHER MALAY ISLANDS: XIV.

THE ILICACEAE AND MYRSINACEAE OF THE OXFORD UNIVERSITY EXPEDITION TO SARAWAK, 1932. H. K. AIRY-SHAW.

ILICACEAE.

Ilex sclerophylloides Loes. Monogr. Aquifol. in Nov. Act. Abh. Akad. Naturf. 78, 77 (1901), *forma*.

Ulu Koyan, white sand forest, c. 850 m., 15 Sept., *Richards* 1820: "Tree, about 80–90 ft. [24–27 m.] high. Petals greenish yellow."

Vernacular name: *medang lit*.

This collection might almost equally well be referred to *I. alternifolia* (Zoll. et Mor.) Loes. or to *I. pleiobrachiata* Loes., both being very close to *I. sclerophylloides*. From the first-named, the present specimens differ in the inflorescences arising from the axils of last year's leaves or from relatively short axillary young shoots, instead of from the bare lower portions of elongate shoots of the current year. From the second, they differ in the mostly smaller, more coriaceous and shining leaves, and less conspicuous venation. From typical *I. sclerophylloides*, to which they probably make the nearest approach, they differ in the somewhat narrower leaves and the dull greyish, not white, bark of the year-old branches.

It would probably be most satisfactory to treat all the above as varieties of one species, for which *I. alternifolia* provides the earliest specific epithet.

Ilex (Byronia) Laurocerasus Airy-Shaw, sp. nov., *I. hypoglaucae* (Miq.) Loes. (*I. sclerophyllae* Hook. f.) necnon *I. grandifoliae* Merr. affinis, ab illa foliis multo majoribus subtus omni vestigia glaucedinis carentibus ideoque subnitidis, ab hac foliis multo crassius coriaceis, nervis lateralibus paucioribus validioribus, rete venularum multo laxiore, ab utraque foliis subsessilibus differt.

Arbor, 2.5 m. alta. *Ramuli annotini* robusti, 4–6 mm. crassi, fere teretes, cortice atro-fusco. *Ramuli hornotini* graciles, saepe valde elongati, usque 30 cm. longi, 2–4 mm. crassi, valde striato-angulati et complanati, recti, glabri, superne tantum foliiferae. *Folia* magna, subsessilia, oblongo-elliptica vel levissime lanceolata-oblonga, 13–25 cm. (et verisimiliter ultra) longa, 5.5–9.3 cm. lata,

basi rotundata vel saepius leviter sed distincte cordata, apice (in plerisque manco) ut videtur breviter acuminato, margine integerrima saepe valde revoluta, crasse et rigide coriacea (iis *Pruni Laurocerasi* L. subsimilia), ab initio undique glaberrima, siccitate supra fusco-olivacea subtus brunnescentia; costa valida, supra canaliculato-impressa, subtus valde prominens usque 3 mm. crassa; nervi laterales 8-10-jugi, late patuli, interdum fere patentes, graciliusculi, fere recti vel leviter sursum procurvi, marginem versus regulariter arcuato-anastomosantes, supra plana vel vix manifeste insculpti, subtus prominuli sed teretes (nec angulato-arguti ut in *I. hypoglaucia*) et conspicue pallidi, rete venularum valde laxo et aperto; petioli brevissimi vel vix ulli, crassissimi. *Cymae* e ramulorum hornotinorum parte media et inferiore, vel foliis hornotinis suppressis ut videtur ex axillis foliorum annotinorum, ortae, sub lente minutissime papilloso-puberulae, pedunculis usque 3.5 cm. longis, ramulis primariis ternis usque 7 mm. longis plerumque semel furcatis. *Flores masculi* 4-5-meri, circiter 7 in apice ramulorum ultimorum pseudo-umbellatim dispositi, pedicellis 1-3 mm. longis. *Sepala* latissime ovata, vix 1 mm. longa, paullo ultra 1 mm. lata, convexa, obtusa vel subacuta, minute eroso-denticulata, basi incrassata. *Petala* oblongo-obovata, 3-3.5 mm. longa, 2 mm. lata, obtusa, basi brevissime et levissime connata, sub anthesin paullo supra basin valde reflexa, alba. *Filamenta* subulata, 2-2.5 mm. longa, crassiuscula, erecta, petalis basi brevissime adnata; antherae ovoideae, vix 1 mm. longae. *Pistillodium* ovoideum, 4-5-angulatum, parvum. *Flores feminei* et *fructus* non visi.

Ulu Koyan, sandy rain-forest, c. 800-900 m., 18 Sept., *Native Collectors* 1939: "Tree, 2.5 m. high. Petals white."

Vernacular name: *kunyatang bukit*.

Very distinct from all the known species of Subgenus *Byronia* in its practically sessile leaves. In size and shape they are similar to those of *I. grandifolia* Merr., but the texture and venation are more like those of *I. hypoglaucia* (Miq.) Loes., to which it is probably most closely allied.

The identity of *I. sclerophylla* Hook.f. with *I. hypoglaucia* was suspected by Loesener: vide Monogr. Aquifol. 86, Obs. 2, and cf. Ridley, FMP. 1, 440. There is a fairly good syntype specimen (Banca, 8 Aug. 1821, *Horsfield* s.n.: "Rengas s. Ingas") of the latter in Herb. Kew., and several additional sheets from Sarawak of what is evidently the same species (nr. Kuching, 3 Feb. 1893, *Haviland* 2244; Rejang, Sib, July 1893, *Kalong* for *Haviland* 2872 [2 sheets]; nr. Kuching, 1 April 1893, *Haviland & Hose* 3744 K: "flowers white"), besides *Beccari* 3323, cited by Loesener as *I. sclerophylla*. I find it impossible to distinguish specifically the fragmentary type-specimen of the latter (Malacca, *Griffith* 5013) from the Banca and Borneo material.

***Ilex orestes* Ridley** in KB. 1931, 35.

var. ***dulitensis* Airy-Shaw**, var. nov. foliis tantum 2-3 cm. longis 1-2 cm. latis subtus conspicue pustulato-verruculosis, nervis supra haud vel vix insculptis fere invisibilibus.

Dulit Ridge, edge of exposed peak of mountain, open moss-forest, c. 1400 m., 13 Sept., *Richards* 1769 (typus, Herb. Kew.): "Shrub, c. 3 m. high. Corolla white. Leaves very thick and hard."

Dulit Ridge, open moss-forest on exposed peak, c. 1400 m., 17 Sept., *Richards* 1886: "Shrub, c. 3 m. high. Fls. white."

One branch of no. 1769 bears fruit. These are subglobose, 2.5-3 mm. long by 2-2.5 mm. in diameter. The colour is not noted by the collector, but appears to have been red rather than black.

The relation between this variety and the type is comparable with that between *I. malaccensis* Loes. (punctate) and *I. Stapfiana* Loes. (epunctate).

***Ilex triflora* Bl.** Bijdr. 1150 (1826).

var. ***viridis* (Champ.) Loes.** Aquifol. 345 (1901).

Ilex viridis Champ. in Hook. Journ. Bot. Kew Gard. Misc. 4, 329 (1852)

I. triflora var. ***longifolia* Ridl.** FMP. 1, 438 (1923).

Dulit Ridge, moss-forest, c. 1250 m., 19 Sept., *Native Collector* 1963: "Shrub, c. 2 m. high. Petals white."

A large-leaved form, the leaves measuring up to 9.5 cm. long. Ridley's variety *longifolia* from Perak is certainly referable to Loesener's var. *viridis*.

***Ilex cissoïdea* Loes.** Aquifol. 430 (1901).

Dulit, primary forest on crest of ridge, under 300 m., 5 Nov., *Richards* 2449: "Tree, c. 20-25 m. high. Fls. greenish white."

Vernacular name: *geredam pangi*.

***Ilex malaccensis* Loes.** Aquifol. 432 (1901); Ridl. FMP. 1, 437. No number was attached to this specimen.

MYRSINACEAE.

***Maesa striata* Mez**, Myrsin., in Engl. Pflanzenr. IV. 236, 42 (1902).

var. ***subintegra* (Merr.) Airy-Shaw**, comb. nov.

M. subcaudata Merr. var. *subintegra* Merr. in UCPB. 15, 234 (1929).

Dulit, by stream in secondary forest, under 300 m., 2 Sept., *Richards* 1593: "Shrub, c. 1 m. high."

I am unable to separate *M. subcaudata* Merr. from *M. striata* Mez, described from Sumatra. The variety *subintegra* is also represented by the following specimens from DUTCH S.E. BORNEO: between M. Uja and Kundim baru, 6 July 1908, *H. Winkler* 2694; between S. Tarik and Kwaru, 21 July 1908, *H. Winkler* 3066.

***Maesa ramentacea* Wall.** in Roxb. Fl. Ind. ed. Carey et Wall. 2, 230 (1824); Mez, Myrsin. 27 (1902); Ridl. FMP. 2, 227.

Baeobotrys ramentacea Roxb. Hort. Beng. 16 (1814), *nomen*, et Fl. Ind. ed. Carey, 1, 558 (1832), *descr.*

Dulit Ridge, moss-forest on edge of cliff, c. 1300 m., 13 Sept., *Richards* 1774: "Tree, c. 8 m. high. Fls. greenish white."

The inflorescences are unusually abbreviated in these specimens.

Embelia Ribes *Burm. f.* Fl. Ind. 62, t. 23 (1768); Mez, Myrsin. 303 (1902); Ridl. FMP. 2, 232, in obs.

E. garciniaefolia (Wall. ex A. DC.) Miq. Pl. Jungh. 187 (1852); Ridl. FMP. l.c.

Dulit Trail, primary forest on spur of mountain, c. 800 m., 29 Aug., *Native Collector* 1523: "Woody climber on tall tree. Fls. whitish."

I cannot agree with Ridley (l.c.) that the Ceylon *E. Ribes* is "totally different" from the Peninsula plant: many Peninsula specimens in Herb. Kew. are almost indistinguishable from Ceylon specimens.

Embelia myriantha Mez, Myrsin. 304 (1902).

Sungei Balapau, R. Tinjar, secondary forest on bank of small river, under 300 m., 15 Oct., *Richards* 2221: "Liane climbing to about 30–40 m. on tall tree. Stem c. 5 cm. diam. Flowers white."

Also represented by the following collection: near Kuching, 17 Nov. 1891, *Haviland* 918 (d.x.b.d.).

Embelia coriacea Wall. ex A. DC. in Trans. Linn. Soc. 17, 135 (1834); Mez, Myrsin. 313 (1902); Ridl. FMP. 2, 233.

Ulu Koyan, c. 800 m., 25 June, *Native Collectors* 2058: "Climber on tall tree. Fl. buds pale green."

Dulit, under 300 m., 19 Oct., *Native Collectors* 2281: "Liane; fls. whitish."

Ulu Koyan, Dulit, "heath" forest, edge of river, c. 800 m., 7 Nov., *Richards* 2493: "Liane on tall tree, hanging down in long festoons. Entire inflorescence greenish white."

Dulit Ridge, open moss-forest, c. 1230 m., 8 Nov., *Richards* 2505: "On tree c. 8 m. high. Large woody liane. Fls. greenish white. Leaves very thick and leathery."

Dulit, primary forest, under 300 m., 11 Nov., *Richards* 2545: "Large woody climber on tall tree."

I agree with Ridley that *E. pergamacea* A. DC. is not distinct from *E. coriacea*.

Grenacheria montana *Airy-Shaw*, sp. nov., a *G. cinerascens* Mez atque *G. Beccariana* Mez, quibus maxime affinis, differt caulibus acutissime angulatis, foliis minoribus crassius coriaceis glaberrimis haud acuminatis, petalis manifestissime nigro-punctatis.

Frutex scandens, 3–4 m. longus; caulis gracilis, parte superiore usque 5 mm. crassus, acutissime 5–7-angulatus, sulca conspicua e quoque ramulo sursum percurrente, cortice nigro vel fusco-rubro laevi glabro; ramuli laterales abbreviati, 1–7 cm. longi, ima basi acute deflexi, velut deorsum crescentes, foliosi, primum minute puberuli, mox glabrescentes, racemo terminati. *Folia* obovata vel elliptico- vel oblongo-obovata vel fere elliptica, (1–) 2–5 (–6) cm. longa, 1–2.5 cm. lata, basi leviter angustata vel subrotundata, apice obtusa vel rotundata, rarius obtuse subcuspidata, margine integro revoluta, glaberrima, crasse rigide coriacea, siccitate supra grisea et

saepe nitida, subtus rubido-brunnea obscura; costa supra insculpta, subtus prominens; nervi laterales late patuli vel fere patentes, gracillimi, recti, in nervum intramarginalem 1 mm. a margine conjuncti, supra valde obscuri, subtus levissime prominuli; petioli 2–4 mm. longi. *Racemi* ut supra dictum ramulos breves laterales terminantes, 2–10 cm. longi, minute ferrugineo-puberuli. *Pedicelli* patentes, 1–2 mm. longi, minutissime puberuli. *Flores* ♀ tantum cognitae. *Sepala* fere 1.5 mm. longa, brevissime connata, late deltoideo-ovata, medio dorso nigro-verruculosa, margine ciliato-fimbriata, glabra vel dorso parce minutissime puberula. *Corolla* 2 mm. longa, usque duas vel tres partes divisa; segmenta ovata vel suboblonga, apice obtusa saepe inflexa, dorso ubique nigro-punctata, glabra vel apicem versus parce minute papilloso-puberula, intus valde papilloso-puberula, margine papilloso-ciliata. *Stamina* circiter 1 mm. longa, infra media petala affixa, antheris parvis oblongis dorso massa nigra auctis. *Ovarium* subglobosum, 0.5 mm. longum, glabrum, in stylum 0.5 mm. longum glabrum attenuatum, stigmatibus parvo capitato. *Ovula* ut videtur 2, lateralia, opposita, in placenta sphaerica semi-immersa. *Fructus* ignotus.

Dulit Ridge, moss-forest on brink of precipice, c. 1230 m., *Richards* 1646: "Slender straggling shrub, c. 3 m. long. Fls. greenish white with peculiar smell."

Dulit Ridge, open dwarf moss-forest on exposed peak, c. 1250 m., 20 Sept., *Richards* 1980 (typus, Herb. Kew.): "Climber on small trees, c. 3–4 m. long. Corolla greenish white."

This species may be regarded as the high mountain representative of *G. Beccariana* and *G. cinerascens*, which are perhaps scarcely distinct from each other. *G. montana* is at once distinguishable by its relatively small, rigidly coriaceous leaves with very indistinct venation and no acumen.

The remarkable deflexion of the branches is not mentioned by Mez in his description of the genus, though observable in herbarium material of all his species (except the incompletely curved or bent downwards immediately after leaving the stem: they actually originate from the stem in a downward direction, and the continuation of the main stem is frequently in exactly the opposite direction to that taken by the branch, forming a kind of flexuous zigzag. In the absence of direct field observations, it may be surmised that the deflexed lateral branches are of considerable service to the plant in hooking itself on to the trees and shrubs over which it climbs.

Grenacheria seems to represent a fairly natural group, but to separate it from *Embelia* on the sole character of the connate petals is not natural, since the very closely allied *Embelia fulva* Mez is thereby excluded. The essential features of *Grenacheria* appear to be the sharply deflexed lateral branches, the elongate, usually strictly racemose inflorescence in which each branch terminates, and the usual connation of the petals, taken in conjunction. One may nevertheless agree with Mez that *Grenacheria* is a genus "absque dubio separandum ne limites ordinis generum omnino evanescant." *Embelia fulva* (allied to *G. Lampani* (Scheff.) Mez) is hereby transferred to *Grenacheria*:

Grenacheria fulva (Mez) Airy-Shaw, comb. nov.

Embelia fulva Mez, Myrsin. 312 (1902); Merr. in Str. Br. Roy. As. Soc., special no., 475 (1921).

E. Lampani Scheff. sec. King et Gamble in JASB. 74 (2), 111 (1906), quoad specim. borneëns., non Scheff.

Grenacheria Lampani (Scheff.) Mez sec. Merr. l.c. 474 (1921), non (Scheff.) Mez.

? *Embelia amentacea* C. B. Clarke sec. Ridley, FMP. 2, 235 (1923), quoad loc. "Borneo," non C. B. Clarke.

SARAWAK. Sine loc. exact., Lobb; Beccari 1705 (type). Near Kuching, 1891, Garai in Haviland 819 ("d.k.r.s."); ibid., 17 Mar. 1893, Haviland* 2280: "Corolla segments lightly imbricate. Anthers white." Sine loc. exact., Native Collector (through Sar. Mus. for Bur. Sci., Manila) 105, 677.

Ardisia brachythyrso Stapf in Trans. Linn. Soc. ser. 2, 4, 202 (1894); Mez, Myrsin. 140 (1902).

var. **stictantha** Airy-Shaw, var. nov. calycis segmentis duplo longioribus conspicue verruculoso-punctatis, petalis punctatis.

Dulit Ridge, open moss-forest on exposed peak, c. 1300 m., 20 Sept., Richards 1992: "Shrub, c. 1-2 m. high. Corolla white."

A somewhat puzzling plant. The longer calyx-segments (more than half as long as the petals), and the conspicuous black and red dotting of both calyx and corolla, give the impression of a distinct species, but the foliage and inflorescences seem practically identical. In Haviland's Kinabalu plant (the type of the species) the leaves are flat, but in Richards's plant they are nearly all folded longitudinally and most of them are distinctly elevate-pustulate just within the margin on the lower surface.

Mez (l.c.) has unaccountably referred *A. brachythyrso* to Subgen. *Pyrgus*, but its affinity, as pointed out by Stapf, l.c., is clearly with *A. laevigata* Bl. (and *A. Moonii* C. B. Cl.) in Subgen. *Akosmos*, from which it differs chiefly in the umbellate-paniculate inflorescence. The minutely lepidote under-surface of the leaves is characteristic of this group.

Ardisia Zollingeri A. DC. in DC. Prodr. 8, 670 (1844); Mez, Myrsin. 111 (1902).

Dulit, forest by torrent, under 300 m., 15 Nov., Richards 2598: "Shrub, c. 1.5 m. high. Corolla greenish pink."

Ardisia synneura Scheff. Comm. Myrs. Archip. Ind. 80 (1867); Mez, Myrsin. 112 (1902).

Tapeinosperma synneurum (Scheff.) Philipson in Journ. Bot. 77, 103 (1939).

Marudi, clearing in "heath" (white sand) forest, under 300 m., 25 July, Richards 1014: "Shrub, c. 5 ft. [1.5 m.] high."

Ulu Koyan, Dulit, "transition" forest, c. 1100 m., 7 Nov., Richards 2494: "Fls. pinkish white. Weak shrub, 1 m. high."

I must dissent from the recently expressed opinion of Philipson (l.c.) that this species, together with *A. crassa* C. B. Clarke (*A. fortis* Mez) and *A. lancifolia* Merr., should be transferred to the genus *Tapeinosperma*.

* Error "Haviland & Hose," King et Gamble, l.c.; Merr. l.c. 474.

This genus was established by J. D. Hooker (in Benth. et Hook. fil. Gen. Pl. 2, 647: 1876) for two New Caledonian species, *T. Vieillardii* Hook. f. and *T. Lenormandii* Hook. f. The outstanding character of the genus, and the one which gives it its name, is the flattened seed (not fruit, as stated by Mez, l.c. 162), enclosed in the flattened, indurated, undulate- or spinose-edged endocarp and fleshy pericarp of the rather large fruit.

Mez, in his monograph of the family (l.c.), greatly enlarged the genus by the inclusion of 24 additional species, but, of these, none of which the fruits are known agrees in this respect with the two original species. Several other species have been since described by Mez, Guillaumin and others, but the only one which seems reasonably close to the type is *T. cephalophorum* Gillespie (in B. P. Bishop Mus. Bull. 74, 8, fig. 7: 1930), from Fiji. This is a remarkable plant: the flowers are concealed by large bracts, and the endocarp (erroneously referred to by Gillespie, l.c. 9, and fig. 7b, as the seed) is an obconic, pentagonal structure, with the angles produced into sharply flanged lobes, a flange from each lobe being decurrent to the attenuate base of the endocarp. The seed is pentagonal and conforms only roughly to the general outline. This structure is evidently an elaboration of that found in *T. Lenormandii*. It is very different from anything yet observed, as far as I know, in any other genus of *Myrsinaceae*.

The rigid use by Mez, for major groups, of the number and arrangement of the ovules on the placenta, uncorrelated with other characters, has probably produced an, at least partially, artificial classification. Gillespie points out that in Mez's generic key *T. cephalophorum* (and the closely related *T. punctatum* Gillespie, but fruits unknown) would run down to *Discocalyx* on account of the ovules being only 5. He is no doubt right in saying that these plants "certainly do not belong" to *Discocalyx*, but it seems at least possible that with these exceptions the great majority of the species assigned to *Tapeinosperma* since its first description are more closely allied to *Discocalyx*. As Gillespie says, "a reconsideration of the characters of *Tapeinosperma* is desirable," and this probably applies to many of the genera of *Myrsinaceae*.

Ardisia oxyphylla Wall. ex A. DC. in Trans. Linn. Soc. 17, 119 (1834); Mez, Myrsin. 131 (1902); Ridl. FMP. 2, 242.

var. **racemosa** Airy-Shaw, var. nov. floribus in racemos elongatos nec breviter subumbellatos dispositis.

Dulit, rain-forest, under 300 m., 31 July, Richards 1046: "Shrub c. 1 m. Corolla flesh-coloured."

Scott-Keltie Falls, Dulit, forest near waterfall, c. 500 m., 31 Aug., Native Collector 1552: "Shrub or small tree. Petals salmon-pink with minute orange spots near apex. Sepals similar, paler. Stamens pale yellow with dark red spots externally. Pedicels red."

Dulit Trail, rain-forest on steep slope, 700-900 m., 19 Sept., Native Collector 1965 (typus, Herb. Kew.): "Shrub, 2-5 m. high. Petals of waxy appearance, pink. Leaves thin, convex between main lateral veins."

This variety also appears to be represented by a specimen from Goping, PERAK, F.M.S., Kunstler 6185, referred to the species, without comment, by King and Gamble in JASB. 74 (2), 139-140 (1906), no allusion being made in the description to an elongate raceme. The variety is proposed with some reserve, as it has not been possible to examine authentic material of the racemose-flowered

species referred to this group by Mez, viz. *A. pubicalyx* Miq., *A. pendula* Mez and *A. racemigera* Mez, to which it may eventually prove to be more closely allied.

Ardisia obovatifolia Merr. in SMJ. 3, 544 (1928).

Dulit Ridge, on ground in transition forest, c. 1230 m., 9 Sept., Richards 1658: "Fl. buds pink. Leaves reddish beneath."

Dulit Ridge, forest by waterfall, on ground, c. 1200 m., 10 Sept., Richards 1683: "Fl. buds pink, fruit scarlet."

Waterfall, Dulit Ridge, rocks in shade near falls, c. 1100 m., 4 Sept., Richards 1800: "Calyx pale crimson, corolla white. Leaves dark green, with matte 'velvet' surface above, reddish purple below; c. 0.3 m. high."

var. **icaroides** Airy-Shaw, var. nov. foliis minoribus anguste elliptico-oblongatis 8–10 cm. longis 2–2.5 cm. latis longe attenuato-acuminatis undulato-serrulatis, inflorescentiae umbellulis tantum 3–4 subapicalibus.

Dulit, on ground in transition forest, c. 1200 m., 9 Sept., Richards 1655: "Fl. buds pink. Leaves reddish purple below, very deep green above."

At first sight rather strikingly distinct from the type, but actually differing only in the size and shape of the leaves and in the poorly developed inflorescence. The leaves recall those of the Burmese *A. Icara* Ham., but the nervation and texture are quite distinct. It is perhaps only a juvenile state.

Labisia pumila (Bl.) Mez, Myrsin. 171 (1902).

Ardisia pumila Bl. Bijdr. 688 (1826).

Labisia pothoina Lindl. Bot. Reg. [31], t. 48 (1845); Ridl. FMP. 2, 237.

forma **genuina** Mez, l.c. 172.

Dulit Ridge, ground in moss-forest, c. 1200 m., 6 Sept., Native Collector 410: "Height 1' [0.3 m.]. Woody. Flowers white, pale pink outside; anthers mauve. Leaves dark green above, purple beneath."

Dulit Ridge, on ground in "transition" forest, c. 1200 m., 9 Sept., Native Collector 1656: "Corolla pinkish white."

Ulu Koyan, sandy forest, on ground, c. 850 m., 15 Sept., Native Collector 1847: "Corolla flesh-coloured, with minute orange-brown spots externally."

Dulit Ridge, shady moss-forest, c. 1300 m., 3 Oct., Richards 2112: "Fls. pale pink; leaves green beneath."

forma **lanceolata** (Scheff.) Mez, l.c.

Ardisia pumila β *lanceolata* Scheff. Comm. Myrsin. Archip. Ind. 93 (1867).

Labisia pothoina var. *lanceolata* (Scheff.) Ridl. l.c.

Dulit, on ground in shady rain-forest, under 300 m., 2 Aug., Syngé 1081: "Herb, c. 0.5 m. high. Fls. dull pink."

Ulu Koyan, "heath" forest, c. 800 m., 3 Oct., Richards 2113: "Fls. pale pink; leaves reddish purple below."

forma **gladiata** Airy-Shaw, f. nov. foliis anguste elongate elliptico-lanceolatis 25–42 cm. longis 2–5.5 cm. latis basi in petiolum breviusculum 2–4 cm. longum anguste alatum decurrentibus superne in apicem acutum sensim angustatis.

SARAWAK. Baram, Aug. 1894, Haviland & Hose 3474 K.

Marudi, swampy ground in shade, in white sand forest, near sea level, 28 July, Syngé 50 (typus, Herb. Kew.): "Berries red. Leaves glabrous and supporting a small lichen."

No berries were received with Syngé's specimen, which is in flower. The epithet is one proposed by Ridley in manuscript for a new species based on the above Haviland & Hose number, but I do not consider the plant distinct enough for this.

It should be noted that the proper authority for the combination *Labisia pumila* is Mez, l.c. The latter cites Benth. et Hook. f. ex Indice Kewensi, but the name is there not validly published, being given as a synonym of *L. pothoina*, and the combination was not made by Bentham and Hooker in the place there referred to (Gen. Pl.).

Of the generic name *Labisia*, Mez writes in a footnote: "Nominis derivatio dubia," but Lindley, l.c., explains it as follows: "From λαβίς, a spoon, in allusion to the form of the divisions of the corolla, which resemble the bowls of small spoons." The word λαβίς, however, properly means a *handle* or *holder* (<λαμβάνω, to take hold).

LIV—CONTRIBUTIONS TO THE FLORA OF TROPICAL AMERICA: XLII*.

NOTES ON THE GENUS *BELOTIA* A. RICH. A. A. BULLOCK.

About eighteen years have elapsed since Dr. Sprague revised the Tiliaceous genus *Belotia*, and the additional material which has accumulated since 1921 has naturally led to some modification in specific concepts. A series of twenty-one sheets from the United States National Herbarium (denoted by the letters US in the enumeration below) has been available for examination, in addition to the further material now in the Kew Herbarium (K).

The known geographical range of the species concerned has, in general, been extended by study of the additional material. *Belotia Campbellii* Sprague, for instance, described from British Honduras, is now known from several localities in that colony, and also from Costa Rica, Nicaragua, the Republic of Honduras, Guatemala, and from the two southern Mexican states of Oaxaca and Tabasco. It should be looked for in Yucatan and Chiapas. The identification of a Guatemalan specimen (Goll 243) with *B. caribaea* Sprague extends the range of that species from St. Lucia

* Continued from K.B. 1939, 199.

to the mainland. The range of *B. grewiifolia* A. Rich., the type of the genus, is also extended from Cuba to Guatemala. It will be noted in the enumeration that I have followed Sprague, and disagreed with Standley, in the identification of this species and of *B. mexicana* (DC.) K. Schum. The range of the latter is also considerably increased.

Belotia Campbellii Sprague in Kew Bull. 1921, 277; Standl. in Publ. Field Mus. Nat. Hist. Chicago, Bot. Ser. 12, 240 (1936).—*B. tabascana* Sprague, l.c. 278.

TABASCO. Lomas de San Sebastian, March 1889 (fl.), *Rovirosa* 416 (K; type of *B. tabascana*).

OAXACA. Bellville, Feb. 1910 (fl.), *Orcutt* 3437 (K, US).

GUATEMALA. Puerto Barrios, Dept. Izabal, Feb. 1905 (fl.), *Deam* 146 (K, ex herb. New York Bot. Gard.); Santa Teresa, Subin River, April, 1933 (fr.), *Lundell* 2773 (K).

BRITISH HONDURAS. Without locality or date (fl., fr.), *Peck* 340 (K). Seven Hills estate (fl.), *Campbell* 75 (K, type). Sibun River (fr.), *Campbell* 81 (K). Stann Creek, about 12 miles from Stann Creek Town, Jan. 1921 (fl.), *Hummel* (K). Manatee, Aug. 1921 (fr.), *Hummel* (K). Big Creek, Feb. 1929 (fl.), *Schipp* 8 (K), "large forest tree (50 ft. high, 12 ins. diameter), with small pink flowers, wood white and very light, used for floats on fishing nets." Stann Creek to Mullin's River road, Stann Creek district, Jan. 1937 (fl.), *Gentle* 1872 (K), "tree, diameter 22 cm., in high forest." Vaca, El Cayo district, Feb. 1938 (fl.), *Gentle* 2235 (K), "tree, diameter 6 ins."

REPUBLIC OF HONDURAS. Forest along Highland Creek, Puerto Sierra, Jan. 1903 (fl.), *Wilson* 251 (K, ex herb. New York Bot. Gard.); *ibid.*, Feb. 1903 (fr.), *Wilson* 297 A (K, ex herb. New York Bot. Gard.). Santa Cruz de Yoaja, Dept. Cortes, in open mountain forest, 600 m., Aug. 1933 (fl.), *Edwards* 650 (K).

NICARAGUA. Englesing 135 (K, ex Mus. Yale School of Forestry).

COSTA RICA. Vicinity of El General, Prov. San José, 1070 m., in forest clearings, June 1936 (fl.), *Skutch* 2658 (K), "tree 23 m., flowers lavender."

Vernacular names: Moho (*vide Hummel*); Mountain Moho (*vide Gentle*). Capulin savanero (*vide Englesing*).

After careful and prolonged examination of all the material cited above I have concluded that the type specimen of *B. tabascana* represents a form of *B. Campbellii*. The leafy nature of the inflorescences of *B. tabascana* is repeated in those of Englesing's specimen from Nicaragua. This character may be due to some growth or environmental factor. Dissection of a number of flowers shows that the petal-shape difference is not significant, and the much wider geographical range recorded above serves to link the specimens originally placed under *B. Campbellii* and *B. tabascana* respectively. Standley (*l.c.*) apparently shares the writer's view, for he gives the range of *B. Campbellii* as "southern Mexico to Honduras."

Belotia caribaea Sprague, l.c. 276—*B. grewiifolia* A. Rich. sec. Standl. in Contrib. U.S. Nat. Herb. 23, 737 (1923), partim, non A. Rich. (1845).

GUATEMALA. Semacoch trail to Panzas, Alta Vera Paz, March 1905 (fl.), *Goll* 243 (US), "large tree, wood soft."

This species was based on a rather poor specimen collected in St. Lucia by *Anderson* (K) and an unlocalized specimen in *herb. Miller*. (in herb. Mus. Brit.).

I have little doubt that the specimen cited above is correctly placed here, though the geographical range is thereby extended to the mainland.

Belotia grandifolia Sprague, l.c. 275—*B. grewiifolia* A. Rich. sec. Standl., l.c., partim, non A. Rich. (1845).

OAXACA. Cafetal Soledad, 800 m., Aug. 1917 (fl.), *Reko* 3376 (US).

VERA CRUZ. Zacuapan, Dec. 1917 (fr.), *Purpus* 8047 (US)

This species is unrepresented at Kew, save for a dissected flower from the type specimen, collected at Zacuapan (*Purpus* 1916 in herb. Mus. Brit.).

Belotia grewiifolia A. Rich. in La Sagra, Hist. Ile Cuba, Bot. 1, 209 (1845); Sprague, l.c. 276.

GUATEMALA. Vicinity of Puerto Barrios, Dept. Izabal, at sea level, June 1922 (sterile), *Standley* 25042 (US). Near the Finca Sepacuite, Alta Vera Paz, April 1902 (sterile), *Cook and Griggs* 622 (US).

Although the specimens cited above are sterile, I have no doubt that they belong to this species, which was hitherto known only from Cuba. Standley (in Contrib. U.S. Nat. Herb. 23, 737: 1923) records it from Mexico and Guatemala, but as indicated elsewhere in these notes, these records actually referred to other species. *B. grewiifolia* is the type of the generic name.

Belotia insignis Baill. in Adansonia, 10, 182 (1872); Sprague, l.c. 274.—*B. mexicana* (DC.) K. Schum. sec. Standl. in Contrib. U.S. Nat. Herb. 23, 737 (1923) partim, non *Grewia mexicana* DC. (1824), nec *Belotia mexicana* (DC.) K. Schum. (1890).

TEPIC. Near Colonio, April 1897 (fl., fr.), *Nelson* 4155 (K, US), "shrubby tree 10–20 ft., flowers purple." Foothills between Acaponeta and Pedro Paulo, Aug. 1897 (fr.), *Rose* 1941 (US).

MICHOACAN. Foothills of Volcano of Jorullo, Dec. 1829 (fl.), *Schiede* 692 (US, ex herb. Mus. Bot. Berol.); *ibid.*, March 1903 (fl., fr.), *Nelson* 6950 (US).

MICHOACAN OR GUERRERO. Botella, 400 m. granitic soil, Nov. 1898 (fl.), *Langlassé* 655 (K, US), "Arbre de 5 à 6 m., fleurs mauves." La Calera, 500 m., granitic soil, Dec. 1898 (fl.), *Langlassé* 717 (K, US), "Arbre, fleurs mauves."

OAXACA. El Calvario, 800 m., April 1917 (fl.), *Conzatti, Reko and Makrinus* 3076 (US). Cafetal Alianza, Distr. Pochutla, 500 m.,

April 1917 (fl., fr.), *Conzatti, Reko and Makrinus* 3126 (US). Cercanias de Tepenixtlahuaca, Distr. Tuquila, 850 m., Dec. 1921 (fl., fr.), *Conzatti* 4371. Vicinity of Cafetal Concordia, 400–650 m., April 1933 (sterile), *Morton and Makrinus* 2458 (K, ex US).

Without locality. *Liebmann* 467 (US, ex herb. Mus. Bot. Haun.).
Vernacular name: Yaco de Cal (*fide* Conzatti).

Most of the specimens cited above have been labelled by Standley "*Belotia mexicana*," whereas the correct interpretations of both *B. insignis* and *B. mexicana* were given by Sprague (*l.c.*), although the latter, at the time of the revision of the genus, saw only one specimen (*Palmer* 146, from Acapulco, Guerrero) of *B. insignis*. Burret (in Notizbl. Bot. Gart. Berlin, 9, 856: 1926) also confused *B. insignis* with *B. mexicana* and at the same time regarded *B. Galeottii* Turcz. (which is conspecific with *B. mexicana*) as a distinct species.

***Belotia mexicana* (DC.) K. Schum.** in Engl. et Prantl, Nat. Pflanzenfam. 3, vi. 28 (1890), excl. syn.; Sprague, *l.c.* 275—*B. grewiifolia* A. Rich. sec. Standl. in Contrib. U.S. Nat. Herb. 23, 737 (1923), partim, non A. Rich. (1845).

CHIAPAS. Escuintla, Nov.–Dec. 1937 (fl., fr.), *Matuda* 2136 (K).

GUATEMALA. Vicinity of San Francisco de Miramar, Costa Cuca, 1000 m., April 1905 (fr.), *Pittier* 74 (US).

These specimens considerably increase the known geographical range of *B. mexicana*. It is now definitely known from Vera Cruz, Chiapas, and Guatemala. Standley (*l.c.*) recorded his "*B. grewiifolia*" from Guatemala and from Oaxaca, the former record being based on Pittier's specimen cited above, and the Oaxaca record on a specimen collected by Reko (No. 3376) which I have referred to *B. grandifolia*.

***Belotia panamensis* Pittier** in Fedde, Repert. Sp. Nov. 13, 313 (1914); Sprague, *l.c.* 276; Standl. in Contrib. U.S. Nat. Herb. 27, 251 (1928)—*B. macrantha* Sprague, *l.c.* 274.

PANAMA. Canal Zone: on slopes of wooded hills at Paraiso railway station, Dec. 1861 (fl.), *Sutton Hayes* 438 (K, type of *B. macrantha*), "pretty tree 20–30 ft., calyx reddish, petals pale blue"; along an old trail above the Reservoir, 1–3 miles from Gorgona, 40–150 m., Feb. 1911 (fr.), *Maxon* 4736 (US), "spreading tree, about 10 m. high"; "Cana and vicinity," 600–1950 m., April–June, 1908 (fr.), *Williams* 772, "[tree] 6 in. [diameter] by 40 ft. [high]"; near Panama, Dec. 1905 (fr.), *Sargent* 21 (US), "small tree"; Las Cascades Plantation, near Summit, Dec. 1923 (fl.), *Standley* 25795 (US), "wet thickets tree 20 ft., sepals pink, petals violet, showy, scarce."

The original account by Pittier of his *Belotia panamensis* was seriously misleading, the inflorescences being explicitly stated to be 1–3-flowered, both in the description and in the note embodying the diagnostic characters.

Comparison of material of two specimens cited by Pittier, *Maxon* 4736 and *Williams* 772, both in fruit, *Standley* 25795 (flower) and *Sargent* 21 (fruit) with *Sutton Hayes* 438, the type of *B. macrantha*, leads to the conclusion that all these are conspecific.

LV—MISCELLANEOUS NOTES.

ROBERT SCOTT TROUP.—It is with great regret that we record the death of Professor R. S. Troup, C.M.G., C.I.E., F.R.S., F.C.H., F.L.S., on October 1st at Oxford, at the age of 64. Troup was educated in Aberdeen at the Gymnasium, the Grammar School and the University, and in 1894 passed into Coopers' Hill College as a probationer for the Indian Forest Service. There he very soon showed his capability, passed out top of his year and was awarded the Fellowship of the College. The Professor of Forestry, Dr. (later Sir William) Schlich was so impressed with Troup's ability that he marked him out, while he was still at college, as his eventual successor.

Troup joined the Forest Department in Burma in 1897 and soon made his mark as a scientific forester of distinction, so that his selection in 1905 as Forest Economist at the newly instituted Forest Research Institute at Dehra Dun caused no surprise. In 1915 he became Assistant Inspector General of Forests and in 1917 was made Controller of Timber Supplies until the end of the Great War. In every post he filled he showed outstanding ability, both in practice and in the written word.

In 1919, Sir William Schlich, then about to retire from the Chair of Forestry at Oxford, induced Troup to return to England to stand as a candidate for that post. This he did with some hesitation as he was reluctant to leave the Indian field. Once he had submitted his name there was no doubt of his selection and he duly succeeded to the chair at the beginning of 1920, a position he held till his death. During this period he made several tours to various parts of the Empire and to some foreign countries to attend conferences and also in an official advisory capacity. In this way he extended both his knowledge and his influence. In virtue of his professorship he was elected a Fellow of St. John's College, Oxford, and became a D.Sc. of that University. In 1926 he was elected to the Fellowship of the Royal Society.

Troup wrote extensively and clearly on forest subjects, his first big work being his "Indian Forest Utilisation," but he will best be remembered by that fine work "The Silviculture of Indian Trees," published in 1921, an exhaustive and copiously illustrated treatise which contained all the knowledge available at the time about the species included, much of which was the fruit of his own research and observation.

Troup was very modest in spite of his achievements and this, with his sense of humour, kindness and charm of manner, will cause him to be remembered with affection by his numerous friends

and many generations of forestry students. He was imbued with a real sense of scientific caution and would not commit himself to any statement without verifying the facts and feeling very sure of his conclusions.

C. E. C. FISCHER.

LADY JOAN LEGGE.—We deeply regret to record the death of Lady Joan Legge in the Bhyundar Valley on 4th July, during a climbing and collecting expedition in the western Himalayas. Lady Joan, who was the youngest daughter of the sixth Earl of Dartmouth, was especially interested in horticulture and farming, including pedigree dairy cattle. She was a J.P. for Staffordshire and amongst other activities of her strenuous life she took a leading part in the Boy Scout Group of that county and was for a time County Commissioner. She was a great lover of plants and when the opportunity arose to visit the Valley of Flowers which had been so vividly described by Mr. F. S. Smythe she eagerly seized it. She spent several months at Ranikhet and Joshimath in Kumaon, securing seeds and roots for her friends and dried specimens for the Kew Herbarium. Although not an experienced collector her dried specimens were gathered with great care and were accompanied by useful notes indicating her interest and enthusiasm in her favourite subject. Death was due to an accident caused by the treacherous nature of the ground after heavy rains and drifting snows.

Annual Report of the Superintendent, Botanical and Forestry Department, Hong Kong: 1938.—In his annual report on the Botanical and Forestry Department of Hong Kong, the Superintendent reports that the Government has shown increased interest in matters connected with Forestry and Agriculture. The importance of protecting and extending the area under forest is recognized, not only from the point of view of the increased demand for fuel owing to the greatly enlarged population which has resulted from the Sino-Japanese conflict, but also with a view to checking erosion. It is proposed to increase the area under forest reserve, and to check illegal fellings and the damage caused by goats. The tree mainly used for afforestation is *Pinus Massoniana* Lamb., and trials were made with different methods of planting. The method of sowing *in situ* which necessitates the digging of pits was compared with broadcasting the seed. Both methods are necessary in dealing with the different types of area in the Colony, but the broadcasting system has given good results with the pines in the burnt areas. Other trees that are being planted in the new forest reserves are *Pinus kasya* Royle ex Parlat., *Liquidambar formosana* Hance, and *Aleurites montana* E. H. Wils.

An attempt is being made to establish one or two species of economic "bamboos." The planting material was obtained from Canton. These efforts were not altogether successful as some of the

planting material was too young, and the method of packing for transport was unsuitable. This has somewhat retarded the development of a useful scheme, which will now be organised on sounder lines in view of the experience gained.

Microscopy of Drugs.*—This work provides an introductory course in the microscopy of drugs suitable for students preparing for the B. Pharm. and other examinations in pharmacy, or for the Fellowship of the Institute of Chemistry. General principles and technique are dealt with briefly in the chapters on drawing, micro-measurement, and microchemical tests, but the major portion of the book is devoted to the more important drugs. These are grouped on their morphology into chapters, each of which opens with a short account of the different types of structure to be encountered. A schedule for the examination of the whole drug and the powder is provided for each drug, with a summary of the diagnostic microscopical characters illustrated by a page of original line drawings. Together, the drawings make an atlas of drug microscopy which should prove useful for reference as well as for teaching; details are drawn to a uniform magnification of 200 diameters, thus facilitating comparison. The morphological grouping of the drugs results in chapters of unequal size, six rhizomes or roots, six fruits, or seeds, but only one herb (*Lobelia*) and one flower (*Clove*) being included. The final chapter is devoted to a description of the method of quantitative analysis of powders using *Lycopodium* spores and to miscellaneous structures likely to be seen in drugs or their powders.

In a short guide for practical work it is always difficult to decide what facts should be omitted. Necessarily the student must rely on the teacher or on textbooks for many details; all facts essential for a thorough appreciation of the practical side of the study should be included. Examined on this criterion the book under review appears in a favourable light. Modern quantitative methods are described, including the estimation of vein islet numbers and palisade ratios for leaves. It is surprising, however, that the several types of arrangement of the accessory cells of the stomata are not defined. Errata are commendably scarce; the misspelling of Burkill's name (p. 114) is evidently copied from the British Pharmacopoeia.

R. MELVILLE.

The Garden of Larkspurs.†—For many years the classification of cultivated Delphiniums has been in great confusion, so that this work by L. H. Bailey is very welcome.

It is a departure from most books on the subject, many of which only deal with Delphiniums as garden plants in the herbaceous border; this work, however, goes deeper into the question, making

* "The Microscopical Study of Drugs" by Lilian A. Kay. Baillière, Tindall & Cox, London, 1938. Pp. VIII+228. Price 10s. 6d.

† By L. H. Bailey. The Macmillan Co., New York, 1939. Pp. 116. Illustrated, Price 13s.

it equally valuable to the botanist, the horticulturist, and the hybridizer, while the help and advice given to the novice will be of great assistance.

Mention is made of more than one hundred species, including dwarf species from the high mountains of different parts of the northern hemisphere suitable for the rock garden, others from lower altitudes for the herbaceous border and for the wild garden, while the fancier's collection is also dealt with.

There is some reason for holding that the name *Delphinium Ajacis* should be applied to *D. orientale* J. Gay, which it undoubtedly covered, but as this view has not yet been fully substantiated, Dr. Bailey has retained *D. Ajacis* for the Rocket Larkspur, to which it has been generally applied for the last ninety years, in preference to adopting the name *D. Gayanum* Wilmott (Journal of Botany, 62, 26 : 1924).

On page 75 in the key, the difference is pointed out between two species in which there is some confusion in many botanic gardens, namely *Delphinium Requinii* and *D. Staphisagria*, the "Stavesacre" or the "Staphisagria of the herbalists," the seeds of which yield delphinine. Although there is considerable difference in the seeds of the two species, the plants when growing look very much alike. As it is pointed out, however, there is also a difference in the length of the spur, and it is not necessary to wait until the seeds have developed for correct determination.

Diseases (by L. H. Leonian, Editor for the Delphinium Society of America) and Pests (by W. E. Blauvelt, Professor in the College of Agriculture at Cornell University) are very fully dealt with, as also are soil, drainage, fertilising, mulching and position.

The key is very helpful, the pen drawings are exceptionally good, and the book is full of useful information, as is to be expected from an author of Dr. Bailey's wide knowledge and experience. It is a valuable addition to the series ushered in with "The Garden of Gourds" and "The Garden of Pinks." G. H. PRESTON.

BULLETIN OF MISCELLANEOUS INFORMATION No. 10 1939 ROYAL BOTANIC GARDENS, KEW

LVI—TAXONOMY OF THE SUGAR-CANE SMUTS.

B. B. MUNDKUR (Imperial Agricultural Research Institute, New Delhi).

The nomenclature of the smuts attacking species of the genera *Saccharum* and *Erianthus* is in confusion and attempts have been made to clarify the situation by Sydow (1924), Ciferri (1933) and Boedijn (1935). Sydow, after making a critical examination of the available specimens of smuts on these two genera, announced in 1924, that the name *Ustilago Sacchari* Rabenh. had been erroneously applied to the smut on sugarcane. *Ustilago Sacchari* is an ovaricolous smut with spores ranging in diameter from 7.5 to 10.5 μ ; it attacks the flowers of *Erianthus ravennae* Beauv. and was collected by Haussknecht at Marasch in Iran. Sydow, who re-examined the specimen, found that the spores were smooth, yellowish to bright yellow-brown, and that their diameter varied from 8.5 to 10.5 μ . In selecting the specific epithet "*Sacchari*" Rabenhorst (1870) presumably had in mind the fact that some taxonomists had merged *Erianthus* into the genus *Saccharum*, but by doing so he introduced a confusion in the nomenclature of the sugarcane smuts which it has taken over half a century to clear up.

Further confusion was added by Fischer von Waldheim (1877) who stated that the spores were localized in the inflorescence and that their diameter was 10 to 12 μ ; he cited *Saccharum cylindricum* L. as an additional host but did not indicate the source of his material or its locality. It is apparent that he had not compared his specimen with Rabenhorst's type, for Fischer von Waldheim (1878) later discovered that he was actually dealing with *Ustilago Schweinfurthiana* Thümen [= *Sphacelotheca Schweinfurthiana* (Thüm.) Sacc.] and that the host itself had been transferred to *Imperata* as *I. cylindrica* (L.) Beauv.

Responsibility for complications in the nomenclature of sugarcane smuts should, however, rest largely with De Toni (1888) who monographed the *Ustilagineae* for Saccardo's "Sylloge Fungorum." He gave the range of spore size as 8 to 18 μ , described the smut for the first time as culmicolous, added *Saccharum officinarum* L. to the list of hosts and cited Natal in South Africa, where J. M. Wood had collected sugarcane smut in 1881, as another locality. It is doubtful whether De Toni had actually seen this specimen, which is in Kew Herbarium, for the measurement of 200 spores has now yielded a

range of only 5.5 to 8.9 μ , which is usual for sugarcane smuts and which comes nowhere near the range given by De Toni. Furthermore, he erroneously cited the type locality as Ravenna, a town in Italy, having apparently mistaken the specific epithet of the host plant, *Erianthus ravennae*, for the locality of the smut. It is surprising how an error once made persists, because even though pointed out by Sydow (1924) and again by Boedijn (1935), Ravenna is still cited by Ciferri (1938) as the type locality and he does not even mention Iran in its area of distribution.

The common sugarcane smut is culmicolous and entirely destroys the inflorescence. Its spores, according to Sydow, are dilute brown, smooth, and 5.5 to 7.5 μ in diameter. He considered the smut, with every justification, to be different from *U. Sacchari* and named it *Ustilago scitaminea*. Another culmicolous smut on what was then known as *Saccharum fuscum* Roxb. [= *Sclerostachya fusca* (Roxb.) A. Camus] had also smooth spores, but a diameter of only 3.5 to 5.0, and he named it *U. consimilis*. Sydow said that he was able to distinguish a third culmicolous form on *S. spontaneum* L. whose spores were intermediate in size between those of *U. consimilis* and *U. scitaminea*, but he tentatively placed it in the latter species as the specimen with him, which like the rest came from India, was too poor to permit adequate description.

Additional complications to the *Saccharum* smut problem arose from the fact that Zundel (1930) confused *U. consimilis* and *U. scitaminea* and included the spore diameter and the host range of the latter in a description of the former and from Boedijn's (1935) statement that Rabenhorst had included *Saccharum officinarum* L. among the hosts of *U. Sacchari*, which he certainly had not.

The statement of Sydow that there may be a third culmicolous smut attacking the genus *Saccharum*, which was distinguishable by its size, led to a critical examination of the available collections of sugarcane smuts. A controversy with regard to the mode of transmission of this smut exists; Krüger and Wakker [as quoted by Dastur (1920)] in Java, and Ajrekar (1916) at Poona maintain that it can be transmitted by smearing the smut spores on the cut surfaces of the setts, while Butler (1918) and Dastur (1920) deny this, and the latter states that infection is only through thin-walled scale hairs of very young buds. Perhaps an explanation to these conflicting views lies in there being more than one species of sugarcane smut with different modes of transmission and it was hoped that this examination of the collections would reconcile these divergent views.

MATERIALS.

Exsiccata material was obtained from several herbaria. Over thirty specimens were available in the Herb. Crypt. Ind. Orient. of the Imperial Agricultural Research Institute, New Delhi. Specimens were kindly sent by the Directors of the Royal Botanic Garden, Kew; Bureau of Science, Manila; Royal Botanic Garden,

Peradeniya; and by Dr. K. B. Boedijn, Curator of the Herbarium Bogoriense, Buitenzorg; Dr. D. H. Linder, Curator of the Farlow Herbarium; Dr. F. J. Seaver, Curator of the New York Botanical Garden; Dr. J. A. Stevenson, Senior Mycologist in charge of the Collections in the United States Department of Agriculture, and others. Within India itself, specimens have been received from the Mycologists of the Assam, Bombay, Burma, Punjab and United Provinces Departments of Agriculture. A large collection of sugarcane smuts was made in different localities and on different varieties of sugarcane by the staff of the Sugarcane Mycology Sub-Section of this Institute and was available for study, while Dr. B. L. Chona, in charge of that Sub-Section, suggested that a critical examination of the spores taken from the smutted plants of different ages and of collections from different cane varieties which had been artificially infected by the same smut collection would be worth while, materials of both of which he kindly supplied. The writer wishes to express his debt of gratitude to these persons for their kind co-operation.

In all cases, except when the material was very scanty, diameters of 200 spores mounted in lacto-phenol have been measured using artificial light from a 100-watt bulb. The light was filtered through a dilute solution of cotton blue which gave the effect of daylight. A Leitz fluorite oil immersion objective and 6+ and 10+ compensating eye-pieces were used, the former for the measurements.

MORPHOLOGICAL CHARACTERS.

Several morphological characters of diagnostic value have been taken into consideration. The place of occurrence of a smut is of much significance, though a few ovaricolous or floricolous smuts like *U. Avenae* (Pers.) Jens. and *U. Tritici* (Pers.) Jens. have been known to assume a foliicolous character. The spores themselves, provided they are perfectly mature, show also a uniformity in the thickness of their spore-wall, in the character of their margin, in the markings of their surface and in their colour. These characters singly are scarcely sufficient to entitle a smut to specific rank, but taken together, they can, without hesitation, be used as characters of diagnostic value.

Spore-surface and Margin. The question has been sometimes raised whether such spore-wall characters as punctate, echinulate or verrucose markings can be relied upon in the separation of species and whether with the passage of time an echinulate spore is not likely to become punctate or smooth. In the course of the studies on smuts hundreds of specimens with echinulate spores, collected in different years, during about a century or more, have been examined. In no case has an instance been found where it was not possible to make out the echinulations clearly, if they had been reported to occur, provided the examination of the spores was made under an oil immersion objective.

Spore-size. With regard to size, it must be mentioned that nearly 400 species of *Ustilago* have been described and that their spore diameters range from 3.0 to 19.0 or 20.0 μ , with means varying from 4.0 to 13.0 or 14.0 μ . All these species have to be accommodated within these limits, which admittedly are very narrow. Equal emphasis should, therefore, be laid on the morphological characters and on the spore measurements in determining the species and an adequate number of spores, selected at random, should be measured. The smaller the number of spores measured, the greater the deviation from the true mean, and the measurement of at least 200 spores should alone be considered adequate in the smuts, although fewer measurements may have to suffice if the material is very scanty.

The Hosts. Agrostologists are not yet in accord regarding the status of the genus *Erianthus* Michx., and it has been merged by some of them into the genus *Saccharum* L., as the only distinction—that of awned upper glumes in *Erianthus* as against awned or awnless glumes in *Saccharum*—seems to break down. The genus for the present has been retained and the culmicolous smuts attacking *S. Barberi* Jesw., *S. fuscum*, *S. officinarum*, *S. spontaneum* and *E. ravennae* Beauv. have been included in the present communication. The host of *U. consimilis*, which, according to Mr. B. C. Basu, who collected it in Assam in 1910, is called "Ikra" grass and which was then identified at the Royal Botanic Garden, Calcutta, as *S. fuscum*, is so much damaged by the smut that it was not possible to re-determine it. Dr. N. L. Bor, an authority on Assam grasses, stated (in a personal communication) that the term "Ikra" is applied to a specially robust type of *S. spontaneum*. A smut collected in Assam in January 1938 on a host which was identified at the Royal Botanic Garden, Calcutta, as *Erianthus ravennae* is undoubtedly *U. consimilis*, but the identification of the host plant is a matter of some doubt as *E. ravennae* does not occur in Assam, according to Dr. Bor.

RESULTS.

Seventy-three collections, fifty-two from India, eleven from the Philippines, three each from China and Java, two from Natal and one each from Burma and Mauritius, have been subjected to these critical tests. They can be divided on the basis of this examination into two species and two varieties, of which the latter are proposed as new. One of the new varieties has already been mentioned by Sydow (1924) as being intermediate between *U. consimilis* and *U. scitaminea*, but he did not describe it. This new variety attacks not only *S. spontaneum* but also *S. Barberi* and *S. officinarum* (both cultivated sugarcanes) and seems to be fairly common in Northern and Eastern India. The other new variety is characterised by its prominently echinulate and considerably large spores, averaging to 8.4 μ or more in diameter and occurs chiefly in Eastern Asia (China and the Philippines) but one collection

has been made in India as well. The description of the two species has been emended for the sake of precision and clarity.

1. *Ustilago consimilis* Sydow.

Culmicolous, completely destroying the inflorescence and part of the axis; sorus covered by the sheath, not extending into a long flagelliform structure; vestiges of a membrane made up of host tissue and columella present. Spores black in mass, dusty, spherical to sub-globose, Chestnut (Ridgway), with thick spore-wall, smooth margin and spore-surface; diameter from 3.7 to 6.2 μ with a mean of 4.9 μ .

On *Saccharum*? *fuscum* Roxb. at Sibsagar, Assam; collected by B. C. Basu on 18th December, 1910. A second collection was made in Assam in January 1938, on *E. ravennae* (L.) Beauv. by T. N. Sen.

Frequency of the spore-diameters of the type specimen (Butler 1412) is as follows:

Diameter μ	...	3.7	4	5	6	
Frequency n	...	7	13	150	30=200.	Mean=4.9 μ .

2. *Ustilago scitaminea* Sydow.

Culmicolous, entirely destroying the floral axis; sorus extending into a long, curved, flagelliform structure, at first covered by a delicate silvery membrane of host tissue, later naked; lower part hidden by the leaf-sheath; columella present. Spores powdery, black in mass, spherical to sub-globose, Rood's Brown to Prout's Brown (Ridgway), with thin spore-wall, smooth margin, very minutely punctate spore-surface; diameter 5.5 to 9.7 μ with a mean of 7.5 μ .

On *Saccharum officinarum* L. and *S. Barberi* Jesw. in India, Java, Burma and South Africa.

Spore measurements of Sydow's *Fungi Exotici Exsiccati* 119:

Diameter μ	...	5.7	6	7	8	9.2
Frequency n	...	8	31	145	74	32=290. Mean=7.3 μ .

The total number of collections examined is forty-five and the spores have ranged in diameter from 5.4 to 9.6 with means from 7.3 to 7.9 μ . This is the more common smut. Sydow's *Ustilagineen* 384 and 406, his *Fungi Exotici Exsiccati* 119 and *Raciborski* 22, are of this smut. All were issued as *U. Sacchari*.

***Ustilago scitaminea* Syd. var. *Sacchari-Barberi* Mundkur, var. nov.**; a typo differt sporis "Mummy Brown (Ridgway)", 5.1-8.6 (in medio 6.7) μ , episporio crasso minutissime verruculoso, margine asperato.

On *Saccharum Barberi* Jesw. at Partabgarh; collected by B. B. Mundkur on 11th March, 1934. Type of the variety deposited in the Herb. Crypt. Ind. Orient., New Delhi and Herb. of the Imperial Mycological Institute, Kew.

Spore measurements of type specimen:

Diameter μ	...	5.1	6	7	8	
Frequency n	...	3	90	104	3=200.	Mean=6.6 μ .

SUMMARY.

1. In 1924 Sydow pointed out that the name *Ustilago Sacchari* Rabenh. had been erroneously applied to the smut of sugar-cane (*Saccharum officinarum* and *S. Barberi*) and proposed the name *U. scitaminea* for it. As the reasons adduced by Sydow were quite sound, the nomenclature proposed by him has been accepted by mycologists.

2. A critical examination of seventy-three collections of these smuts was recently made and on the basis of spore-colour, surface markings, thickness of the spore-wall and size, a conclusion has been reached that the culmicolous smut on sugarcane consists of one species and two new varieties, to which the names *U. scitaminea* var. *Sacchari-Barberi* and *U. scitaminea* var. *Sacchari-officinarum* have been given. The former variety has much smaller spores and the latter has consistently longer spores than those of the main species.

ACKNOWLEDGMENTS.

The writer wishes to record his grateful thanks to Mr. L. D. Galloway, formerly Imperial Mycologist, for suggesting this study and to Mr. S. F. Ashby, Director, Imperial Mycological Institute, and Dr. G. R. Bisby of the same Institute, for critically reading the manuscript and for making several valuable suggestions. The latin diagnoses of the new varieties were kindly supplied by Mr. E. W. Mason.

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LVII—ADDITIONS TO THE FLORA OF BORNEO AND OTHER MALAY ISLANDS: XV.*

THE WINTERACEAE, LAURACEAE AND MENISPERMACEAE OF THE OXFORD UNIVERSITY EXPEDITION TO SARAWAK, 1932.

H. K. AIRY-SHAW.

For explanation of abbreviations, see K.B. 1939, 275.

WINTERACEAE

Drimys piperita Hook. fil. in Hook. Ic. Pl. **9**, t. 896 (1852); Stapf in Trans. Linn. Soc. ser. 2, **4**, 128 (1894).

Dulit Ridge, moss-forest on brink of precipice, c. 1230 m., 9 Sept., Richards 1645: "Petals white. Shrub, c. 2-3 m. high."

Ulu Koyan, white sand forest, between 800 and 1000 m., 15 Sept., Native Collector 1872: "Fls. white. Shrub."

Dulit Ridge, open moss-forest on exposed peak (also occurs in "heath forest"), c. 1300 m., 17 Sept., Richards 1896: "Shrub, 2-3 m. high. Petals white. Leaves thin, glaucous beneath. White latex."

* Continued from K.B. 1939, 517.

Dulit Ridge, open moss-forest, c. 1300–1400 m., 8 Nov., *Richards* 2507: "Shrub, 2–3 m. high. Petals white, minutely rugose. Stamens yellow. Leaves glaucous beneath."

LAURACEAE

Beilschmiedia titanophylla *Airy-Shaw*, sp. nov., ex aff. *B. longipedicellatae* Ridley et forsan *B. tawaënsis* Merr., ab utraque foliis giganteis usque 64 cm. longis et 30 cm. latis valde distincta.

Arbor parva, *statura* ignota. *Ramuli* usque 7 mm. diametro, cortice pallido striato sub lente parce piloso, innovationibus dense pallide cinnamomeo-tomentosis. *Folia* ingentia, alterna, obovata, 51–64 cm. longa, 23–30 cm. lata, basi late cuneata, apice obtusa vel vix rotundata brevissime cuspidato-caudata, cuspidate 1–2 cm. longa tenui acuta, integerrima, tenuiter chartacea, siccitate olivacea, supra glabra, subtus molliter breviter subvelutino-pubescentia; costa valida, supra plana vel vix impressa, glabra, subtus valde prominens, tomentosa; nervi laterales 15–20-jugi, patulo-procurvi (infimi subpatentes), vix arcuato-anastomosantes, nervis secundariis inter primarios laxè scalariformiter dispositis; petioli 3–4.5 cm. longi, 3–4 mm. diametro, lateraliter compressi, supra glabri, subtus plus minus tomentosi. *Thyrsi* ex innovationibus orti, extra-axillares, elongati, laxi, 35–38 cm. longi, breviter haud dense patulo-pubescentes, pedunculo 15–20 cm. longo, ramis brevibus 1–2.5 cm. longis bracteis oblanceolatis 5–8 cm. longis involutis subtus dense supra sparsius cinnamomeo-tomentosis suffultis, ramis apice in ramulos 2 breves 2–5 mm. longos divisos, ramulis cymas 3–7-floras gerentibus, pedicellis usque 5 mm. longis puberulis. *Perianthii segmenta* 6, latissime ovata vel fere orbicularia, 2.5–3.5 mm. longa, 2.5 mm. lata, valde concava, extra et intus parce adpresse puberula. *Stamina* seriei primi (extimi) oblonga, 1.5 mm. longa, filamentis longe pubescentibus, antheris glabris introrsis; seriei secundi similia; seriei tertiæ angustiora, magis subulata, ut videtur extrorsa sed sterilia, glandulis basalibus nullis; staminodia 3, circiter 1 mm. longa, breviter oblanceolata, acuta, inferne pubescentia, superne glabra. *Ovarium* oblongo-ovoideum, 1.25 mm. longum, in stylum tenue 0.75 mm. longum attenuatum, glabrum, stigmate breviter 3-loba, lobis recurvis; ovulum 1, pendulum. *Fructus* ignotus.

Gunong Balapau, Ulu Tinjar, primary forest on steep slope, c. 500–600 m., 2 Nov., *Native Collector* 2438: "Small tree. Fls. greenish."

This remarkable species, which has larger leaves than any other Lauraceous plant known to the writer, differs from *Beilschmiedia*, as hitherto defined, in the absence of the stipitate glands between the 2nd and 3rd rows of stamens. Ridley makes no mention of glands in his description of *B. longipedicellata*, from the Malay Peninsula, which, judging from a fruiting specimen (*Md. Soh* 8170) in Herb. Kew., is a closely allied plant. The softly pubescent, almost membranous leaves are also unusual in *Beilschmiedia*. The currently accepted distinctions between *Beilschmiedia*

and the closely related genera *Dehaasia* and *Alseodaphne* are very unsatisfactory. It may eventually be necessary to transfer these species to one of the latter, or else to establish a separate genus for their reception.

Cryptocarya Kurzii Hook. f. in Hook. f. *FBI*. 5, 119 (1886).

var. **subsericea** *Airy-Shaw*, var. nov. foliis subtus persistenter breviter subsericeis siccitate pallide brunneis, inflorescentiis brevissimis (? an semper).

Gunong Balapau, Ulu Tinjar, primary forest, c. 800–900 m., 2 Nov., *Richards* 2443: "Tree, c. 20 m. high. Fls. yellowish brown." Also: Baram distr., Miri River, Jan. 1895, *Hose* 66.

var. **argentea** (*Gamble*) *Airy-Shaw*, stat. nov.

Cryptocarya argentea Gamble in KB. 1910, 144 et in JASB. 75, 51 (1912); Ridl. *FMP*. 3, 81.

C. Kurzii Hook. f. sec. Gamble in JASB. l.c. 49, quoad *King's Collector* 6083 tantum, non Hook. f.

Foliis subtus valde caesio-glaucis minus puberulis tantum differt.

PERAK. Gopeng, dense jungle, hilly localities, 90–240 m., May 1884, *King's Collector* 6083: "A tree 50 to 70 ft. high. Stem 10 to 15 in. diam. Leaves rich glossy deep green, slaty blue underneath. Flower pale greenish yellow." Batang Padang, dense jungle, low hills, 90–150 m., Aug. 1885, *King's Collector* 7966: "A tree 50 to 70 ft. high. Stem 15 to 20 in. diam. Leaves bright green, silvery grey underneath. Fruit dark green, young."

PAHANG. Ulu Sungai Rompin, 18 May 1928, *Md. Soh* 15468.

Gamble suspected that *K.C.* 6083 might represent the flowering stage of his *C. argentea*, but eventually decided against it. I am at a loss to understand his reasons for this decision. I agree, however, with Ridley (l.c. 82) that *C. argentea* is not specifically separable from *C. Kurzii*. The type and the variety seem distinct in the Malay Peninsula, but the Bornean forms are intermediate, though on the whole nearer to *Kurzii*. Such are the following specimens (all from Sarawak) in Herb. Kew.: *Sine loc.*, *Beccari* 3395, 3519, 3898; *Rejang*, Sibui, Feb. 1893, *Kalong for Haviland* 3082; *sine loc.*, *Native Collector* (Sar. Mus. for Bur. Sci. Manila) 91.

Actinodaphne fuliginosa *Airy-Shaw*, sp. nov., *A. oleifoliae* Gamble et *A. gelonioidi* Ridley affinis, ab illa foliis multo minoribus subtus haud glaucis, ab hac foliis obtusis vel rotundatis subtus haud areolatis, ab utraque ramulis annotinis petiolisque atro-tomentellis differt.

Frutex circiter 3–4 m. altus. *Ramuli* teretes, usque 4 mm. diametro; innovationes dense castaneo-tomentellae et simul sparsius longe adpresso-sericeae; ramuli annotini atro-tomentelli, demum glabrescentes cortice brunnescente vel cinereo. *Folia* per 3–5 (plerumque 4) pseudo-verticillata, obovata vel elliptico-obovata, rarius suboblata vel late elliptica, 3.5–6 cm. longa, 1.5–3 cm. lata, basi late cuneata vel vix rotundata, apice obtusa vel rotundata, margine integra levissime recurva, firme coriacea, supra costa castaneo-puberula excepta glabra, nitidula, subtus primo crispule castaneo-puberula cito glabrata, siccitate pallide viridia; costa supra leviter impressa, subtus prominula, pallida; nervi laterales graciles, circiter 5-jugi, patuli, prope marginem arcuato-anastomosantes, supra tenuiter insculpti, subtus vix

prominuli; venuli ultimi valde inconspicui, haud vel rarissime areolati; petioli 8–10 mm. longi, modice graciles, novelli sicut innovationes, annotini sicut ramuli annotini induti. *Flores* (masculi tantum cogniti) valde sparse editi, in fasciculis brevissimis 1–5-floris plerumque extra-axillaribus orti, longe rufo-pubescentes. *Pedicelli* circiter 2 mm. longi, rufo-pubescentes. *Perianthii* tubus 1 mm. longus; segmenta 6, suborbicularia vel late ovata, 1.5–2 mm. diametro, obtusa vel subacuta, extra pubescentia, intus glabra. *Stamina* 9, exteriora 6 perianthio subaequilonga vel eo paullo longiora, intima 3 perianthio breviora: filamenta longe villosa; antherae oblongae. *Ovarii rudimentum* nullum. *Fructus* ignotus.

Dulit Ridge, open moss-forest on exposed peak, c. 1400 m., 17 Sept., *Synge* 1893: "Petals pale yellowish green. Leaves blackish green above, glaucous below. Shrub, c. 3–4 m. high."

Readily distinguished from its nearest allies by the close sooty-black indumentum of the year-old twigs and petioles.

It may be remarked here that the Bornean form of *A. olcifolia* referred to by Gamble (in KB. 1910, 313, et in JASB. 75, 122: 1912) is almost identical with Ridley's variety *glabra* from Gunong Tahan, but until flower of the latter or fruit of the former is known a direct comparison is not possible. The number (334) of the *Haviland & Hose* specimen cited by Gamble is apparently an error, since the specimens written up by him in Herb. Kew., with his dissections attached, are nos. 3647 J and 3647 K. The same form is represented by *Native Collector* 2174 (through Sar. Mus. for Bur. Sci., Manila, Feb.–June 1914), from Sarawak, without precise locality.

Litsea montis-dulit *Airy-Shaw*, sp. nov., ex affinitate *L. grandis* (Nees) Meissn., a qua habitu minus robusto, foliis multo minoribus elliptico- vel subovato-oblongis (nec obovatis) siccitate supra laete viridibus, nervis lateralibus paucioribus, nervis tertiariis obscuris, umbellulis minoribus siccitate saturatius brunneo-tomentosis abunde differt.

Arbor circiter 15 m. alta, trunco circiter 13 cm. diametro. *Ramuli* usque 7 mm. diametro, teretes, juniores leviter sulcato-angulati, cortice cinereo-fusco glabrescente, innovationibus breviter dense brunneo-tomentellis. *Folia* elliptico- vel subovato-oblonga, rarius leviter obovato- vel oblanceolato-oblonga, 6–13.5 cm. longa, 2–6.5 cm. lata, basi rotundata rarius levissime angustata, apice angustata vel vix brevissime acuminata obtusa, margine integra levissime decurva, firme coriacea, supra glaberrima (nisi valde juvenilia brunneo-tomentosa) nitida siccitate laete viridia, subtus brevissime nec dense asperulo-velutina pallide brunnescentia; costa supra fere plana vel levissime impressa, subtus prominens 1–2 mm. lata brunneo-tomentosa, nervis lateralibus 5–8-jugis gracilibus anguste patulis valde sursum procurvis supra planis subtus prominentibus brunneo-tomentellis marginem versus evanescentibus nec anastomosantibus; petioli 1–1.5 cm. longi, 2 mm. crassi, brunneo-tomentosi, rugulosi. *Umbellulae* plerumque 2–3 in racemos abbreviatos usque 5 mm. longos saepe fasciculiformes plerumque ex axillis defoliatis ortos dispositae; pedunculi 5–9 mm.

longi, 1.5 mm. crassi, dense tomentosi, saturate brunnei; bractae involucrales 4, suborbiculares, 6–7 mm. longae et fere aequilatae, rotundatae, valde cucullatae, extra dense brunneo-tomentosae, intus glabrae. *Flores* ♀ tantum cogniti, circiter 6 in quaque umbellula, 1–2 mm. pedicellati. *Perianthii* tubus trigono-ovoideus, extra tomentosus, 2 mm. longus; segmenta 6, oblanceolato-elliptica, 2–2.5 mm. longa, 0.5–1.5 mm. lata, obtusa, extra sericea. *Staminodia* 12, lineari-clavata, inferne villosa, 6 exteriora circiter 2 mm. longa, simplicia, 6 interiora breviora, glandulis binis magnis discoideis glabris praedita. *Pistillum* sigmoideum, 3.5 mm. longum, glabrum: ovarium 1 mm. longum, trigonum, in stylum sensim attenuatum; stigma magnum, foliaceum, irregulariter lacerum, 2 mm. latum. *Fructus* ignotus.

Dulit Ridge, "transition" forest, c. 1200 m., 9 Sept., *Synge* 1649: "Tree, about 15 m. high, c. 13 cm. diam. (probably young spmn.). Fls. buff-coloured. Timber useful."

Vernacular name: *medang impangor*.

The most striking feature of the herbarium material is the contrast between the bright green shining upper surface of the leaves and the deep sepia brown of the numerous inflorescences. *L. grandis* has been given as its affinity on account of the pubescent lower leaf-surface (see Gamble's key in Mat. Fl. Mal. Penins. 5, 125: 1912), but *L. castanea* Hook. f. is perhaps equally closely allied, though with glabrous or almost glabrous leaves.

Litsea singaporensis *Gamble* in KB. 1910, 358; Ridl. FMP. 3, 122; vel aff.

Dulit, crest of ridge, primary forest, under 300 m., 29 Oct., *Richards* 2361: "Tree, 24 m. high, 5 cm. diam. Traces of buttresses."

Vernacular name: *medang kuning*.

Neolitsea amabilis *Airy-Shaw*, sp. nov. ex affinitate *N. latifoliae* (Bl.) S. Moore atque *N. formosae* S. Moore, ab utraque foliis subtus pulchre rufo-tomentellis facile distincta.

Frutex gracilis, circiter 3 m. altus. *Ramuli* usque 5 mm. diametro, teretes, striati, cortice annotinorum cinereo glabrescente, hornotinorum brunneo rufo-puberulo. *Folia* alterna vel subopposita, apicem cujusque anni incrementi versus aggregata, latissime elliptica, 7–8.5 cm. longa, 3.5–5.2 cm. lata, basi rotundata usque cuneata, apice abruptiuscule acuminato-cuspidata, cuspidate 1–1.5 cm. longa obtusa vel subacuta, margine integra subrevoluta, rigide coriacea, supra costa puberula excepta glabra siccitate pallide griseo-brunnea, subtus omnino dense adpresse rufo-tomentella (ipsa epidermi glauca), seniora nigro-tomentella; nervi primarii laterales 1-jugi, subbasales, 3–4 mm. supra basin costae orti, subrecti, usque duas trientes laminae attingentes, dein incurvi et evanidi, nervis secundariis e costa apicem versus ortis 2–4-jugis, omnes sub-bullato-impressi, subtus plerumque glabrati; petioli circiter 1 cm. longi, 2 mm. lati, dense tomentelli, rugulosi.

Glomerulae in capitula circiter 6-glomerulata brevissime (1–2 mm.) pedunculata axillaria extra-axillaria et subterminalia aggregatae, pedunculis bracteis parvis 5–6 instructis, 1–3-florae, bracteis 4 magnis suborbicularibus 3–4 mm. diametro valde cucullatis inclusae. *Flores* ♂ tantum cognitae. *Pedicelli* 3 mm. longi, dense longe ferrugineo-villosi. *Perianthii segmenta* 4, oblonga usque late elliptica, 3 mm. longa, 1–1.5 mm. lata, obtusa vel subacuta, glabra, tubo brevi villosa. *Stamina* 6, perianthio subaequilonga, basi longe villosa, 2 interiora glandulis 2 peltatis infra medium praedita, antheris 0.75 mm. longis. *Fructus* ignotus.

Dulit, open moss-forest, c. 1230 m., 2 Oct., *Richards* 2096: "Slender shrub, c. 3 m. high. Fls. yellowish green."

A distinct and attractive species on account of the fine red-brown indumentum on the underside of the broadly elliptic, cuspidate-acuminate, almost bullate leaves.

The following plant from the Malay Peninsula is evidently very closely allied and may conveniently be described here as:

var. *sericea* *Airy-Shaw*, var. nov., ramulis hornotinis foliis subtus bracteis extra adpresse rufo-sericeis, foliis angustius ellipticis vel obovato-ellipticis 2.5–4.3 cm. longis breviter subcuspidatis haud bullatis, petiolis circiter 1.5 cm. longis.

SELANGOR. Gunong Mengkuang, 1500 m., 2 Feb. 1913, *H. C. Robinson* sine no.

This bears a superficial resemblance to large-leaved forms of *Lindera rufa* (Stapf) Gamble and may prove to be worthy of specific rank.

***Lindera malaccensis* Hook. f.** in Hook. f. *FBI*. 5, 183 (1886); *Ridl. FMP*. 3, 133.

Tetranthera Griffithii Meissn. in DC. *Prodr.* 15 (1), 191 (1864), non *Lindera Griffithii* Meissn. l.c. 245.

Dulit, primary forest, under 300 m., 12 Nov., *Richards* 2565: "Tree, 9 m. high. Fls. greenish white."

MENISPERMACEAE

***Stephania* cf. *venosa* (Bl.) Spreng.** Linn. *Syst. Veg.* ed. 16, 4 (2), 316 (1827); Diels in Engl. *Pflanzenr.* IV. 94 (Menisp.), 271 (1910).

Clypea venosa Bl. *Bijdr.* 27 (1825).

Dulit, secondary forest on hill ridge, c. 300 m., 5 Aug., *Richards* 1126: "Climber to c. 10 m. on low trees. Lower part of stem bearing flowers leafless. Flowers yellowish green."

***Cyclea elegans* King** in *JASB.* 58 (2), 387 (1889); Diels, *Menisp.* 311 (1910); *Ridl. FMP*. 1, 115.

Dulit Trail, primary forest on steep spur of mountain, c. 700 m., 27 Aug., *Richards* 1483: "Small climber in undergrowth. Fls. green."

Leaves (laminae) up to 15 cm. long, but otherwise a perfect match of the type material from Perak. The species is new to Borneo.

LVIII—ADDITIONS TO THE FLORA OF BORNEO AND OTHER MALAY ISLANDS: XVI.

THE MYRISTICACEAE OF THE OXFORD UNIVERSITY EXPEDITION TO SARAWAK, 1932. H. K. AIRY-SHAW.

For explanation of abbreviations, see K.B. 1939, 275.

***Myristica villosa* Warb.** *Mon. Myrist.*, in *Nov. Act. Abh. Deutsch. Akad. Naturf.* 68, 419, t. XIV (1897).

Dulit Trail, primary rain-forest on top of steep ridge, c. 400 m., 10 Aug., *Richards* 1190: "Tree, height about 30', diam. at breast height c. 8". Bark fairly smooth, with minute shallow longit. fissures. No buttresses. Fls. [♂] light brown."

Vernacular name: *kumpang*.

A description of the hitherto unknown male flowers of this species is appended:

Flores ♂ ex axillis foliorum delapsorum singulatim vel saepius binatim orti, subsessiles, bracteis 2–3 suborbicularibus 4–5 mm. diametro longe fulvo-sericeis caducis suffulti. *Perianthium* campanulatum, 5–6 mm. longum, fere usque ad basin tripartitum, crassum, extra dense longe fulvo-sericeum, intus glabrum et striatum, segmentis 3–4 mm. latis subobtusis. *Columna staminea* circiter 3 mm. longa, vix 1 mm. crassa, apice subtruncata, stipite brevissimo basi piloso, antheris circiter 12 connatis.

The lateral nerves of the leaves are rather more numerous than in the type, 25–32 pairs instead of 16–25, and the lower surface is less densely villose, but these are probably only individual fluctuations.

***Myristica Cumingii* Warb.** *Myrist.* 442, t. XIII (1897).

var. *floribunda* *Airy-Shaw*, var. nov. inflorescentiis majoribus umbellato- vel fasciculato-racemosis magis floriferis usque 6.5 cm. longis.

Dulit Trail, primary forest on spur of mountain, c. 800 m., 29 Aug., *Native Collector* 1522: "Woody climber on tall tree. Corolla white."

Dulit Trail, rain-forest on side of mountain, c. 900 m., 8 Sept., *Richards* 1615 (typus, *Herb. Kew.*): "Tree, c. 8" diam."

Vernacular name: *medang lit*.

The branched inflorescence and glabrous leaves at first seemed to indicate one of the first five series in Warburg's key (l.c. 374–5), but it is evident that the former character, in this case at any rate, is of only secondary importance, the true affinity of this plant being clearly with series 9–11 (l.c. 376–7). In foliage it is practically indistinguishable from Cuming's Philippine specimens. To this variety is provisionally referred the following specimen from BRITISH NORTH BORNEO: Sibugal River, Apr. 1927, *Agullana* 3887: "Fl. yellow."

Typical *M. Cumingii* bears a strong superficial resemblance to *M. cinnamomea* King, of the Malay Peninsula.

Gymnacranthera crassinervis Warb. Myrist. 362, t. xx (1897).

Dulit, secondary forest, under 300 m., 19 Oct., Richards 2289 : "Tree, probably 10–15 m. high. Fls. bright yellow."

Horsfieldia rufo-lanata Airy-Shaw, sp. nov., *H. reticulatae* Warb. affinis, a qua foliis late ellipticis subtus dense rufo-ferrugineo-tomentosis, inflorescentiis brevioribus dense longe ferrugineo-lanatis, floribus dense aggregatis (nec tamen pressione angulatis) differt.

Arbor 17 m. alta, trunco 19 cm. diametro. *Ramuli* usque 1 cm. diametro, cortice ruguloso-striato glabrescente, innovationibus pilis dendroideis dense ferrugineo-lanatis. *Folia* late elliptica vel fere oblongo-elliptica, 17–22 cm. longa (et forsitan ultra), 9–12 cm. lata, basi rotundata, apice obtusa usque subacuta (nullo modo acuminata), margine primum leviter recurva demum subplana, integra, coriacea, supra costa nervisque exceptis glabra, olivacea vel olivaceo-brunnea, nitidula, subtus pilis brevibus dendroideis dense ferrugineo-tomentosa, demum glabrescentia; costa supra prominula, secus medium sulcata, breviter pubescens, subtus crasse prominens, tomentosa et primum pilis subsimplicibus longe villosa, tenuiter subrectis vel leviter sursum curvatis prope marginem regulariter arcuato-anastomosantibus (arcubus proximis arcu intermedio distincto conjunctis) supra alte bullato-insculptis sed ipsis tenuiter prominulis interdum sicut costa sulcatis subtus valde argute prominentibus tomentosis, nervis tertiariis inter secundarios laxè subscalariformiter dispositis subobscuris; petioli robusti, rugosi, 1–1.5 cm. longi, tomentosi. *Inflorescentiae* ♂ tantum cognitae, ex axillis foliorum delapsorum ortae, pyramidales, 5–8.5 cm. longae, circiter 4 cm. latae, inferne saepe cerasosae, floribus pedicellis exceptis dense longe ferrugineo-lanatae, rhachi robusta inferne 4–5 mm. crassa, ramis brevibus patulis vel patentibus. *Flores* apicem ramorum versus dense subumbellatim conglobati, pedicellis glabris 1–1.5 mm. longis. *Perianthium* oblate globosum, 2 mm. diametro, 3- vel saepius 4-fidum, glabrum, sublucidum, sub lente minute pellucido-punctatum. *Antherae* circiter 40, in massam globosam brevissime stipitatum apice basique alternatim 3- vel 4-rimosam connatae, marginibus subliberis. *Fructus* incognitus.

Dulit Ridge, forest by waterfall, c. 1200 m., 10 Sept., Richards 1667 : "Tree, 17 m. high. Diam. 19 cm. Underside of leaves and peduncles covered with reddish brown tomentum."

A handsome species. The shaggy rusty covering of the rather short congested inflorescences immediately distinguishes it from *H. reticulata* Warb. The leaves of the latter are not, as erroneously stated by Warburg (Myrist. 266, 304), glabrous, but are distinctly rusty-pubescent on the midrib beneath with dendroid hairs similar to those of *H. rufo-lanata*. The more frequent occurrence of tetramerous than of trimerous flowers in this species is noteworthy.

Horsfieldia xanthina Airy-Shaw, sp. nov., *H. majusculae* (King) Warb. affinis, sed cortice rugoso, foliis anguste oblanceolato-ellipticis 4–5 cm. tantum latis crassius coriaceis siccitate subtus laete castaneis, inflorescentiis plerumque brevioribus recedit.

Arbor 12 m. alta, ramulis usque 8 mm. diametro, cortice cinereo-brunneo rugoso saepe in laminas parvas subquadratas valde longitudinaliter et transverse fisso, innovationibus minute rubiginoso-puberulo cito glabrescentibus. *Folia* anguste oblanceolato-elliptica, rarius anguste elliptica vel oblongo-elliptica, 10–18 (plerumque circiter 15) cm. longa, 3–5 cm. lata, basi angustata in petiolum abruptiuscule (rarius sensim) attenuata, apice acuta, brevissime abruptiuscule (rarius sensim) attenuata, apice acuta, brevissime vel vix acuminata, margine integra, leviter recurva, coriacea, ut videtur leviter carnosae, glaberrima, siccitate supra obscure viridia vel brunnescentia, subtus laete castanea; costa supra fere plana, subtus elevata, modice robusta, nervis lateralibus 12–16-jugis gracilibus patulis vel late patulis subrectis vel leviter sursum curvatis prope marginem regulariter arcuato-anastomosantibus supra leviter impressis subtus argute prominentibus, nervis tertiariis omnino obscuris; petioli robusti, 7–10 mm. longi, 3 mm. crassi, supra valde canaliculata. *Inflorescentiae* ♂ tantum cognitae, e ramis annotinis et vetustioribus ortae, abbreviatae, 2–4 cm. longae, ferrugineae, floribus pedicellis exceptis minutissime papilloso-puberulae, rhachi pro longitudine robusta inferne 1.5–2.5 mm. crassa, ramis 4–7 brevibus patulis vel patentibus 3–13 mm. longis, bracteis caducis non visis sed cicatricibus conspicuis elevatis. *Flores* 3–8 in apice ramulorum subumbellatim dispositi, pedicellis glabris cernuis 2–3 mm. longis suffulti, glabri, vivi colore gambogia dicto, siccitate ferruginei. *Perianthium* globosum, 2 mm. diametro, 3–4-fidum, basi valde incrassatum. *Antherae* circiter 10, subsessiles, in massam ellipsoideam 3- vel 4-gonam connatae, marginibus subliberis.

Ulu Koyan, sandy ("heath") forest, 800–900 m., 18 Sept., Native Collectors 1927 : "Tree, 12 m. high, 20 cm. diam. Fls. gamboge yellow. Red resin or latex in bark."

Vernacular names : *kumpang* ; *getah merah*.

Closely related to *H. majuscula* (King) Warb., but readily distinguished by the much narrower and thicker, almost fleshy, leaves, drying a light chestnut brown below. The male inflorescences of these two species are very similar (cf. *Scortechini* 837, *Ridley* 11919) and equally unlike those of any other species, being short and robust, with short spreading branches, the globose flowers about 2 mm. in diameter arranged subumbellately on each branch, on conspicuously curved pedicels. By some slip Warburg has included *H. majuscula* in Subsect. *Euirya*, "♂ Perigon fast stets 2 klappig" (Mon. 267, key), but the flowers are, as he states correctly in the description (p. 316), 3–4-merous. *H. glabra* (Reinw. ex Bl.) Warb. has rather similar short male inflorescences, and flowers about 2 mm. in diameter (Warb. l.c. 314, not 1.5 mm. as stated in the key, l.c. 266–7), and is perhaps related. The leaves of the present

species recall rather those of *H. carnosa* Warb. or *H. sucosa* (King) Warb., but these species have much smaller flowers.

Horsfieldia fragillima Airy-Shaw, sp. nov., ex affinitate *H. brachiatae* (King) Warb., *H. Lemannianae* (A. DC.) Warb. et *H. Ridleyanae* (King) Warb., ab illa ramulis lineis elevatis haud notatis, ab his foliis multo majoribus distincta.

Arbor 9 m. alta. *Ramuli* 5–10 mm. diametro, cortice brunneo glabro longitudinaliter fisso ut videtur laminatim decorticante. *Folia* elongate elliptico-oblongata, rarius fere oblonga, 25–40 cm. longa, 8–12 cm. lata, basi angustato-rotundata, apice sensim attenuata sed vix acuminata, ut videtur acuta, integra, chartacea, glaberrima, siccitate (maxime subtus) rubro-brunnea et fragillima; costa supra plana, subtus rotundato-elevata, nervis lateralibus 20–30-jugis gracilibus fere rectis late patulis prope marginem regulariter arcuato-anastomosantibus supra prominulis subtus magis prominentibus, nervis tertiariis gracillimis subparallelis inter secundarios scalariformiter dispositis supra obscuris subtus aegre cernendis; petioli robusti, 1.5 cm. longi, 4–5 mm. lati, supra e marginibus decurrentibus laminae bicarinati et sulcati, siccitate nigrescentes. *Inflorescentiae* ♂ tantum cognitae, rameales, 10–22 cm. longae, laxae, brevissime ferrugineo-furfuraceae, ramis patentibus vel subdeflexis inferioribus usque 9 cm. longis, bracteis caducis non visis. *Flores* (immaturi) minimi, turbinati vel depresso-globosi, vix 1 mm. diametro, glabri, siccitate nigri, pedicellis sublongioribus insidentes. *Perianthium* trifidum. *Antherae* circiter 8–10 in massam cupulari-turbinatam breviter stipitatam apice excavato-depressam connatae, marginibus vix liberis. *Fructus* incognitus.

Dulit, primary forest, under 300 m., 15 Nov., Richards 2602: "Tree, 9 m. high. Inflorescence green."

Vernacular name: *kumpang*.

Warburg's classification of the species of *Horsfieldia* does not seem very satisfactory in this group, since the Sections *Pyrrhosa* and *Irya*, distinguished on the basis of whether the anthers are completely united or free at their edges, contain some closely related species, at least among the trimerous-flowered glabrous-leaved ones, which are separated in this arrangement. Moreover there appears to be no sharp division between the completely fused and the marginally free condition of the anthers. In the present species, especially, an intermediate stage seems to be represented, though the flowers are admittedly immature. At all events, Warburg's species 29, *H. amygdalina* (Wall.) Warb., in Sect. *Pyrrhosa* Subsect. *Eupyrrhosa*, would surely be better placed with species 35–38 forming Subsect. *Trivalves* of Sect. *Irya*.

The epithet *fragillima* refers to the exceedingly brittle nature of the large rather thin leaves of this species in the dried state.

Horsfieldia montana Airy-Shaw, sp. nov., *H. oligocarpha* Warb. ut videtur proxima, foliis crassius coriaceis rigidis siccitate minus

fragilibus supra nitidulis, nervis circiter 10-jugis, inflorescentia ♂ dense rubiginoso-tomentella distincta.

Arbor circiter 7 m. alta, ramulis usque 5 mm. diametro, cortice fusco-cinereo angulato-ruguloso glabro, innovationibus minute rubiginoso-puberulis. *Folia* oblongo-obovata, (4–) 6–9.5 cm. longa, 3–4 cm. lata, basi in petiolum abruptiuscule angustata, rarius subcuneata, apice optime rotundata vel leviter retusa, saepe nescioquo casu altius emarginata, margine integra, plana vel saepius plus minus revoluta, rigide coriacea, glaberrima, siccitate supra olivaceo-brunnea saepe nitidula, subtus rubido-brunnea; costa supra prominula basin versus saepe sulcata, subtus magis prominens, nervis lateralibus 8–12-jugis gracilibus late patulis leviter arcuato-adscedentibus supra prope costam argute prominulis subtus obscurioribus vix prominulis, nervis tertiariis utrinque omnino obscuris; petioli 8–10 mm. longi, 2 mm. crassi, rugulosi. *Inflorescentiae* ♂ tantum cognitae, ex axillis foliorum delapsorum ortae, plus minus pyramidales, usque 6 cm. longae, floribus pedicellisque exceptis dense rubiginoso-tomentellae, rhachi inferne vix 2 mm. crassa, ramulis usque 2 cm. longis patentibus vel conspicue deflexis bracteis ovato-ellipticis 3 mm. longis 2 mm. latis. *Flores* angulato-subglobosi, basi truncatuli, 1–1.3 mm. diametro, glabri, haud dense subglomerulati, pedicellis circiter 1 mm. longis glabris. *Perianthium* 3–rarius 4-fidum. *Antherae* 20–25, sessiles, in massam angulato-subglobosam omnino connatae.

Dulit Ridge, moss-forest, c. 1300 m., 8 Nov., Native Collector 2509: "Tree, c. 7 m. high."

This certainly seems very near to the imperfectly known *H. oligocarpha* Warb., for which Warburg suggested no relationship. The fracture of the dried leaves of the latter is very similar to that which is so characteristic of *H. Lemanniana* (A. DC.) Warb., and this is probably its true affinity. The male inflorescence of *H. montana* also supports this suggestion. The leaves of this species are evidently much tougher than those of *H. oligocarpha*, *H. Lemanniana* and their allies, since they show no sign of breaking up in the dried state.

Knema glauca (Bl.) Warb. Myrist. 594, t. xxv (1897).

Myristica glauca Bl. Bijdr. 576 (1825).

Palaquium prob. *rivulare* H. J. Lam, sec. H. J. Lam in KB. 1936, 17, non H. J. Lam in Bull. Jard. Bot. Buitenz. sér. 3, 8, 403 (1927); vide KB. 1938, 306.

Dulit Trail, rocky forest near torrent, under 300 m., 3 Aug., Richards 1107: "Tree, c. 2.5 m."

Male flowers are present on the specimens, but Dr. Lam was probably misled by the similarity in foliage.

Knema tridactyla Airy-Shaw, sp. nov. distinctissima, foliorum paginae inferioris indumento tenui sordide griseo (illi *K. Elmeri* Merr. tantum comparabili sed plane absimili), inflorescentiae structura

anomala (cf. descr. infra), in genere unica; *K. Wrayi* (King) Warb. adspectu similis sed vix arcte affinis.

Arbor parva, 2–3 m. alta. *Ramuli* graciles, teretes, 3–5 mm. diametro, cortice fusco inconspicue striato haud fissis, innovationibus breviter ferrugineo-tomentosis. *Folia* anguste oblonga, raro subelliptico-oblonga, 10–22 cm. longa, 2–5 cm. lata, basi rotundata, rarius subangustata, apice sensim attenuata acutissima, margine integra, saepe leviter undulata, revoluta, chartacea, supra glaberrima, nitidula, olivaceo-brunnea, subtus glauca, pilis minutis brevissimis dendroideis substellatis ± intertextis detersibilibus subtilissimis sordide griseo-fuligineo-tomentella; costa modice gracilis, supra in sulco prominula, subtus elevata, nervis lateralibus gracilibus 15–20-jugis late patulis procurvis prope marginem evanidis vel obscurissime anastomosantibus supra bullatulo-impressis subtus tenuiter argute prominentibus, nervis secundariis valde obscuris angulo recto e costa ortis; petioli 6–10 mm. longi, circiter 2 mm. crassi, teretes, supra alte canaliculati, rugosuli, primum tomentelli, demum glabri. *Inflorescentiae* (masculae tantum cognitae) axillares et ex axillis defoliatis, e racemis densis juliformibus 2–3 in apice pedunculi communis brevis digitatim dispositis sistentes: pedunculus communis 2–3 mm. longus, 1 mm. crassus; racemi 2–17 mm. longi, 1.5 mm. crassi, saepe sursum curvati, apice tantum floriferi, tota longitudine cicatricibus florum delapsorum densissime et regulariter mammillosi (amenta nesciocujus *Betulae* vel *Alni* simulant), incremento ut videtur perenni et infinito aucti, apice ferrugineo-tomentelli, inferne fusci et glabrescentes. *Flores* tantum 1–3 simul in apice cujusque racemi evoluti, ferrugineo-tomentosi, pedicellis 2–3.5 mm. longis gracilibus ferrugineis supra medium bracteola minuta instructis. *Perianthium* 1.5 mm. diametro, turbinatum, apice truncatulum, extra pilis dendroideis ferrugineis obsitum. *Antherae* 7–8, apice truncatae, stipite gracili sursum incrassato glabro, disco leviter concavo crenato vel breviter lobulato glabro. *Flores feminei* et *fructus* ignoti.

Dulit, primary forest on summit of steep ridge, under 300 m., 12 Aug., Richards 1220: "Small tree, 2–3 m. high."

This very distinct species does not appear to be closely related to any hitherto described. Warburg states in his generic description of *Knema* (Mon. p. 132) that the inflorescence is never branched or forked, but later describes that of *K. Kunstleri* (King) Warb. (p. 569) as bifid or trifid, of *K. lenta* Warb. (p. 584) as bifurcate, and of *K. oblongifolia* (King) Warb. var. *monticola* (King) Warb. (p. 587) and of *K. pulchra* (Miq.) Warb. (p. 600) as bilobed. Of these four species, *K. Kunstleri* affords the clearest example of a branched inflorescence, but is not otherwise a near relative of the present species.

The inflorescence of *K. tridactyla* consists typically of a terminal raceme, and two lateral apparently opposite racemes, arranged digitately on a short axillary peduncle. The racemes have the

power of unlimited growth, those towards the apex of a branchlet being extremely short, while those on the older wood may have elongated considerably, the longest seen being 17 mm. in length. Not more than 3 fully developed flowers were observed on any raceme, and these arose from the extreme apex. The persistent bases of the pedicels, arranged with great regularity in a close (? double) spiral, are extremely characteristic and bear a superficial resemblance to the catkins of certain *Amentiferae*, or to the peduncle of *Stemonurus corniculatus* (Becc.) Ridley. The only other species of *Knema* in which a comparable structure occurs are *K. sphaerula* (Hook. f.) Airy-Shaw,* the type-specimens of which (Malacca, Cantley, Herb. Kew.) show it very clearly, as noted by Hooker (l.c. infra), and *K. oblongifolia* var. *monticola*, especially King's Collector 835, cited by Warburg (l.c. 587), presumably by inadvertence, under *K. oblongifolia* itself.

The indumentum of the lower-leaf surface is unlike that of any other species. It consists of a very thin layer of minute, dirty grey or sooty, dendroid or almost stellate hairs. This layer seems easily removable, leaving the glaucous epidermis uncovered. The nearest approach to it is found in *K. Elmeri* Merr., in which, however, the layer is a light silvery grey, much more dense and regular, composed of closely interwoven stellate hairs, and interspersed with minute, scattered, ferrugineous, dendroid hairs.

LIX—CONTRIBUTIONS TO THE FLORA OF TROPICAL AMERICA: XLIII.†

FURTHER RESULTS OF RECENT COLLECTIONS IN BRITISH GUIANA.‡
N. Y. SANDWITH AND OTHERS.

The following descriptions and records are of plants collected, for the most part, by Mr. Sandwith on his second visit to British Guiana in the summer of 1937, by the Forest Department, or by the recent Boundary Commission. The help of Prof. C. E. B. Bremekamp, Dr. H. A. Gleason, Dr. J. Lanjouw, Dr. H. Uittien, Dr. A. J. P. Oort and Dr. Robert E. Woodson Jr., is gratefully acknowledged.

POLYGALACEAE

Securidaca uniflora Oort, confirm. Oort.

Kaieeteur Savannah, on the fringe of high forest, c. 1200 ft., fl. and fr. Sept. 5th, 1937, Sandwith 1365. Climber over small trees. The two large wing sepals are at right angles to the pedicel, and white. Upper petals deep chocolate, except at the white base. Keel pale claret.

* *Knema sphaerula* (Hook. f.) Airy-Shaw, comb. nov.—*Myristica sphaerula* Hook. f. in Hook. f. FBL. 5, 859 (1890). *M. missionis* Wall. ex King in ABGC. 3, 321 (1891). *Knema missionis* (Wall. ex King) Warb. Mon. Myrist. 602 (1897).

† Continued from K.B. 1939, 521.

‡ See K.B. 1939, 3.

Distr. Surinam. First record for British Guiana. The fruits are now collected for the first time.

QUINACEAE

Quina oblanceolata *Sandwith* sp. nov.; *Q. obovatae* Tul. affinis, ramulis superne stipulis petiolis dense pubescentibus, racemis brevibus dense pubescentibus, fructu majore pyriformi differt.

Arbor mediocris; ramuli summi juniores superne compressi 4 mm. lati, ferrugineo-pubescentes. *Folia* oblanceolata vel obovata, apice obtusa, acuta vel breviter late cuspidata, saepe etiam rotundata emarginata, basin versus longe attenuata cuneata et in petiolum decurrentia, ad 25 cm. longa, ad 8.3 cm. lata, glanduloso-denticulata, coriacea, praesertim subtus nitida, siccitate supra brunneo-chocolatina subtus brunnea, costa supra inferne sparse pubescente excepta glabra, costa utrinque praesertim subtus prominente, nervis lateralibus utroque costae latere vulgo 20-28 patulis sed denique in marginem sursum arcuatis supra elevatis prominentibus subtus planis vel subimpressis, venulis immersis haud cernendis; petiolus 0.5-1.5 cm. longus, dense pubescens. *Stipulae* subulatae, 1 cm. longae, dense pubescentes. *Inflorescentiae* secus ramulos crassos vetustos pro maxima parte defoliatos exorientes; racemi in quaque axilla numerosi, congesti, breves, 0.5-1 cm. longi, pubescentes; bracteae late ovatae, obtusae, valde concavae, circiter 1 mm. longae, dense ferrugineo-pubescentes; pedicelli ex axillis bractearum solitarii, graciles, glabri, 5-11 mm. longi. *Flores* masculi tantum visi, flavidi. *Sepala* 4, oblonga vel ovata, obtusa, valde concava, 1.5-2 mm. longa, vix 1.2 mm. lata, praesertim prope apicem conspicue ciliata, ceterum glabra. *Petala* 4, obovato-oblonga, valde obtusa, rotundata, 2.5-4 mm. longa, 2-2.3 mm. lata. *Stamina* circiter 25, filamentis 1.5-2 mm. longis; antherae globosae, 0.3 mm. longae atque latae. *Ovarii* rudimentum deest. *Fructus* pyriformis, sub semine velut stipite lato contractus, 1.2-1.5 cm. longus, 0.7-1.1 cm. diametro, glaber, crebre tenuiter striatus, sepalis basi persistentibus; semen unicum globosum, aureo-fulvo-tomentosum, velutinum, 7-8 mm. diametro.

BRITISH GUIANA. Wiruni River, Berbice River, in mixed high forest, fl. Feb. 10th 1938, *Davis in Forest Dept.* 2606 (typus): tree 75 ft. high, 6 in. diam., very slightly buttressed; flowers creamy-yellow. Issororo River, 1888, *im Thurn in Jenman* 5197.

STERCULIACEAE

Ayenia praeclara *Sandwith*, sp. nov.; inter omnes species ob faciem singularem ad *A. stipularem* Tr. et Pl. tantum approximans, a qua foliis apicem versus integris, stipulis minoribus, praesertim forma inflorescentiarum omnino abhorrente, petalorum cucullo dorso laminifero longe distat.

Arbor parva inermis, ramulis stellato-puberulis; internodia ad 1.3 cm. longa. *Stipulae* subulatae, ad 4 mm. longae. *Folia* oblanceolata vel oblanceolato-oblonga, apice longe (1.5-3 cm.) acute

caudato-acuminata, basin versus cuneatim attenuata sed basi ipsa rotundata, 11-16.5 cm. longa, 3.7-5.4 cm. lata, satis tenuiter chartacea, glabra, basi trinervia, nervis primariis utroque costae latere 7-8 arcuatim ascendentibus, his cum costa supra prominulis subtus prominentibus, secundariis subparallelis subtus tenuiter elevatis, rete venularum intricatissimo sub lente manifesto; glandula subtus in costa paulo supra basin lineari-oblonga, 2-3.5 mm. longa, perforata, nonnunquam haud evoluta; petiolus 4-5 mm. longus, parce stellato-puberulus. *Flores* axillares, in quoque nodo circiter ad 15 umbellati; ramuli igitur valde floriferi; perulae brunneo-tomentosae; pedicelli filiformes, stellato-pilosuli, ad 1 cm. longi, prope medium (paulo supra) articulati. *Calyx* albus, 3.5 mm. longus; lobi ovato-lanceolati, 1.75 mm. lati, marginibus lanuginosis ceterum glabrescentes. *Petalorum* unguis more generis filiformis, gracillimus, perconspicuus, glaber, albus, 8 mm. longus; cucullus roseus, triangulari-obcordatus, 1.5-1.75 mm. longus, 2-2.2 mm. latus, apice inflexus bilobus atque quadridentatus, dentibus externis multo longioribus 0.5 mm. longis incrassatis subfalcato-incurvis; lamina e dorso cuculli exorians glanduliformis, spathulato-clavata, 1.3-1.5 mm. longa. *Gynophorum* glabrum, 3.5-4.5 mm. longum. *Tubus staminalis* campanulatus, circiter 0.75 mm. longus; stamina filamentis ad 0.5 mm. longis; antherae tres thecas gerentes. *Ovarium* ovoideum, verruculosum, apice parce pilosum, stylo incluso 0.6-1 mm. longum. *Fructus* non visus.

BRITISH GUIANA. Brazilian boundary survey: New River, Sun River Divide, near Boundary Pillar 94, on gravelly soil on ridge, only one example seen, fl. Dec. 20th 1937, *Beddington* 41. "Tree about 20 ft. high and 2 in. diam. Scores of flowers growing all along the branches. Sepals white. Petals rose, tips joined to sepals by white strings [i.e., claws] about $\frac{1}{4}$ in. long."

This outstanding species resembles the Colombian *A. stipularis* alone of all species presenting the floral characters of *Ayenia*, the general facies, owing to the shape and size of the glabrous leaves, being far nearer to that of certain species of *Byttneria*, especially *B. ancistroclada* Mildbr. and *B. myriantha* K. Schum. The floral characters place the material beyond doubt within the limits of *Ayenia* § *Cymbiostigma* as defined by K. Schumann in the *Pflanzenfamilien*. The curious "glands" on the midrib near the base of the lower surface of the leaves cannot be used as a clue for determining sterile material as referable to *Byttneria*, since they are sometimes developed in the Jamaican *Ayenia laevigata* Sw., as well as in *A. stipularis* and in the present new species. It should also be noted that, according to Triana and Planchon, the anthers of *A. stipularis* bear usually two, but sometimes three, thecae; while Benthham and Hooker, in the *Genera Plantarum*, ascribed 2-3 thecae to the anthers of *Byttneria*. The presence or absence of a lamina arising from the petal-hood has vanished as a diagnostic character since the so-called 'gland' formerly attributed to the hood of certain

species of *Ayenia* is now interpreted as a reduced lamina. We are thus left with the long filamentous petal-claw and the well-developed gynophore as distinguishing characteristics of *Ayenia*; but these are short and inconspicuous in certain species, for example *A. magna* L. No doubt such plants as *A. stipularis* and *A. praeclara* are "bridge-species" between the two genera; which is only another way of saying that they might well be united.

RUTACEAE

Spiranthera parviflora Sandwith sp. nov.; a *S. odoratissima* St. Hil. atque *S. guianensi* Sandwith ob flores cum omnibus partibus suis minimos primo visu distinguenda; praeterea ob formam dentium calycinorum necnon disci, antheras pilosulas notabilis.

Arbor parva; ramuli cortice purpurascanti-nigrescente minute pubescente laccato costato praediti. *Folia* trifoliolata; petiolus ramulis similis, 4.5–13 cm. longus; petioluli laterales 3–7 mm. longi, terminalis 5–13 mm. longus; foliola lanceolato-elliptica, oblanceolato-elliptica vel elliptica, apice conspicue (ad 2 cm.) acuminata, basi acute cuneata ac in petiolulos attenuata, 8–18 cm. longa, 3.3–7 cm. lata, chartacea vel tenuiter coriacea, supra siccitate nigrescentia, subtus ut in ceteris speciebus pallidiora brunnea, subtus minute satis dense adpresse pubescentia (cf. *S. guianensem*), nervis primariis utroque costae latere 10–12 exacte ut in ceteris speciebus arcuato-ascendentibus ac anastomosantibus. *Inflorescentia* forma generis thyrsoides, ad 7 cm. longa, ad 5.5 cm. lata, ubique dense pubescens, floribus suaveolentibus apice ramorum satis crebris atque congestis; pedicelli 2–4 mm. longi, velut calyces verruculis nigris punctati. *Alabastra* matura oblonga vel obovoideo-oblonga, circiter 6 mm. longa, indumento generis typico tomentosa. *Calycis* tubus brevissimus; dentes conspicui, angusti, triangulari-lanceolati, 1.5 mm. longi. *Petala* alba, oblonga, obtusa, 8.3–9.5 mm. longa, ad 2.5 mm. lata. *Stamina* 5 perfecta, libera; filamenta inferne pilosula, 6.5 mm. longa; antherae circiter 2 mm. longae, minute pilosulae. *Ovarium* forma indumentoque ejus *S. odoratissimae*, brevissime stipitatum, 1.75 mm. diametro; discus brevissimus, aperte cupularis margine undulato sed integro, 0.3 mm. altus, pallide brunneus, ovarii stipitem cingens, dentibus calycinis longe superatus; stylus 2.5–3 mm. longus, verruculoso-glandulosus, inferne pilosulus. *Fructus* non visus.

BRITISH GUIANA. Brazilian boundary survey, Camp D, on hilltop on clay soil, fl. Oct. 1937, *Beddington* 23 (typus). "A small tree about 30 ft. high and 4 in. diam. Flowers white, in clusters, sweet-smelling. Unknown kind of Mamuriballi."

AMAZONIAN VENEZUELA. Rio Pacimoni, in wet forests, fl. Feb. 1854, *Spruce* 3444: a small tree, 18 ft. high; flowers white. According to a note on the label of the sheet in Herb. Benth. no more flowers were seen, and this is perhaps the only sheet of this number. It was referred by Bentham to the genus *Galipea*.

This interesting plant fits perfectly well into *Spiranthera* alongside of *S. odoratissima* and *S. guianensis* which it resembles closely in numerous characters of the leaves and inflorescence. The dissimilarity in the size of its flowers is very remarkable. The treatment of *Spiranthera* in the recent account of the *Rutaceae* in the *Pflanzenfamilien* (2. Aufl. 19A, pp. 209, 283) requires emendation since Engler was unaware of the description of *S. guianensis*. The disk of the latter species, like that of *S. parviflora*, is short and entire on the margin, often undulate-sinuate, but not toothed. All three species exhibit the same bloom-like appearance on the lower surface of the leaflets.

S. guianensis Sandwith in Kew Bull. 1928, p. 368.

Additional collections are *Jenman* 6716, Demerara River; and *Forest Dept.* 2697, Portuguese Landing, Makauria Creek, Essequibo River, fl. and fr. June 1938. The latter collection was from a tree 30–40 ft. high, 12 in. diam.; bark like that of Mamuriballi; leaflets with a bloom on the lower surface; petals floppy, pale cream; stamens cream.

A new distinguishing character is afforded by the fruit, which was collected for the first time in *Forest Dept.* 2697. The carpels are roughly of the same shape and size as those of *S. odoratissima*, but are blackish and glabrescent, and more conspicuously transversely rugose; above all, the dorsal keel is terminated at the apex by a sharp triangular beak 4–5 mm. long and 2.5–3 mm. wide at the base. This sharp beak is in strong contrast with the short, rounded, inconspicuous appendage which terminates the dorsal keel of the carpels of *S. odoratissima*.

ROSACEAE

Hirtella macrosepala Sandwith sp. nov.; nulla affinitate manifesta, glabrescentia ramulorum inflorescentiaeque, foliis coriaceis oblongis basi leviter cordatis, inflorescentiis foliis brevioribus, racemis inferne compositis, bracteis bracteolisque conspicuis recurvis, floribus (praesertim sepalis) magnis, staminibus 6–7 distinguenda.

Arbor mediocris, ramulis annotinis griseo-cinnamomeis lenticellatis glabris, hornotinis angulatis superne parce pubescentibus. *Folia* oblonga, apice breviter (2–6 mm.) cuspidata, basi late rotundata atque leviter sed manifeste cordata, satis brevia, 6.5–13 cm. longa, 4–7 cm. lata, coriacea, utrinque nitidula, glabra nisi costa superne juventute sparse pubescente, siccitate brunneo-plumbea vel novella brunnea, nervis primariis utroque costae latere 7–10 patulis vel ascendentibus et longe a margine anastomosantibus, his cum costa supra tenuiter elevatis vel subplanis subtus prominentibus, rete venularum supra satis obscuro subtus elevato intricato; petiolus crassus, 3–6 mm. longus, supra pubescens. *Stipulae* subulatae, persistentes, 3.5–4 mm. longae, juventate pubescentes, demum coriaceae glabrae. *Inflorescentiae* axillares atque terminales, breves, foliis subtendentibus conspicue breviores, inferne saepius monochasialiter compositae, densiflorae, nonnunquam subcorymbosae,

vulgo 2.5-5 cm. longae, rarius ad 9 cm. longae, siccitate nigrescentes, glabrescentes sed ubique sparse subadpresse pubescentes; pedicelli 8-10 mm. longi; bracteae bracteolaeque rigidae, coriaceae, oblongae, obtusae, fere semper revolutae, 1.5-2.75 mm. longae, ad 1.3 mm. latae, apice tantum glandula sessili patelliformi terminatae. *Calycis* *tubus* campanulatus, 2-3 mm. longus, ad 2.75 mm. latus, glaber vel sparse pubescens; lobi ovati vel elliptico-ovati, obtusi, 6-6.5 mm. longi, 3.5-4.5 mm. lati, extra marginibus exceptis sparse tantum pubescentes, intus tomentosi atque siccitate pallide flavi. *Petala* alba, oblonga vel ovato-oblonga, apice obtusa emarginata, basi breviter unguiculata, 7-8.3 mm. longa, 3.75-4.3 mm. lata. *Stamina* 6-7, filamentis glabris basi connatis 1.7 cm. longis basi albis apice puniceis. *Ovarium* villosum; stylus staminibus fere aequilongus, ad 1.85 cm. longus, inferne conspicue pilosus. *Fructus* non visus.

BRITISH GUIANA. Dukalikuru Creek, Berbice River, in mixed forest on brown sand, April 2nd, 1938, *Davis in Forest Dept.* 2631: tree 60 ft. high, 8 in. diam., with very hard wood; calyx lobes glossy green in bud, very much overlapping, when open concave, pale green, faintly pubescent; petals waxy-white, erect; stamens varying from white at base to crimson at top.

MELASTOMATACEAE (H. A. Gleason)

***Leandra sanguinea* Gleason, sp. nov. (Sect. *Secundiflorae*).**

Frutex, caulibus juvenilibus 4-sulcatis densissime strigosis, pilis 1-2 mm. longis saepe curvatis. *Petoli* validi, usque 8 cm. longi, vel superne breviores, ad 3 cm., densissime breviterque strigosi. *Laminae* firmulae ovatae vel rhombo-ovatae, maximae 24 cm. longae 14 cm. latae, superiores sub panicula saepissime minores, abrupte acuminatae, integrae et ciliatae, basi late rotundatae, 9-nerviae supra pubescentes, pilis dimorphis, his subulatis 1 mm. longis, eis filiformibus satis brevioribus, subtus ad superficiem molliter cano-villosae ad venas purpureo-substrigosae, pilis circa 2 mm. longis. *Paniculae* 10-20 cm. longae, solitariae terminales, vel 3 vel 5, terminales et ex axillis superioribus, ramis simplicibus vel furcatis, patentibus, 2-4 cm. longis, secundifloris, ubique densissime sanguineo-substrigosae. *Flores* desiderantur. *Fructus* subglobosi, 3 mm. longi, dense strigosi; semina obovoidea, 0.5 mm. longa, apicem versus granulosa.

BRITISH GUIANA: sandy soil in dense forests of the Kaieteur gorge, altitude about 300 metres, Sept. 1937, *Sandwith* 1268 (typus in Herb. Kew.).

Few other species of the section exhibit strigose stems, and these are all small-leaved forms with smaller panicles and thinner indument. In general habit our plant is reminiscent of the common *L. dichotoma* (Don) Cogn. of the Cordilleran region, which may well be its closest relative, notwithstanding the marked difference in stem-pubescent. Dimorphic hairs are known for several species of the section.

***Tococa desiliens* Gleason, sp. nov. (Sect. *Anaphysca*).**

Frutex vel arbor parva, ramis juvenilibus, petiolis, foliorum paginis, inflorescentiis et hypanthiis sparse glanduloso-hirsutis. *Rami* leviter complanati, mox glabri. *Petoli* 3-7 cm. longi. *Laminae* in quoque jugo saepe inaequales, ovato-oblongae vel elliptico-oblongae, usque 17 cm. longae, 11.5 cm. latae, superne subito contractae vel rotundatae in apiculum parvum, crenatae ciliataeque, basi late rotundatae, 5-nerviae, jugo exteriori submarginali. *Inflorescentia* erecta, inferne parce ramosa, ramis brevibus. *Flores* 5-meri, sessiles, 2-4 ramos terminantes vel 1-2 ad nodos superiores. *Hypanthium* anguste campanulatum, ad torum fere 6 mm. longum. *Calycis* *tubus* 1.3 mm. longus; sepala late triangularia, 0.4 mm. longa. *Petala* carnosa, obovata, valde inaequilateralia, 6.5 mm. longa. *Filamenta* glabra, 5 mm. longa. *Antherae* subulatae, 5.5-6 mm. longae, poro ventro-terminali dehiscentes, thecis basi brevissime productis, connectivo simplici. *Ovarium* 3-loculare, infra medium adnatum, superne truncato-conicum glabrum. *Stylus* 8.5 mm. longus, glaber, stigmatibus truncato.

BRITISH GUIANA: in sandy forest skirting the Kaieteur Savannah, altitude about 400 metres, Sept. 1937, *Sandwith* 1426 (typus in Herb. Kew.). The petals were noted as "whitish-pink."

Notwithstanding its very different habit and its glandular pubescence, there can be little doubt that this plant is closely related to *Tococa nitens* (Benth.) Triana, while the two together form a species group quite apart from others in the genus. The relation is shown by the aspect of the leaves, the shape of the inflorescence, the sessile flowers, the shape of the sepals, the glabrous style and the truncate stigma. The species was collected more than fifty years ago in the same locality (*Jenman* 1049) and has remained unnamed in the Kew Herbarium.

***Henriettea succosa* (Aubl.) DC. var. *guianensis* Gleason, var. nov.;** indumento et florum structura *H. succosae* (Aubl.) DC. similis, differt foliis multo minoribus basi cuneatis vix 3-plex-nerviis, paginae inferioris pilis dimidio minoribus, stylo sparsissime villosulo.

BRITISH GUIANA: Mazaruni Station, in low bush on white sand, August 1937, *Sandwith* 1056 (typus in Herb. Kew.).

Leaves usually about 10 cm. long, 4 cm. wide, the largest only 13 cm. long. Petals pink. Anthers pale bluish-slate.

RUBIACEAE

***Cephaelis nivea* Sandwith, sp. nov.;** *C. Altsoni* Sandwith affinis, foliis subtus cinereo-albis, involucris multo brevius pedunculatis, venatione bractearum involucri, calyce conspicue denticulato, corolla longiore, staminibus pro rata multo altius insertis differt.

Frutex humilis glaberrimus, ramulis summis 5-7 mm. latis. *Stipularum* vaginae supra petiolos 5-9 mm. longae, siccitate brunneae, ore truncato integro. *Folia* oblanceolata vel obovata vel elliptica, apice acute 0.5-1 cm. cuspidato-acuminata, basi acute

attenuato-cuneata, 18-23 cm. longa, 5-7-10-7 cm. lata, firme chartacea vel subcoriacea, supra siccitate griseoviridia vel brunnescentia, subtus et statu vivo et siccitate multo pallidiora cinereo-alba, venatione ei *C. Altsoni* simillima; petiolus siccitate nigrescens, 1-2-2-5 cm. longus. *Inflorescentiae* terminales, solitariae; pedunculus 2-5-3-8 cm. longus. *Involucrum* glabrum, ad 4 cm. longum, ad 5 cm. latum; bracteae 4 ascendentes, carnosae, pulcherrime niveae, basi in tubum 1-5-2-5 cm. longum campanulatum connatae, tum late ovatae obtusae vel breviter late obtuse cuspidatae, 1-5-2-3 cm. longae, 1-5-2-5 cm. latae, nervis principalibus utroque costae latere 3-4 tantum ascendentibus rete venularum valde intricato connexis quam eis *C. Altsoni* minus numerosis atque minus approximatis. *Flores* numerosi, dense congesti; pedicelli 2-5 mm. longi; bracteae florum post pressionem haud rite visae, unica haud manca visa triangulari-ovata subulato-acuminata, circiter 2 mm. longa. *Calyx* 1 mm. longus, dentibus subulatis 0-5 mm. longis. *Corolla* nivea, limbo demum flavescente, glabra; tubus 1-9 cm. longus, 1-5 mm. latus; lobi ovati apice inflexo, 1-75 mm. longi, 1-75-2 mm. lati. *Stamina* 1-2 cm. supra tubi basin inserta, filamentis brevissimis; antherae lineari-oblongae, 3 mm. longae. *Disci* glandulae 1 mm. altae. *Stylus* stigmatibus inclusis 8 mm. longus. *Fructus* ovoideo-oblongus, 5 mm. longus, 3-3-75 mm. latus, aliquantum costatus vel fere laevis, calyce fisso conspicue 5-lobato coronatus.

BRITISH GUIANA. Potaro River, Amatuk portage, in shade of forest on sandstone, August 31st, 1937, *Sandwith* 1249 (typus): low shrub; leaves greyish-white beneath; bracts fleshy, snow-white; corolla snow-white, the limb turning yellow. *Ibid.*, Feb. 20th, 1879, *in Thurn*.

Psychotria kaieteurensis *Sandwith*, sp. nov.; *P. cuspidatae* Bred. ex Willd. affinis, forma stipularum, foliis flavo-viridibus crassioribus magis ovatis basi latioribus magis rotundatis, lobis corollinis prope apicem gibbis vel cornibus nullis praeditis intus pubescentibus inferneque conspicue villosis differt.

Frutex, ramulis glabris flavo-viridibus superne compressis. *Stipulae* omnes nisi paris foliorum summi e vagina truncata integra viridi glabra ad 2 mm. longa 4-5 mm. lata constitutae; stipulae foliorum in quoque ramulo summorum vagina utrinque bidentata, dentibus brevibus triangularibus ad 0-5 mm. longis circiter 0-5 mm. latis. *Folia* late ovata, apice conspicue argute acute acuminata, basi late rotundata lateribus basi ipsa paulo obliquis abrupte in petiolum cuneatum decurrentibus, 7-16-5 cm. longa, 5-10-2 cm. lata, oculo nudo glabra sed sub lente forti utrinque minutissime papilloso-puberula, firma, subcoriacea, flavoviridia, seniore siccitate olivacea, marginibus incrassatis, nervis supra prominulis subtus prominentibus, primariis utroque costae latere 10-11 arcuato-ascendentibus atque secus marginem anastomosantibus, secundariis crebris conspicuis subparallelis; petiolus 5-10 mm. longus, glaber, supra canaliculatus subtus tereti-convexus. *Inflorescentia* viridi-

alba, siccitate flavescent, passim minute puberula, pedunculo 2-5-4 cm. longo, tum thyrso 2-5-3-5 cm. longo, basi ad 5 cm. lato; rami imi oppositi, ceteri alterni, 1-2-1-75 mm. lati, cincinnatim composite brachiati; bracteae basi brachiorum subfoliaceae, saepius concavae, ad 3-5 mm. longae et 2 mm. latae. *Flores* albi, secus brachia saepius apice ramulorum brevissimorum per paria sessiles. *Ovarium* glabrum, circiter 0-75 mm. longum. *Calycis* dentes breviter late deltoideo-triangulares, vix 0-2 mm. longi. *Corolla* 6-7 mm. longa, tubo sursum ampliato ac ibi ad 3 mm. lato extra puberulo intus circa et supra staminum insertionem villosa; lobi ad 2-5 mm. longi, 1-3-1-75 mm. lati, extra fere glabri, intus et papilloso-puberuli et praesertim faucem versus dense conspicue villosi. *Stamina* paulo supra medium tubum inserta, filamentis glabris, antheris 1-75 mm. longis. *Discus* pulvinato-annularis, integer. *Stylus* floris longistyli fere 5 mm. longus, superne papillosus, ramis papillosis fere 2 mm. longis, floris brevistyli haud visus. *Fructus* ignotus.

BRITISH GUIANA. Potaro River; in sandy forests at the top of the Kaieteur Gorge, by the path descending from the Savannah to Tukeit, c. 1000 ft., Sept. 7th 1937, *Sandwith* 1429. A shrub with yellow-green leaves, greenish-white inflorescences and white corollas.

Psychotria bostrychothyrsus *Sandwith* sp. nov.; ex affinitate, ut videtur, *P. paniculatae* (Aubl.) Raeusch., forma stipularum, inflorescentia maxima gracillima valde distincta; quoad inflorescentiam *P. ramifloram* Rusby boliviensem simulans sed haec species ramis inflorescentiae primariis stricte oppositis, corollis extra tomentosis gaudet.

Frutex glaberrimus, ramulis summis compresso-subtetragonis. *Stipulae* triente inferiore connatae, late triangulari-ovatae, 5-5-7-5 mm. longae, basi ad 5-5 mm. latae, siccitate purpureo-brunneae, apice in lobos duos breves deltoideo-triangulares circiter 1 mm. longos fissae, eae foliorum terminalium breviores profundius fissae lobis apice subulato-acuminatis. *Folia* oblongo-lanceolata usque ovato-elliptica, apice conspicue (saepe ad 1-2 cm.) acuminata, basi cuneata usque rotundata, 14-5-24 cm. longa, 4-8-11 cm. lata, summa minora, chartacea usque fere subcoriacea, marginibus incrassatis, siccitate plerumque viridia vel olivacea, utrinque saepe crebre verruculoso-punctata, nervis primariis utroque costae latere 10-12 pulcherrime sursum arcuatis ac in margine ipso tantum secum conjunctis, his cum costa fere aequaliter prominentibus, nervis secundariis crebris subparallelis prominulis; petiolus 1-3-5 cm. longus. *Inflorescentia* terminalis, pyramidalis-thyrsoidea, glabra, gracillima, statu infructescente pendula brunneo-purpurea, pro genere magna valde florifera, pedunculo incluso 15-30 cm. longa, basi 11-16 cm. lata; pedunculus infra ramos 5-9 cm. longus; rami numerosi, alterni vel inferiores semiverticillati, vix unquam stricte oppositi, patentes, graciles, inferiores arcuato-flexuosi, superiores nonnunquam recti, omnes basi tumescentes et in axem decurrentes ebracteati, parte nuda inferiorum 3-5-5 cm. longa superiorum

gradatim brevior, apice partis nudae alternatim vel rarius oppositè trichotomi; ramuli ita orientes bis vel ter dichotome cymosi, flore terminali in dichotomia sessili, nonnunquam ob abortum alterius brachii dichotomiae sympodialiter cincinnati; bractea basi trichotomiae oblongo-lanceolata, ad 3.5 mm. longa, ad 1 mm. lata; cymulae ultimae semper uniflorae, floribus sessilibus, bractea subtendente 0.75–1.5 mm. longa. *Ovarium* glabrum, 0.8 mm. longum. *Calycis* lobi brevissimi, late triangulari-ovati, obtusi, circiter 0.2 mm. longi. *Corolla* alba, 4–6 mm. longa, extra glabra, tubo intus supra insertionem staminum conspicue piloso. *Stamina* in medio tubo inserta, filamentis glabris, antheris in flore brevistylis 2.2 mm. longis in flore longistylis 1.2 mm. longis. *Discus* annularis. *Styli* floris brevistyli rami filiformes 2 mm. longi, floris longistyli rami spatulati valde papilloso 1.75 mm. longi. *Drupa* albo-purpurea, globosa, matura 5–7 mm. diametro; pyrena 3.75 mm. longa, 2.75 mm. lata, facie convexa 4-costata.

BRITISH GUIANA. Anandabaru, Kopinang River, low ground in forest, 1800 ft., fl. April 1926, *Altson* 470 (typus): shrub 4 ft. high; upper surface of leaf finely pitted and with a velvety appearance; corolla white. Potaro Road, fl. April 1899, *Jenman* 7509. In dark rocky forest in the gorge below the Kaieteur Falls, fr. Sept. 10th, 1937, *Sandwith* 1460: shrub; inflorescence pendulous, brownish-purple; berry whitish-purple.

Psychotria (*Mapouria*, Sect. *Eumapouria*, Subsect. *Cephalanthae* Müll. Arg.) **deinocalyx** *Sandwith* sp. nov.; a speciebus subsectionis affinis limbo calycis valde evoluto late plicato-sinuato illum *Bellynkxiae calycinae* (Bth.) Brem. revocante statim distinguitur.

Frutex satis humilis, glaberrimus, ramulis teretibus. *Folia* elliptico-oblonga, obovato-oblonga vel oblanceolata, apice conspicue ad 1.5 cm. caudato-cuspidata, basi acute cuneata ac in petiolum ad 1.5 cm. longum decurrentia, 7.5–20 cm. longa, 2.8–6.2 cm. lata, glabra, chartacea, nervis primariis utroque costae latere circiter 13–15 patulis marginem versus arcuato-anastomosantibus, utrinque fere aequaliter reticulata. *Stipulae* apice ramulorum gemmam conicam apice barbatam exaristatam formantes; vaginae vetustiores truncatae ore integro, supra petiolos 2.5–3 mm. longae. *Inflorescentia* capitulum terminale solitarium densiflorum 1–1.5 cm. diametro apice ramuli ita sessile vel fere sessile formans ut petioli foliorum summorum per flores capituli protrudant; bractee bracteolaeque obsoletae. *Flores* sessiles, pentameri. *Calyx* glaber, inferne cupulari-campanulatus, 2 mm. longus atque latus, tum abrupte in limbum chartaceum flavo-viridem plicato-sinuatum fere 2.5 mm. longum 6 mm. latum late ampliatus; lobi limbi sinu brevi sejuncti, rotundato-obtusi, pinnatim nervosi atque laxè reticulati. *Corolla* pallide crenea; tubus urceolato-cylindricus, apice contractus, 4.5–4.75 mm. longus, 2 mm. latus, extra glaber, intus prope faucem circa stamina basinque loborum zona dense lanata praeditus; lobi patulo-ascendentes vel demum reflexi, valvati, ovato-lanceolati,

apice cucullati obtusi mucrone deorsum inflexo, 1.5–2 mm. longi, 1 mm. lati, extra glabri, intus pulverulento-tomentelli. *Stamina* prope apicem tubi inserta, filamentis albo-lanatis 0.5–1 mm. longis; antherae lineari-oblongae, circiter 1 mm. longae. *Ovarium* biloculare, 1 mm. altum; discus pulvinatus, circiter 0.5 mm. altus; stylus glaber, circiter 2.2 mm. longus, stigmatibus 2 linearibus aliquidum papilloso-scaberulis 1.2 mm. longis; ovula in quoque loculo solitaria, ascendentia. *Fructus* ignotus.

BRITISH GUIANA. Berbice River: Kibihui Creek, Wiruni River, in heavy bush fringing muri bush, Feb. 9th, 1938, *Fanshawe* in *Forest Dept.* 2638: shrub 5 ft. high, with spreading lax growth; calyx enlarged, pale yellow-green, papery; buds and flowers pale cream; corolla tubular, lobes reflexed, mouth closed with hairs.

Very distinct among members of this small group, which also includes *P. nudiceps* Standley. Described as a *Psychotria*, since the fruit is unknown and the group may not fall into *Mapouria* as recently restricted by Bremekamp.

Psychotria crococlhamys *Sandwith* sp. nov.; *P. duidanae* Standl. ut videtur affinis, foliis longioribus, pedunculo brevior, radiis inflorescentiae 5, bracteis glabris, corolla aurantiaca brevior differt; *P. calochlamys* Standl. etiam subsimilis inflorescentia pubescente, colore bractearum florumque roseo, corolla longior recedit.

Frutex parvus sylvestris, nisi penes stipulas glaberrimus, ramulis tetragonis. *Stipularum* vagina ad 6 mm. longa, extra glabra, intus inferne villosa, siccitate purpureo-nigrescens margine pallide rubro-brunneo, haud dentata, margine truncato integro sed utroque ramuli latere sinu lato obtuso profunde fisso; e sinibus vaginae ramuli cuiusque summae folia novella incipientia uninervia lanceolata acuta erecta ad 2 cm. longa ad 3 mm. lata evadunt. *Folia* oblongo-elliptica, elliptico-lanceolata vel rarius plus minusve oblanceolata vel obovato-elliptica, apice conspicue acute acuminata, basi attenuata et acute cuneata rarissime obtusa subrotundata, 7.5–19 cm. longa, 2.6–7.3 cm. lata, coriacea, siccitate flavo-viridia usque brunneo-olivacea, nervis primariis utroque costae latere 14–15 sursum arcuatis atque secus marginem anastomosantibus, secundariis multis interjectis per breve spatium subparallelis, costa utrinque prominente, nervis lateralibus supra prominulis vel planis vel impressis subtus cum secundariis venulisque prominentibus; petiolus 0.5–1.8 cm. longus. *Inflorescentia* terminalis, glabra, siccitate nigrescens, pedunculo 2–9 cm. longo, tum radiato-thyrsoidea, ad 3.5 cm. longa, 3–6 cm. lata, radiis quinque 0.5–3 cm. longis apice capitulis latibracteatis terminatis radio terminali nonnunquam ramoso trifido; radii basi nudi ebracteati, velut capitula statu vivo laete aurantiaco-flavi demum vinacei vel saturate purpurascens. *Capitula* bracteis compluribus inaequalibus praedita; bractee exteriores ovatae vel ovato-ellipticae, acutae, glabrae, ad 2 cm. longae, ad 1.1 cm. latae, in multis inflorescentiis ad 9 mm. longae ad

7 mm. latae; bracteae intimae oblongae, obtusae, 4 mm. longae, 1-2 mm. latae. Flores numerosi, sessiles, aurantiaco-flavi. Ovarium circiter 1 mm. longum. Calyx cupularis, glaber, 1 mm. longus, dentibus late triangularibus ad 0.4 mm. longis ad 1 mm. latis. Corolla cylindrica, longistyla tantum visa; tubus 5-6.2 mm. longus, extra glaber, intus basi glaber, circa insertionem staminum zona pilorum praeditus, superne ubique aureo-papillosus; lobi triangulares, ad 1.75 mm. longi, extra glabri, intus aureo-papilloso. Stamina infra medium tubum 2-3 mm. supra basin inserta; antherae 2-2.5 mm. longae. Discus pulvinato-cupularis, integer. Stylus ad 6.5 mm. longus, lobis brevibus ovatis papilloso circiter 0.5 mm. longis. Drupa matura cinereo-alba, ovoideo-subglobosa, ad 1.2 cm. diametro.

BRITISH GUIANA. Potaro River: Kaieteur Savannah, in fringing forest, c. 1200 ft., Sept. 6th 1937, *Sandwith* 1390 (typus); *ibid.*, Sept.-Oct. 1881, *Jenman* 1251; *ibid.*, in forests descending to Tukeit, c. 900 ft., Sept. 1st 1937, *Sandwith* 1272 (type of fruit). Arabaroo Creek, 1863-1864, *Appun* 992. Forests north of Roraima near Caramang, 1838, *Robert Schomburgk* 31 of "last small set" in Herb. Benth.

A small shrub, up to about 1 metre high. Inflorescence and bracts bright orange-yellow, turning wine-coloured or dark purple with age. Buds yellow. Flowers orange, with yellow anthers (fide Schomburgk).

Palicourea roraimae Standley in Field Mus. Publ. Bot. 17, 280 (1937), based on *Ule* 8765, is conspecific with **Psychotria oblita** Wernham (1914) and the species should not be regarded as a *Palicourea* since there is neither a unilateral swelling at the base of the corolla tube nor a woolly fringe of hairs within the tube near the base.

APOCYNACEAE (Robert E. Woodson, Jr.)

Mandevilla Sandwithii Woodson, sp. nov.

Fruticosa volubilis; ramulis gracilibus teretibus pilosulis inferne glabris; foliis oppositis breviter petiolatis elliptico-lanceolatis apice acuminatis basi subcuneatis obtusis rotundatisve haud cordatis 10-13 cm. longis 4-5 cm. latis membranaceis supra viridibus glabris nervo medio sparse glandulifero subtus pallidioribus minute puberulis, petiolis 0.4-0.6 cm. longis minute pilosulis; inflorescentiis lateralibus alternatis racemosis foliis multo brevioribus flores albidos 12-15 speciosos gerentibus; pedunculo 4-6 cm. longo minute puberulo; bracteis lanceolatis acuminatis 0.2-0.3 cm. longis subscariosis; pedicellis 0.3-0.4 cm. longis puberulo-papillatis; calycis laciniis ovatis anguste acutis 0.25 cm. longis subscariosis puberulo-papillatis squamellis oppositis triangularibus apice minute erosis ca. 0.1 cm. longis; corollae infundibuliformis extra minute papillatae tubo proprio 2 cm. longo basi ca. 0.2 cm. diam., faucibus conico-tubulosis 2.5 cm. longis, ostio ca. 0.7 cm. diam., lobis oblique

obovatis ca. 1.3 cm. longis patulis; antheris oblongo-sagittatis basi obtuse 2-lobatis 0.5 cm. longis dorso glabris; stigmatum umbraculiformi 0.3 cm. longe brevissime apiculato; ovariis oblongoideis ca. 0.2 cm. longis glabris; nectariis 5 compresse ovoideis basi conrescentibus ca. 0.15 cm. longis; folliculis ignotis.

BRITISH GUIANA: forests of gorge below Kaieteur Falls, Potaro River, Sept. 11th, 1937, *Sandwith* 1494 (typus in Herb. Kew.): trailer over shrubs; corolla creamy-white.

This species suggests *M. subspicata* (Vahl) Mgf., but I suspect that it is more closely allied to *M. sagittarii* Woods. because of the subtubular throat of the infundibuliform corollas. From the latter species, however, *M. Sandwithii* differs in the nearly glabrous corolla, subscarious bracts, and shape of the leaves, which is quite original for a *Mandevilla*. It is named to commemorate the painstaking floristic work of Mr. Sandwith in British Guiana.

ACANTHACEAE (C. E. B. Bremekamp)

Gynocraterium Brem. gen. nov.; maxime ut *Staurogyne* Wall., sed ovulis paucioribus, stigmatum crateriformi ab ea facilius distinguenda.

Herba. Folia sine cystolithis. Inflorescentia spica terminalis densa, bracteis bracteisque angustissimis et longissimis fimbriata. Flores ad nodos solitarii, bracteis subaequilongi. Calyx fere usque ad basin 5-partitus, lobo postico bracteis persimili, trinervio, lobis aliis brevioribus et praesertim angustioribus, uninerviis. Corolla tubo longo, dimidio inferiore cylindrico, dimidio superiore infundibuliformi, limbo brevi, lobis orbicularibus subaequalibus, duobus superioribus in alabastro externis. Stamina 4, ad medium tubum inserta, inclusa; antherae thecis ovoideis, basi minute apiculatis, connectivo brevi; pollinis granula globosa fissuris tribus, sed sine poris germinativis. Discus cupularis parvus. Pistillum ovario tereti, apiculato, utroque loculo ovulis sex, stylo filiformi, stigmatum crateriformi inclusum. Capsula nondum nota.

Species unica Guianam anglicam habitans.

Gynocraterium guianense Brem. sp. nov.

Herba ut videtur, erecta et simplex. Caulis 20 cm. altus, 3.5 mm. diam., ferrugineo-tomentosus, ultime glabrescens. Folia petiolo ferrugineo-tomentoso 1-2.5 cm. longo; lamina lanceolata 9-14 cm. longa et 2.7-4.4 cm. lata, apice acuta an subacuminata, basi cuneata, margine subintegra subrevoluta, supra saturate et subtus dilute viridis, costa utrinque et nervis subtus primum ferrugineo-tomentosis, deinde glabrescentibus, nervis utroque latere costae 9-14, venulis paucis siccitate utrinque distinguendis. Spica sessilis, primum ovoidea, bracteis anguste linearibus 17 mm. longis et 1 mm. latis, acutis, bracteis 20 mm. longis et 0.7 mm. latis, acutissime exeuntibus, sicut bracteis margine brevissime ciliatis. Calyx lobo postico 21 mm. longo et 1.2 mm. lato, lobis aliis 10-13 mm. longis et 0.5 mm. latis, omnibus margine breviter ciliatis.

Corolla tota 21 mm. longa, extra primum puberula sed mox glabrescens, intus glabra, tubo dimidio inferiore 1.3 mm. diam., dimidio superiore sensim usque ad 4 mm. dilatato, lobis 2.5 mm. longis. *Stamina* filamentis minute glandulosis 5-5.5 mm. longis, antheris thecis 0.9 mm. longis et 0.4 mm. latis, connectivo glanduloso; pollinis granula 40 μ diam. *Discus* 0.2 mm. altus, glaber. *Pistillum* 15.5 mm. longum ovario apicem versus puberulo 2 mm. alto et 0.8 mm. diam., stylo glabro, stigmatibus ad os 2 mm. diam. *Capsula* nondum nota.

BRITISH GUIANA. Upper Essequibo, Mataruki River, J. G. Myers 5840 (typus in Herb. Kew.), fl. Dec. 6th 1935, in partially cleared rain-forest. The pollen grains are nearly all badly developed, and the finer structure is, therefore, difficult to make out.

I have coined the name *Gynocraterium* in analogy to *Staurogyne*.

***Teliostachya mazarunensis* Brem. sp. nov.**; cymis plerumque ad florem singulum reductis, pollinis granulis majoribus a congeneribus divergens, bracteis haud aristatis *T. surinamensi* Brem. et *T. medicagineae* Brem. similis, sed ciliis bractearum brevissimis ab eis facilius distinguenda, a *T. gracili* Brem. cuius bracteae inaristatae sunt calycis lobis inaristatis recedens.

Herba 6-13 cm. alta. *Caules* basi repentes, quadricostati, glabri, cystolithis haud distinguendis, internodiis quam foliis brevioribus. *Folia* basi in pseudopetiolum usque ad 5 mm. longum contracta, praeterea anguste elliptica an lanceolata et 7-18 mm. longa et 4-8 mm. lata, obtusa, tenuia, glaberrima, nervis utroque latere costae tribus, supra cystolithis cylindricis interdum conspicue lineolata. *Inflorescentia* spica cylindrica haud confluens, 1-2.5 cm. longa et 6-7 mm. diam., axi in costis conspicue ciliata; cymae plerumque ad florem singulum reductae, bracteis obovatis, infimis 6 mm. longis et 2.2 mm. latis, apicem spicae versus usque ad 3.5 mm. longis et 1.6 mm. latis decrescentibus, acuti- et callosomucronulatis, trinerviis, haud ciliatis; bracteae florum lateralium rariorem lineares, subobliquae, 2.5-3 mm. longae et 0.5-0.6 mm. latae, acutissimae, uninerviae, haud ciliatae; bracteolae bracteis florum lateralium similes. *Calyx* lobo postico lanceolato 5 mm. longo et 1.4 mm. lato, in cuspidem 0.3 mm. longam exeunte, trinervio, basin versus brevissime ciliato; lobis lateralibus anguste triangularibus 3.5 mm. longis et 0.5 mm. latis, uninerviis, acutissimis, brevissime ciliatis; lobis anticis linearibus 4 mm. longis et 0.6 mm. latis, subobliquis, uninerviis, acutissimis, brevissime ciliatis. *Corolla* alba, labio inferiore tamen rubro-maculato, tota 5.7 mm. longa, glabra; tubo 2.2 mm. longo et 0.9 mm. diam., fauce glabro; labio superiore lanceolato obtuso, subintegro; labio inferiore lobis oblongis obtusis 2.2 mm. longis. *Stamina* 0.2 mm. sub divisura corollae inserta, filamentis glabris 1.3 et 2 mm. longis, antheris 0.4 mm. altis, thecis 0.3 mm. altis, basi vix apiculatis; granula pollinis 42 μ longa et 28 μ diam. *Discus* cupularis, margine incisa, facie antica in lobum ovoideum ovario dimidio brevior productus. *Pistillum* ovario

apice piloso, 0.7 mm. alto, stylo glabro 3 mm. longo. *Capsula* nondum nota.

BRITISH GUIANA. Mazaruni River; Kartabo, Sandwith 1545 (typus in Herb. Kew.), fl. Sept. 17th 1937. On muddy river bank, creeping. Upper lip of corolla nearly white, lower blotched with pinkish-purple.

***Hygrophila Sandwithii* Brem. sp. nov.**; calycis lobis hirtellis ad *H. guyanensem* N. ab E. et ad *H. surinamensem* Brem. accedens, ab utraque specie corolla extra glabra, staminibus basi liberis distincta, floribus solitariis *H. surinamensi* similior, forma corollae et sculptura pollinis granulorum tamen ad *H. guianensem* vergens.

Herba semi-aquatica, 20-25 cm. alta, basi decumbente et radicante. *Caules* obtuse quadrangulares, sulcati, angulis et lineis interpetiolaribus interdum fimbriatis, cystolithis haud conspicuis. *Folia* sessilia lineari-lanceolata 2.5-5.5 cm. longa et 0.5-1.0 cm. lata, obtusa, supra glabra, subtus costa nervisque pilis crassis ciliata, cystolithis cylindricis praesertim supra densius lineolata. *Flores* axillis foliorum solitariae, subsessiles, bracteolis spathulatis 7 mm. longis et 1.5 mm. latis margine dense ciliatis praecessi. *Calyx* fere usque ad basin in lobos 5 aequaliter partitus; lobi anguste lineares 6 mm. longi et 0.5-0.7 mm. lati, margine dense ciliati, costa hirtelli. *Corolla* dilute violacea, tota 8.5-9 mm. longa, extra glabra; tubo 6 mm. longo, dimidio inferiore cylindrico, dimidio superiore infundibuliformi; labiis 3 mm. longis, superiore apice in lobulos 1.2 mm. longos exeunte, inferiore in lobos tres 2.2 mm. longos partito. *Stamina* longiora ad medium tubum inserta, breviora ad apicem tubi; staminodium clavato-filiforme 0.6 mm. longum inter stamina breviora insertum; staminum filamenta basi libera, 3.8 et 1.5 mm. longa, basin versus dilatata et breviter ciliata; antherae apice obtusae 1.1 et 0.7 mm. longae, staminum breviorum interdum thecis valde inaequalibus; granula pollinis punctatione et fissurarum numero granulis *H. guianensis* similiora, fissuris subaequalibus granula *H. surinamensis* imitantia. *Discus* annularis parvus, glaber. *Pistillum* ovario glabro 1.8 mm. alto, utroque loculo ovulis sex, stylo glabro 6.0-6.7 mm. longo, stigmatibus lobo antico filiformi 0.8 mm. longo, lobo postico minuto. *Capsula* nondum nota.

BRITISH GUIANA. Mazaruni Station, Sandwith 1546 (typus in Herb. Kew.), fl. Sept. 18th 1937: creeping herb on sandy and muddy river bank; corolla mauve.

Fruits are entirely absent, though withered flowers are not rare. As the plants are entirely coated with mud, they have apparently been exposed to the influence of the tides, and pollination therefore may have been difficult. The pollen grains which I have seen were empty and badly developed, but this may be due to the fact that they were taken from open flowers, in which the anthers had already shed the greater part of their pollen; buds in the right state of development were not present.

Noteworthy features of this new species are the free filaments and the presence of a staminodium : in the other species the filaments are united at the base in pairs, and a sterile fifth stamen has not yet been observed.

Duvernoia potarensis Brem. sp. nov. ; a speciebus africanis calycis lobis longioribus, angustissime triangularibus, spica secunda longa, bracteolis bracteis subaequalibus distincta.

Herba simplex, 7–17 cm. alta, basi decumbente et radicante. *Caulis* obtuse quadrangularis et bisulcatus, pilis recurvatis dense pubescens, 1 mm. diam., cystolithis inconspicuis. *Folia* petiolo 3–5 mm. longo, pilis incurvatis dense pubescente ; lamina elliptica an oblonga, 2.3–5.5 cm. longa et 1.3–1.8 cm. lata, subacuta an subacuminata, basi acuta, supra pilis robustioribus paucis, subtus costa densius, nervis margineque sparse pubescens, siccitate haud conspicue decolorata, costa nervisque subtus albidis, nervis utroque latere costae plerumque 5, cystolithis cylindricis subtus haud faciliter distinguendis. *Spicae* terminales et interdum axillares, laxae, secundae, ultime longissimae, dense glanduloso-pubescentes, pedunculo circiter 10 mm. longo, floribus ad nodos solitariis, bracteis decussatis anguste linearibus an spathulatis 5–8 mm. longis et 0.6–1.5 mm. latis, acutis, uninerviis, dense glanduloso-hirtellis ; bracteolis bracteis subaequalibus. *Calyx* usque ad basin partitus, lobis 5 subaequalibus angustissime triangularibus et acutissime exeuntibus, dense hirtellis, 4.5–5 mm. longis et 0.3 mm. latis. *Corolla* dilute violacea, 12 mm. longa, extra breviter pubescens ; tubo cylindrico 5 mm. longo et 1.8 mm. diametro ; labiis 7 mm. longis, superiore triangulari, ad basin 4 mm. lato, apice vix conspicue bidentato, recto, inferiore in lobos tres orbiculares obtusos 3 mm. longos fisso. *Stamina* 0.6 mm. infra incisuras corollae inserta, filamentis glabris 5 mm. longis, antheris thecis subaequilongis 1 mm. longis, connectivo late separatis, inferiore basi calcari 0.5 mm. longo munita, superioris dimidium attingente ; granula pollinis ellipsoidea 32μ longa et 22μ diam., tripora, poris in fissuris longitudinalibus, utroque latere fissura aequilonga comitatis, superficie inter fissuras minute punctata. *Discus* cupularis tenuis, 0.4 mm. altus. *Pistillum* ovario apice puberulo 2 mm. alto, stylo glabro 9 mm. longo, stigmatibus parvo punctiformi. *Capsula* dense pubescens, 8.5 mm. longa, stipite 3 mm. longo comprehenso ; valvulis biseminilibus. *Semina* lenticularia ovoidea, basi inaequalia, 2.3 mm. alta, 2.0 mm. lata, brunnea, pilis brevissimis patentibus muriculata.

BRITISH GUIANA. Potaro River, above Kaieteur Falls, alt. 360 m., *Sandwith* 1418 (typus in Herb. Kew.), fl. and fr. Sept. 7th 1937. Small herb, on damp sandy path in forest. Corolla lilac-mauve.

var. **tetrapora** Brem. var. nov. ; a typo foliis majoribus, usque ad 7.5 cm. longis et 4 cm. latis, nervis subtus haud albidis, sed praesertim granulis pollinis tetraporis, 38μ longis et 25μ diam. diversa.

BRITISH GUIANA. Below the Kaieteur, *Jenman* 960 (typus in Herb. Kew.), fl. and fr. Sept.-Oct. 1881.

It looks almost as if this variety might be a polyploid form of the type.

It has been said that apart from the pollen grains *Duvernoia* and *Justicia* are indistinguishable. For this reason, in the Floras of South and Tropical Africa, the genus *Duvernoia* was sunk by Clarke in *Justicia*. Lindau duly mentions Clarke's standpoint in Engler and Prantl, *Nachträge* III. p. 325, without, however, expressing an opinion. The question of the status of the plants reckoned by Lindau to *Duvernoia* is, nevertheless, from a taxonomic point of view, of great importance. On account of the structure of the pollen grains *Duvernoia* has been placed in the *Odontonemeae*, whereas *Justicia*, of course, belongs to the *Justicieae*. If *Duvernoia* is sunk in *Justicia*, the *Odontonemeae* and the *Justicieae* therefore will have to be united too. That these tribes are nearly related can hardly be denied ; it might even be right to regard the *Justicieae* as a subtribe of the *Odontonemeae*. When we see, however, that elsewhere in the *Acanthaceae* differences in the pollen characters are always correlated with differences in other characters, the absence of such a correlation here does not look convincing ; it is quite possible that subsequent investigations will reveal its presence.

The similarity between *Duvernoia* and *Justicia* is itself perhaps not so great as has been supposed. One should not overlook that the genus *Justicia* as delimited by Lindau contains very heterogeneous elements, and that its diagnosis accordingly is very vague. The characters of the pollen grains are already, as a glance at plate XVI of my "Notes on the Acanthaceae of Surinam" (Rec. Trav. Bot. Néerl. 35 (1938)) will reveal, by no means very uniform ; the presence of two germ pores is about the only character in which they agree, and even this character is not universal, for in *J. Gendarussa* L. and its allies Lindau mentions the presence of three pores. The only other characters in which all the species agree are the presence of but two stamens, the insertion of the anther lobes at unequal height, and the stipitate capsule with one or two ovules per valve. These characters, however, are found in other genera too, and that they are present in *Duvernoia* proves, therefore, very little. When the genus *Justicia* has been split up into more natural groups, it will doubtless appear that even apart from the pollen characters none of them agree fully with *Duvernoia*.

XYRIDACEAE (J. Lanjouw)

Xyris dolichosperma Lanj. in Rec. Trav. Bot. Néerl. 34, 488, f. 5 (1937).

By stream in burnt bush fringing the Kaieteur Savannah, c. 1200 ft., Sept. 6th 1937, *Sandwith* 1397. Petals yellow.

Distr. Surinam. First record for British Guiana.

Very poor material, with rather short leaves, but the characters of the bracts, sepals and seeds (rather young) are well-marked.

X. subuniflora *Malme*.

Kaieteur Savannah, forming dense little tussocks on sandy ground, c. 1200 ft., Sept. 5th 1937, *Sandwith* 1373. Stems brownish. Leaves red.

Distr. Surinam. First record for British Guiana.

X. Uleana *Malme*.

Kaieteur Savannah, in damp sand, Sept. 7th 1937, *Sandwith* 1422; *ibid.*, Sept.-Oct. 1881, *Jenman* 1253. Peduncles flattened. Petals yellow.

Distr. Surinam, Amazonian Brazil.

var. **angustifolia** *Lanj.*, var. nov.; a planta typica foliis angustioribus (latitudine 0.8 mm. haud attingente), pedunculo subtereti leviter bicostato (haud alato) differt.

BRITISH GUIANA. Kaieteur Savannah, in damp sand, c. 1200 ft., Sept. 7th 1937, *Sandwith* 1421 (typus in Herb. Kew.); *ibid.*, Aug. 20th 1933, *Tutin* 497. Petals deep orange-yellow.

Differs from the species by its narrow leaves (less than 0.8 mm. broad) and the subterete, slightly bicostate (not alate) peduncle.

Abolboda americana (*Aubl.*) *Lanj.* l.c. 492.

Kaieteur Savannah, in damp sand and boggy places, c. 1200 ft., Sept. 1937, *Sandwith* 1306, 1424. Growing in dense tufts. Petals pale blue.

Distr. Guiana, Amazonian Brazil. Previously unrepresented at Kew.

CYPERACEAE

Rhynchospora arenicola *Uitt.*, det. Uittien.

Kaieteur Savannah, in damp sand, c. 1200 ft., Sept. 7th 1937, *Sandwith* 1423. Spikelets pale greenish-brown.

Distr. Surinam. First record for British Guiana.

R. curvula *Griseb.*

Kaieteur Savannah, bare stony ground, local, c. 1200 ft., Sept. 9th 1937, *Sandwith* 1445. Stems and leaves delicate. Spikelets green. Stigmas 3.

Distr. Trinidad, Guiana. First record for British Guiana.

Diplacrum notopterum (*Nees*) *C. B. Cl.* in Kew Bull. Add. Ser. 8, 62 (1908).—*Scleria notoptera* *Nees* in *Linnaea*, 9, 303 (1835); *Kunth*, Enum. 2, 359 (1837). *Pteroscleria gujanensis* *Nees* in *Mart. Fl. Bras.* 2, pars 1, 196 (1842). *Diplacrum longifolium* (*Griseb.*) *C. B. Cl.* var. *laevissimum* *Kük.* in *Engl. Jahrb.* 56, Beih. 125, p. 23 (1921). *D. laevissimum* (*Kük.*) *Uittien* in *Pulle, Fl. Suriname*, 1, 149 (1934).

Distr. Guiana, Rio Branco.

The type of *Scleria notoptera* *Nees* ("Guiana, Hooker") has been borrowed from the Lindley Herbarium in the Herbarium of Cambridge University and proves to be conspecific with the plant known as *Diplacrum laevissimum*, agreeing perfectly with—and

possibly being part of—a collection of Parker from British Guiana in Herb. Hooker in the Kew Herbarium. Recent authors have misinterpreted *Nees'* plant, presumably owing to a mistake in his description of *Pteroscleria gujanensis*: "folia $\frac{1}{2}$ – $\frac{3}{4}$ poll. longa" should, no doubt, read "folia $\frac{1}{2}$ – $\frac{3}{4}$ ped. longa."—N.Y.S.

LX—THE GENUS PYCNOSTACHYS. E. A. BRUCE.

The genus *Pycnostachys* (1) was described by W. J. Hooker (2) in 1825, and was based on the single species, *P. coerulea*, from Madagascar. In 1838 *Fresenius* (3) added another species, *P. abyssinica* (*Abyssinia*), and in 1848 *Bentham* (4) reduced *E. Meyer's* monotypic genus *Echinostachys* (5) to *Pycnostachys*, transferring *E. reticulata* to *Pycnostachys*, and at the same time describing a new variety, *P. reticulata* var. *angustifolia*. Later *Bentham* and *J. D. Hooker* (6) amplified the original generic description to include a further species, *P. urticifolia*, making in all four species and one variety, though they stated, apparently erroneously, that the genus included six species. Before the end of the century a further twenty species were published, mainly by *Gürke*, (7) though *Baker* (8) and *Briquet* (9) also contributed to their number. It was not, however, until 1900 that an attempt was made by *Baker* (10) to classify and make an artificial key to the Tropical African species. He recognized thirty-four species, including eleven new ones. In the next twenty-one years a further thirteen species were described by various authors, but no revisional work was done on the genus until 1921, when *Miss Janet Perkins* (11) published a paper on "The African Species of *Pycnostachys*." *Miss Perkins* revised the concept of a number of existing species and published eight new ones, recognizing in all thirty-three species. In the same year, but two months earlier *De Wildeman*, (12) unknown to *Miss Perkins*, published four new species and seven years later added another nine, all described from the Belgian Congo and the Ruwenzori area. From this date to the present day six species have been described by different authors but no further attempt has been made at classification. Thus, since the foundation

(1) *πυκνός* dense, *στάχυς* spike.

(2) Hooker, *Exot. Fl.* 3, t. 202 (1825).

(3) *Fres.* in *Flora*, 2, 608 (1838).

(4) *Benth.* in *DC. Prod.* 12, 83 (1848).

(5) *E. Mey. Comm. Pl. Afr. Austr.* 243 (1837).

(6) *Benth. & Hk. f. Gen. Plant.* 2, 1177 (1876).

(7) *Gürke* in *Engl. Hochgeberge Fl. Trop. Afr.* 362 (1892) et in *Engl. Bot. Jahrb.* 22, 145 (1895) et in *Pflanzenw. Ost-Afr.* C, 345 (1895).

(8) *Bak.* in *Kew Bull.* 1895, 71, 72, et 1898, 161, 162.

(9) *Briq.* in *Engl. Bot. Jahrb.* 19, 191 (1894) et in *Bull. Soc. Bot. Belg.* 37, 63 (1898).

(10) *Bak.* in *Dyer Fl. Trop. Afr.* 5, 378 (1900).

(11) *Perk.* in *Notizbl. Bot. Gart. Berlin*, 8, 63 (1921).

(12) *De Wild.* *Contrib. Fl. Katanga*, 171 (1921) et *Pl. Bequaert.* 4, 386 (1928).

LIST OF GROUPS

Group 1.	Group 2.	Group 3.	Group 4.	Group 5.	Group 6.
1. <i>graminifolia</i>	9. <i>orthodonta</i>	14. <i>coerulea</i>	24. <i>sphaerocephala</i>	28. <i>Elliottii</i>	29. <i>Batesii</i>
2. <i>verticillata</i>	10. <i>gracilis</i>	15. <i>deflexifolia</i>	25. <i>angolensis</i>		30. <i>umbrosa</i>
3. <i>DeWildemaniana</i>	11. <i>ruandensis</i>	16. <i>niamniamensis</i>	26. <i>Perkinsii</i>		31. <i>Eminii</i>
4. <i>linifolia</i>	12. <i>congensis</i>	17. <i>pseudospeciosa</i>	27. <i>Whytei</i>		32. <i>Erici-Roseni</i>
5. <i>Prittwitzii</i>	13. <i>Kassneri</i>	18. <i>nepetifolia</i>			33. <i>urticifolia</i>
6. <i>parvifolia</i>		19. <i>Chevalieri</i>			34. <i>abyssinica</i>
7. <i>Descampsii</i>		20. <i>reticulata</i>			35. <i>Goetzenii</i>
8. <i>pallide-caerulea</i>		21. <i>Schweinfurthii</i>			36. <i>Schliebenii</i>
		22. <i>Stuhlmannii</i>			37. <i>Meyeri</i>
		23. <i>speciosa</i>			

KEY TO GROUPS

Leaves whorled or if opposite appearing fasciculate, linear, linear-lanceolate, spatulate, oblanceolate-cuneate or if lanceolate under 3 cm. long and fasciculate (*P. parvifolia*).....**Group 1.**

Leaves opposite (rarely whorled or appearing fasciculate, if so not of a linear type), linear-lanceolate, lanceolate, oblanceolate, oblong-lanceolate, ovate-lanceolate, ovate, obovate, elliptic or broadly ovate :

Annuals with thin, flaccid, glabrous or, on the nerves below thinly pubescent, linear-lanceolate, lanceolate, ovate-lanceolate, ovate or broadly ovate leaves ; stems definitely quadrangular, never rounded, sulcate, succulent or woody, unbranched below and generally branched towards the top.....**Group 2.**

Plants generally perennial herbs or undershrubs ; stems quadrangular or often rounded, striate, woody or succulent ; if annual then leaves not thin and flaccid :

Leaves sessile or subsessile, lower ones at most 0.5 cm. petiolate :

Leaves generally glabrous or thinly puberulous on the nerves below, if thinly pubescent below then, either flowers less than 1 cm. long, or leaves sessile, or leaves elongate-lanceolate and acuminate : (leaves varying from linear-lanceolate to elliptic, rounded or acuminate at the apex).....**Group 3.**

Leaves thinly pubescent to tomentose over the lower surface, sometimes becoming pubescent on nerves only, lanceolate or oblong-lanceolate, serrate or crenate-serrate, acute or subacute at the apex, scarcely acuminate, subsessile or very shortly petiolate ; flowers large over 1 cm. long, generally 1.3 cm. or over.....**Group 4.**

Leaves definitely petiolate ; lower petioles at least 1 cm. :

Flowers large, 1-2 cm. long, with long-exserted stamens, 3-6 mm. beyond the lower-lip ; corolla with a short 1 mm. long upper-lip ; narrow cylindric portion of tube 2 mm. long, about a third the length of the 6 mm. long funnel-shaped portion, which is 4 mm. diameter at the throat ; bracts lanceolate ; spikes generally solitary 5-8 cm. long and about 2.5 cm. broad in fruit, 3-6 cm. pedunculate.....**Group 5.**

Flowers variable in size, 0.5-2.5 cm. long, stamens not long-exserted ; narrow cylindric portion of tube at least half the length of funnel-shaped portion, generally sub-equal to it or longer ; bracts, spikes and leaves variable in size and shape.....**Group 6.**

KEY TO SPECIES

Group 1.

Stems and leaves with a few scattered long white hairs ; leaves sessile, grasslike, generally in whorls of fours, 3-6 cm. long, and about 2 mm. broad ; fruiting spikes solitary, 2-5 cm. long and about 1.5 cm. broad ; base woody.....**1. graminifolia**

Stems and leaves with short, comparatively close, crisped, appressed or subscabrid pubescence ; leaves not grasslike :

Flowers small, about 5 mm. long, lower-lip of corolla shallow, not deeply boat-shaped ; fruiting spikes narrow about 1 cm. in diameter :

Leaves spatulate, shortly petiolate, 1-4 cm. long, pubescence of stem crisped and spreading, not closely appressed ; calyx-teeth short, 1-2 mm. long in flower and young fruit, pubescent or puberulous.....**2. verticillata**

Leaves $\pm$ flaccid, linear or linear-lanceolate, subsessile, 2-9 cm. long ; pubescence of stem closely appressed, not spreading ; calyx-teeth more than 2 mm. long, glabrous or glandular, not pubescent, calyx-tube in flowering stage and young fruit thinly hirsute and glandular...**3. De Wildemaniana**

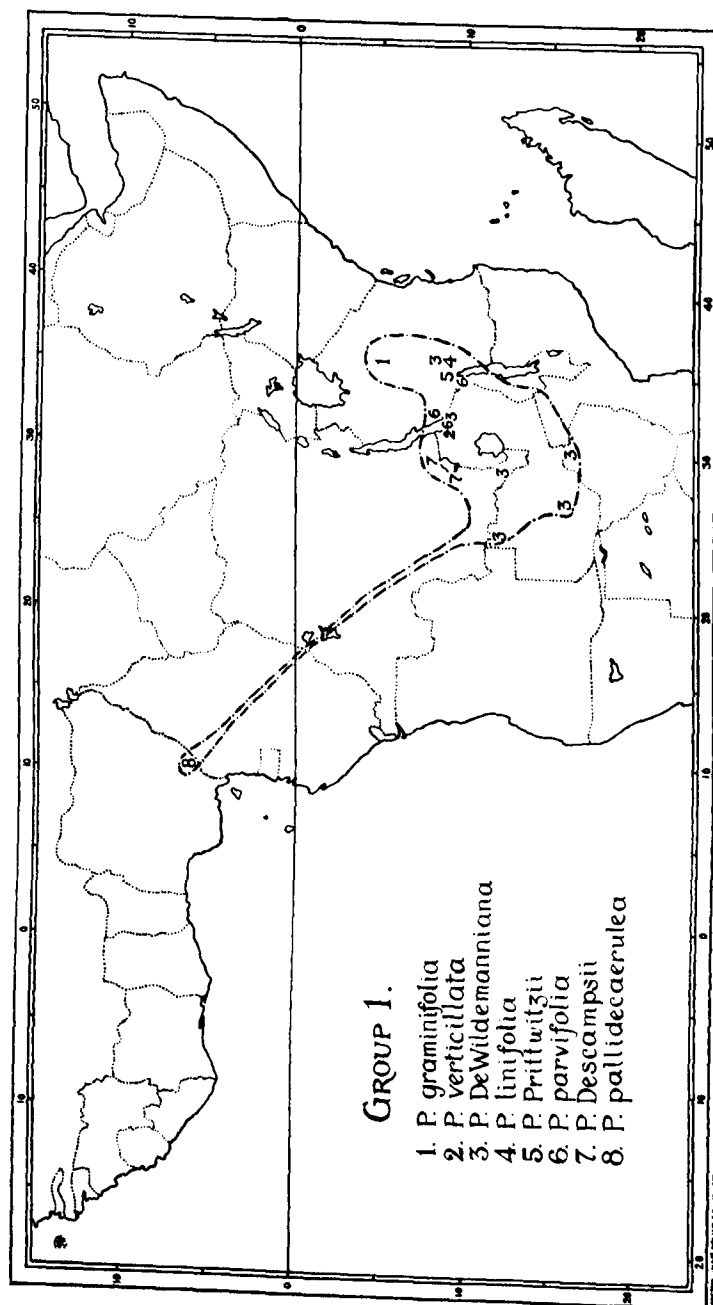
Flowers larger, 8 mm. long or over, lower-lip of corolla deeply boat-shaped ; fruiting spikes broader than above (1-5 cm. or over) :

Stems quadrangular or occasionally $\pm$ rounded, not conspicuously sulcate :

Leaves thin $\pm$ flaccid, linear-lanceolate, shallowly toothed, 3-10 cm. long, 0.3-1 cm. broad ; indumentum of stem subscabrid ; fruiting spikes 1.5-2 cm. diameter.....

Schweinfurthii

Perennial herbs with firm, $\pm$ leathery, linear, spatulate, lanceolate, oblong-lanceolate or oblanceolate leaves, 0.5-5 cm. long and up to 0.6 cm. broad ; indumentum soft or subscabrid :



Leaves linear, spathulate or oblanceolate 2-5 cm. long ;
indumentum of lower surface of leaf soft :

Bracts linear, less than 1 mm. broad at the base, not
forming a conspicuous coma at the apex ; leaves
sessile, linear or spathulate, up to 3 mm. broad,
some at any rate in whorls ; calyx teeth 3-4 mm.
long, pubescent ; corolla pubescent ; indumentum
of stem $\pm$ crisped not very closely appressed.....

4. *linifolia*

Bracts linear-lanceolate, long acuminate, about 2 mm.
broad at the base, forming a conspicuous coma at
the apex ; leaves narrowly oblong to narrowly
oblanceolate, up to 6 mm. broad ; indumentum
of stem very short and closely appressed.....

5. *Prittwitzii*

Leaves lanceolate or oblong-lanceolate, generally appearing
densely fasciculate, 0.5-3 cm. long, conspicuously
punctate and subscabrid on the nerves below.....

6. *parvifolia*

Stems conspicuously sulcate (6-10 ribbed) ; leaves linear or
oblanceolate appearing fasciculate ; calyx-teeth thinly
pubescent or pilose :

Spikes generally solitary ; bracts conspicuous in flower,
linear, about 1 cm. long, ciliate ; corolla densely
papillose or crisped pubescent on the lip, not glandular ;
leaves up to 5 cm. long (Congo).....

7. *Descampsii*

Spikes generally many ; bracts not conspicuous in flower ;
corolla sparsely pubescent, glandular ; leaves up to
3 cm. long (British Cameroons).....

8. *pallide-caerulea*

The plants within this group form a fairly natural assemblage.
They are characterized by the whorled or apparently fasciculate
arrangement of the leaves, which are of a linear type. The only
subtropical species which occur here are *P. De Wildemaniana*,
Schweinfurthii and *P. Prittwitzii*. The two former have been
inserted in Groups 2 and 3, whilst the latter is related to *P. niamnia-
ensis* in Group 3, but is distinguished from it by the narrow,
oblanceolate leaves.

Group 2.

Leaves long (2-5 cm.) petiolate, ovate or broadly ovate ; flowers
comparatively large, 1-1.5 cm. long :

Fruiting spikes short and broad, about 3 cm. long and 2.5 cm.
broad ; flowering spikes comparatively narrow 1-1.5 cm.
broad ; calyx-tube in fruit conspicuously inflated below
and contracted at the throat, teeth glabrous, 3 mm. long in
flower and fruit, spreading and thickened in fruit ; leaves
very coarsely crenate, 5-7 teeth on each side, rounded or
truncate at the base ; lamina 5-8 cm. long, 2-5 cm. broad,
glabrous **Batesii**

Fruiting spikes narrow, elongate, 3–16 cm. long, 1–2 cm. broad ; calyx-tube not conspicuously inflated below, teeth shortly puberulous or pubescent, 4–8 mm. long, $\pm$ erect and needle-like ; leaves cuneate at the base, crenate or crenate-dentate with more than 7 teeth on each side.....**9. orthodonta**

Leaves sessile or subsessile, if long-cuneate at the base, often shortly petiolate, linear-lanceolate, lanceolate, ovate-lanceolate or ovate :

Flowers small, 4 to 7 mm. long ; lower lip of corolla shallow, not deeply boat-shaped :

Calyx in fruit not at all contracted and hooded at the throat, tube often glandular or hirsute, teeth straight, glabrous or sparingly glandular or puberulous, never long-ciliate ; spikes narrow, in fruit about 1 cm. diameter ; leaves sessile, or subsessile, linear-lanceolate or lanceolate, 2–12 cm. long, 0.4–3 cm. (though rarely over 1 cm.) broad ; Calyx-teeth in fruit 1.5–3 mm. long :

Leaves sessile, not narrowly cuneate at the base, lanceolate, 2–4 cm. long, 0.4–1 cm. broad, subentire or shallowly toothed, sparsely puberulous above and on the nerves below, not conspicuously reticulate ; spikes in fruit 1–2 cm. long and about 1 cm. broad ; calyx-teeth glabrous or shortly pubescent subequal to the tube ; tube pilose in the throat.....**10. gracilis**

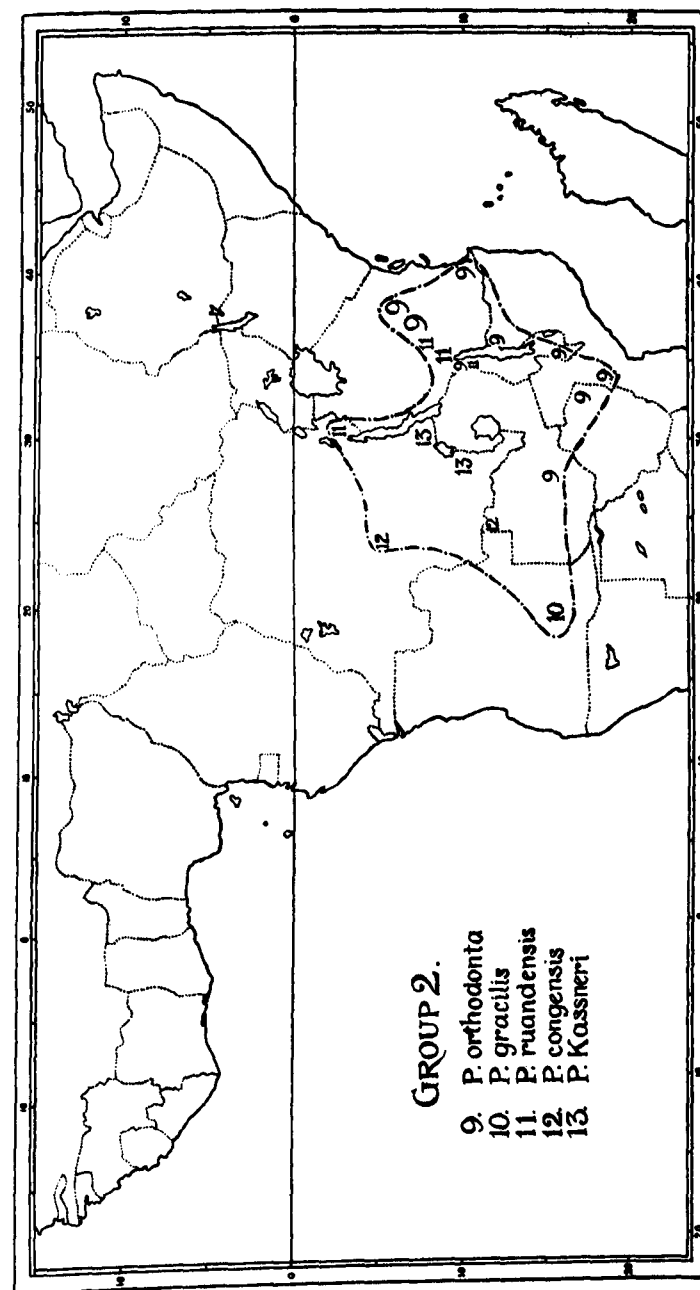
Leaves lanceolate or linear-lanceolate, 5–12 cm. long, 0.6–3 cm. broad, toothed, venation reticulate below ; calyx teeth comparatively stout, $\pm$ winged near the base, 1.5–3 mm. long in fruit ; tube glabrous in the throat.....**coerulea**

Calyx-teeth in fruit about 5 mm. long, glabrous ; tube glandular and generally pilose outside, leaves linear-lanceolate not conspicuously toothed, 4–8 cm. long and 0.5 cm. broad, narrowly cuneate or attenuate at the base ; spikes 2.5 cm. long and about 1 cm. broad.....

De Wildemaniana

Calyx in fruit, generally contracted and $\pm$ hooded at the throat, if not hooded, fruiting-spikes always over 1.5 cm. broad or calyx-teeth ciliate ; leaves generally broader than above, oblong-lanceolate, lanceolate or ovate-lanceolate, shallowly crenate or dentate, 2.5–12 cm. long, 0.5–3 cm. broad :

Leaves narrowly long-cuneate to the base and sometimes shortly petiolate, lanceolate to ovate-lanceolate, 2.5–6 cm. long, 0.5–2.5 cm. broad, acute or subacute ; bracts broadly lanceolate, or narrowly elliptic, broadest about the middle and narrowed to the base and apex, ciliate ; spikes 2–3.5 cm. long in fruit ; calyx contracted at the throat and hooded, teeth slightly curved, 2–3 mm. long in fruit**11. ruandensis**



Leaves not long-cuneate at the base, subsessile, oblong-lanceolate, lanceolate or ovate-lanceolate, 4-12 cm. long, 0.8-3 cm. broad, acuminate, generally deflexed; bracts linear, densely pilose-ciliate, 5-8 mm. long; spikes 3-9 cm. long and 1.5-2.5 cm. broad in fruit; calyx-teeth sparsely pilose-ciliate, 4-10 mm. long in fruit.....

deflexifolia

Flowers larger, 0.8-1.5 cm. long, lower lip of corolla deeply boat-shaped:

Calyx-teeth very short, in flower about 1 mm. long, subequal to the tube; corolla about 1.5 cm. long with a narrow cylindric tube about 6 mm. long and 1 mm. diameter; spikes short up to 2 cm. long; leaves lanceolate or linear-lanceolate, 3-8 cm. long, 0.4-2 cm. broad, densely glandular and pubescent on the nerves below.....

12. congensis

Calyx-teeth much longer than above, 3-8 mm. in flower and up to 10 mm. in fruit; spikes generally longer:

Leaves generally 3-6 mm., at most 8 mm. broad, and 5-11 cm. long, linear-lanceolate, subscabrid on the nerves below; in fruit calyx-tube sparsely pubescent and glandular, teeth about 5 mm. long, sparsely ciliate; flowers 0.8-1 cm. long; indumentum of stem sparse, scabrid or subscabrid.....

Schweinfurthii

Leaves 0.8-3 cm. broad, 4-16 cm. long, elongate-lanceolate, linear-lanceolate, lanceolate, oblong-lanceolate or ovate-lanceolate; indumentum not scabrid, generally appressed:

Flowers about 8 mm. long; leaves oblong-lanceolate, lanceolate or ovate-lanceolate, 4-12 cm. long, 0.8-3 cm. broad, acuminate; spikes 3-8 cm. long and 1.5-2.5 cm. broad in fruit; bracts conspicuous, linear, densely pilose-ciliate.....

deflexifolia

Flowers larger than above, 1-1.5 cm. long:

Spikes in flower slender and comparatively short, 2-3 cm. long; bracts inconspicuous; calyx-teeth in flower 4-6 mm. long, glabrous or sparsely pubescent at the base not pilose; leaves lanceolate or linear-lanceolate very flaccid 4-8 cm. long, 0.8-2 cm. broad.....

13. Kassneri

Spikes solitary, in flower broader and longer than above, 3-7 cm. long, in fruit stout, 4-12 cm. long, 2-3 cm. broad; bracts conspicuous, linear-lanceolate, densely ciliate; calyx-teeth in flower about 0.6 cm., in fruit 1 cm. long, pilose below, glabrous above; flowers about 1.5 cm. long; leaves large, elongate-lanceolate, 10-16 cm. long, 1-2.5 cm. broad.....

speciosa

Some species have been included in this key which are probably not annuals and do not belong to this Group (*P. Batesii*, *P. Schwein-*

furthii, *P. deflexifolia*, *P. coerulea*, *P. speciosa*), but with the imperfect material and lack of good collectors notes it is often impossible to be certain of this character. These doubtful species have also been included among the perennial herbs in Groups 3 and 6, where they most probably belong.

This group is characterized by the annual habit and the thin, flaccid leaves.

Group 3.

Flowers small, 4-7 mm. long, lower lip of corolla short and shallow about 2 mm. long; stem neither sulcate nor woody; leaves neither firm nor leathery:

Calyx not at all hooded in fruit, teeth glabrescent or puberulous, never pilose, stout, winged near the base, 2-3 mm. long; spikes in fruit about 1 cm., in flower 0.5 cm. diameter; bracts oblong-lanceolate, about 3 mm. long, very shortly ciliate; leaves linear-lanceolate to lanceolate, up to 3 cm. though rarely more than 1.5 cm. broad, reticulate below.....

14. coerulea

Calyx generally hooded in fruit, if not fruiting spikes over 1.5 cm. broad or calyx-teeth long-ciliate:

Leaves long-cuneate to the base and sometimes shortly petiolate, lanceolate to ovate-lanceolate, 2.5-6 cm. long, 0.5-2.5 cm. broad; bracts $\pm$ lanceolate, broadest at the middle and narrowed to the apex and base, ciliate; spikes 2-3.5 cm. long in fruit; calyx contracted at the throat and hooded, teeth slightly curved 2-3 mm. long in fruit.....

ruandensis

Leaves not long-cuneate at the base, subsessile, oblong-lanceolate, lanceolate or ovate-lanceolate, dentate, 4-12 cm. long, 0.8-3 cm. broad, acuminate, often deflexed; bracts linear, densely pilose-ciliate, about 5 mm. long; spikes 3-8 cm. long and 1.5-2.5 cm. broad in fruit; calyx-teeth sparsely ciliate, 4-10 mm. long in fruit.....

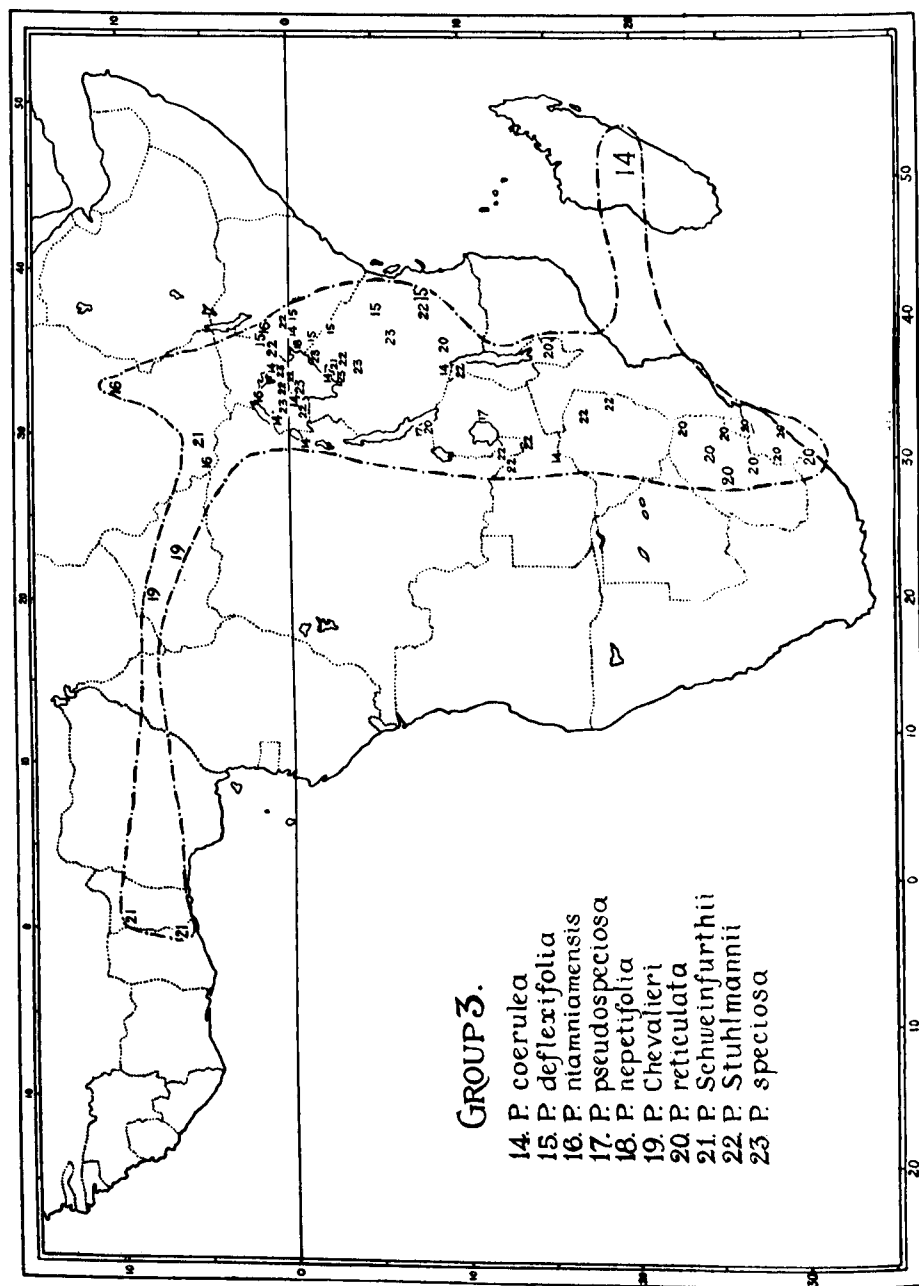
15. deflexifolia

Flowers larger than above, 0.8-1.8 cm. long; leaves generally (except *P. Schweinfurthii*, *P. speciosa*) firm, sometimes $\pm$ leathery; stems often sulcate or $\pm$ woody:

Leaves rounded to subacute at the apex, never acuminate; Bracts 1-2 mm. broad, widest about or just below the middle, tapered below and acuminate above, $\pm$ papery, chestnut or pale brown; calyx teeth glabrous to pubescent; leaves oblanceolate, lanceolate, elliptic, ovate or obovate, very shortly and closely appressed pubescent on the nerves below or glabrous, 4-9 cm. long, 1.5-4 cm. broad; stem sulcate, appressed pubescent and $\pm$ woody.....

16. niamniamensis

Bracts at most 1 mm. broad, gradually tapered from the base, broadly linear or very narrowly wedge-shaped, $\pm$ firm and leathery, dark purple brown; calyx-teeth pubescent or pilose, never glabrous; leaves generally oblong-



lanceolate up to 1.5 cm. broad, if ovate or elliptic not more than 2.5 cm. broad and crisped or spreading pubescent on the nerves below, not appressed; stem very rarely sulcate**20. reticulata**

Leaves acute or acuminate at the apex:

Calyx throat and base of teeth conspicuously long tomentose, teeth short, 2-3 mm. long in young fruit; leaves shortly petiolate; bracts inconspicuous.....**Eminii**

Calyx throat and base of teeth not conspicuously long tomentose; leaves sessile or subsessile:

Leaves ovate, ovate-lanceolate, lanceolate or elliptic, 3-9 cm. long, 1-3 cm. broad sometimes whorled; stems conspicuously sulcate:

Corolla-lips densely tomentose; leaves glabrous or shortly pubescent on the nerves below, some at any rate amplexicaul; bracts linear-lanceolate, caudate-acuminate, conspicuous in flowering stage.....

17. pseudospectiosa

Corolla thinly pubescent; leaves not or scarcely amplexicaul; bracts linear-lanceolate not caudate:

Leaves sparingly pubescent on the nerves below, generally rounded at the base ovate or elliptic; spikes several.....**18. nepetifolia**

Leaves glabrous below, narrowed to the base, generally arranged in whorls of threes, lanceolate or ovate-lanceolate; spikes solitary.....**19. Chevalieri**

Leaves linear-lanceolate, oblanceolate, elongate-lanceolate, or occasionally lanceolate, 4-15 cm. long; stems quadrangular, rounded or rarely sulcate:

Lateral nerves arising at a wide angle to the midrib (60°-90°), then sharply ascending just within the margin; lamina elongate-lanceolate, linear-lanceolate or occasionally lanceolate, 4-15 cm. long, 0.5-2.5 cm. broad; spikes short, many, terminal on lateral branches, about 1-3 cm. long in flower and fruit.....

22. Stuhlmannii

Lateral nerves arising at a narrow angle to the midrib (20°-30°), not abruptly bent:

Spikes large, solitary, terminal, 3-7 cm. long in flower, 4-13 cm. long and about 3 cm. broad in fruit; leaves large, elongate-lanceolate, 9-20 cm. long, 1.5-3 cm. broad.....**23. speciosa**

Spikes generally many, terminal on lateral branches, narrower than above, 1-2 cm. broad in fruit:

Leaves thin not firm, linear-lanceolate, 5-11 cm. long, 3-6 mm. broad never whorled; stem never sulcate, pubescence subscabrid.....

21. Schweinfurthii

Leaves firm not thin, linear-lanceolate, oblong-lanceolate or oblanceolate, 4-12 cm. long, 0.5-1.5 cm. broad, sometimes whorled; stem often sulcate, pubescence soft not subscabrid.....

20. reticulata

Species included in this key have also been mentioned in the key to Group 2: this is to facilitate the keying-out of species which have some characters in common with both groups.

Group 4.

Calyx-teeth short, 2-2.5 mm. long in flower and young fruit, narrowly but conspicuously winged, glabrous or thinly glandular; calyx-tube not pilose; bracts ovate-lanceolate, attenuate at the base, about 3 mm. long, inconspicuous.....

24. sphaerocephala

Calyx teeth generally 4-8 mm. long, not or very slightly winged at the base, if less than 4 mm., then not winged:

Calyx-tube and between the teeth pilose; teeth about 2.5 mm. long in flower and up to 5 mm. long in fruit; bracts broadly lanceolate, attenuate at the base, about 2 mm. broad and 4-7 mm. long; stem densely tomentose below the inflorescence; leaves at first pubescent over the lower surface, becoming pubescent on the nerves only.....

25. angolensis

Calyx-tube and between the teeth not pilose; stem rarely densely pilose below the inflorescence, generally at most pubescent:

Calyx-teeth slightly winged at the base, glabrous or with a few hairs towards the base, 4-7 mm. long; bracts linear-lanceolate, long-cuneate at the base, 7-12 mm. long, conspicuous.....

26. Perkinsii

Calyx-teeth not at all winged, 8 mm. long in flower and about 10 mm. in fruit, densely glandular-puberulous; spikes in flower 3.5-4 cm. in diameter; bracts linear-lanceolate, about 8 mm. long, inconspicuous.....

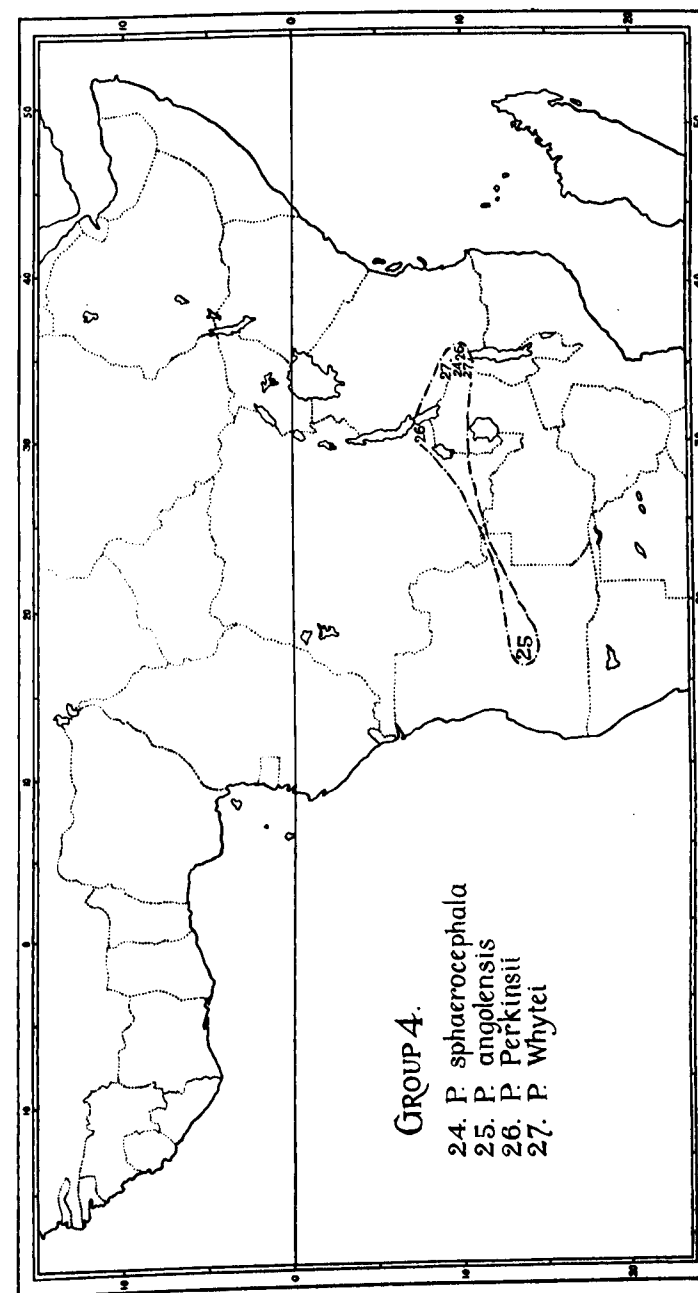
27. Whytei

The species in this group are very closely related to one another, the main difference being in the size and form of the calyx-teeth and in the pubescence of the tube. It is possible that when more material is available these differences may be connected together and that some of the species will then be relegated to synonymy.

Group 5.

Flowers large, 1-2 cm. long, stamens conspicuously exserted; upper lip of corolla short, deeply bifid, about 1 mm. long, throat about 4 mm. diameter; calyx-teeth and tube glabrous or pilose, 0.7-1 cm. long in fruit; bracts lanceolate to linear-lanceolate, about 5 mm. long, acute not caudate, ciliate, minutely pubescent or glabrous; leaves large, 7-24 cm. long, 3.5-12 cm. broad, crenate-dentate.....

28. Elliotii



GROUP 4.

- 24. P. sphaerocephala
- 25. P. angolensis
- 26. P. Perkinsii
- 27. P. Whytei

There is a fairly wide range of variation in the indumentum of the calyx-teeth and bracts, but as this is not a constant character it cannot be satisfactorily used for specific or even varietal separation. The material has therefore been treated as a single species.

Group 6.

Leaves very coarsely crenate (5-7 teeth on each side), thin, glabrescent, ovate or broadly ovate, rounded or truncate at the base, acute or acuminate at the apex, 5-7 cm. long, 3-5 cm. broad, long petiolate; in fruit, spikes short and broad, 3 cm. long and 2.5 cm. broad, calyx-tube conspicuously inflated; corolla glabrous, 1 cm. long or over.....**29. Batesii**

Leaves not coarsely crenate, if crenate then more than 7 teeth on each side; calyx-tube not conspicuously inflated in fruit:

Inflorescence relatively lax, usually branched and with visible spaces between the bases of the flowers, 7-20 cm. long, not forming a dense spike; corolla large, 1.2-2.5 cm. long with a narrow tube and large lower lip; calyx-tube in fruit asymmetrically expanded below, teeth glandular, tube pilose in the throat; leaves ovate, crenate-dentate, petiole 2-5 cm. long, lamina 6-15 cm. long, 3-8 cm. broad; stem succulent or slightly woody.....**30. umbrosa**

Inflorescence compact, forming a dense and almost solid spike; calyx-tube symmetrical in fruit:

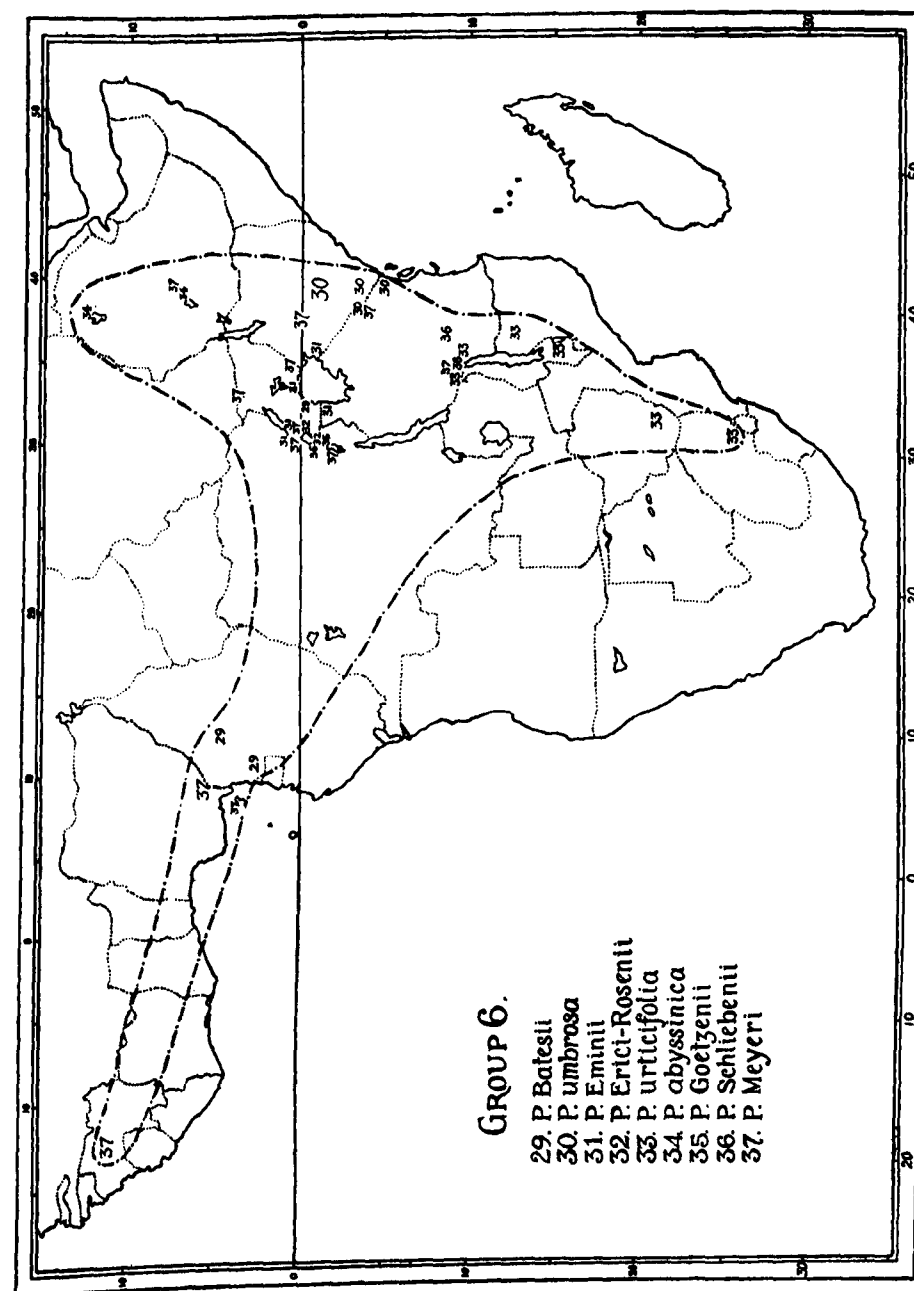
Calyx conspicuously long-matted-tomentose at the throat and at the base of and between the 2-3 mm. long teeth so that the spikes in young fruit appear tomentose with glabrous teeth sticking out; corolla 0.8-1.3 cm. long, thinly pubescent on the lips, or glabrous; leaves ovate, 4-11 cm. long and 2-5.5 cm. broad, pubescent below, shortly petiolate; bracts inconspicuous.....**31. Eminii**

Calyx not very conspicuously long-tomentose at the throat:

Calyx-teeth comparatively short and thick, spreading and slightly curved, 2-3 mm. long in fruit, very shortly pubescent or puberulous, at least at the base, often glandular; bracts inconspicuous, about 1 mm. broad; corolla 1-1.5 cm. long, pubescent on the lips; spikes several, 2-3 cm. long in flower and up to 4 cm. long and about 1 cm. broad in fruit; leaves 1-3.5 cm. petiolate, ovate, acuminate, closely crenate; lamina 5-9 cm. long and 2-4 cm. broad, generally fairly densely pubescent below, at any rate on the nerves; stem $\pm$ woody.....**32. Eri-ci-Rosenii**

Calyx-teeth generally more than 3 mm. long in fruit and more slender than above; if less than 3 mm. then bracts conspicuous, more than 1 mm. broad:

Leaves broadly ovate, truncate or very widely cuneate at the base, petiole 1.5-5 cm. long, lamina 4-11 cm. long, 3-6 cm. broad, crenate-dentate, thinly pubescent



below; bracts lanceolate, 1.5–2.5 mm. broad, rather thin, pubescent and glandular; flowers large, 1.2–2.3 cm. long; calyx-teeth puberulous, 5–9 mm. long in flower and up to 1.2 cm. in fruit; spikes often sessile, 2.5–8 cm. long in flower and up to 10 cm. long and 2–3 cm. broad in fruit.....**33. urticifolia**
 Leaves generally narrowed to the base, sometimes auriculate, if truncate or widely cuneate then bracts less than 2 mm. broad;
 Calyx-teeth and tube conspicuously glandular-puberulous, teeth about 4 mm. long in flower and up to 10 mm. in fruit; corolla 1.1–1.5 cm. long; leaves ovate, crenate-dentate.....**34. abyssinica**
 Calyx-teeth and tube not conspicuously glandular-puberulous;
 Leaves closely pubescent or tomentose below; flowers large, 1.5 cm. or over.....**Perkinsii**
 Leaves generally at most thinly pubescent on the nerves below, if tomentose over the lower surface then flowers not more than 1 cm. long;
 Flowers over 1 cm. (1.2–1.7 cm.) long; stems generally $\pm$ woody;
 Flowering spikes comparatively long, 4–8 cm., tapered not rounded at the apex; leaves lanceolate to ovate-lanceolate, crenate, 7–12 cm. long, 2–5 cm. broad, glabrous or puberulous on the nerves below, otherwise glabrous; stem woody.....**35. Goetzenii**
 Flowering spikes comparatively short, 1–3 cm., rounded at the apex; leaves lanceolate to ovate-lanceolate, serrate or crenate-serrate, pubescent on the lower surface at least on the nerves.....**36. Schliebenii**
 Flowers 0.5–1 cm. long; calyx-teeth 4–6 mm. long in flower, up to 8 mm. in fruit, glabrous or ciliate; bracts conspicuous, linear, ciliate; leaves lanceolate to ovate, crenate-dentate, 6–14 cm. long, 2.5–6 cm. broad, glabrous or thinly pubescent below; spikes 2–3 cm. long in flower and up to 6 cm. in fruit...**37. Meyeri**

ENUMERATION

1. Pycnostachys graminifolia *Perk.* in Notizbl. Bot. Gart. Berlin, **8**, 66 (1921).

TANGANYIKA TERRITORY. Kilimatinde, 1300 m., *Prittwitz* 118 (type in Berlin Herb.).

2. P. verticillata *Bak.* in Kew Bull. 71 (1895), et in Dyer, Fl. Trop. Afr. **5**, 383 (1900); *Perk.* l.c. 69.

NORTHERN RHODESIA. Lake Tanganyika; Fwambo, *Carson* 38 (type in Kew Herb.).

3. P. De Wildemaniana *Robyns et Lebrun* in Rev. Zool. et Bot. Afr. **16**, 352 (1928).

BELGIAN CONGO. Munama, *Quarré* 1143 (type in Brussels Herb.).

TANGANYIKA TERRITORY. Iringa, table top of east ridge, 1770 m. *Lynes* l.h. 250 i.

NORTHERN RHODESIA. Abercorn District; near Wambeshi River, 1500 m., *Burt* 6374. Mwinilunga District: Matonchi Farm, *Paterson* 5. Mumbwa, *Mrs. Macaulay* 1051.

SOUTHERN RHODESIA. Lomagundi; Darwendale, 1350 m., *Eyles* 699.

4. P. linifolia *Gürke* in Engl. Bot. Jahrb. **30**, 397 (1902); *Perk.* l.c. 69. *P. lavanduloides* *Perk.* l.c. 68.

TANGANYIKA TERRITORY. Ubena, 1900 m., *Goetze* 798 (type in Berlin Herb.). Uhehe; Utschungwe Mts., 1600 m., *Hauptmann* Prince 28a.

5. P. Prittwitzii *Perk.* in Notizbl. Bot. Gart. Berlin, **8**, 68 (1921).

TANGANYIKA TERRITORY. South West Iringa; Ndembera-Niederung, near Gominyi, *Haupt.* v. *Prittwitz* u. *Gaffron* 28 (type in Berlin Herb.).

NORTHERN RHODESIA. 25 miles S. of Abercorn, 1440 m., *Hutchinson et Gillett* 4023.

6. P. parvifolia *Bak.* in Kew Bull. 72 (1895), et in Dyer, Fl. Trop. Afr. **5**, 381 (1900); *Perk.* l.c. 68.

TANGANYIKA TERRITORY. Between Lake Tanganyika and Lake Rukwa, 1800 m., *Nutt* s.n. Rungwe District; 1500 m., *Davies* 471.

NYASALAND. Tanganyika Plateau, Fort Hill 1050–1200 m., *Whyte* s. n.

NORTHERN RHODESIA. Lake Tanganyika; Fwambo, *Carson* 26, 34, 92, 103 (type in Kew Herb.).

7. P. Descampsii *Briq.* in Bull. Soc. Bot. Belg. **37**, 63 (1898); *Bak.* in Dyer, Fl. Trop. Afr. **5**, 380 (1900); *Perk.* l.c. 69.

BELGIAN CONGO. Lufongo River, Kisobi, *Descamps* s.n. (type in Brussels Herb.). Between Pweto and Baudouinville, *Robyns* 2037. Kasanga River, *Kassner* 2660. Kundelunga, *Kassner* 2762, 3618.

8. P. pallide-caerulea *Perk.* in Notizbl. Bot. Gart. Berlin, **8**, 67.

BRITISH CAMEROONS. Bamsso Mts.; Kumbo, 1800–2000 m., *Ledermann* 5738 (type in Berlin Herb.).

9. P. orthodonta *Gürke* in Engl. Pflanzw. Ost-Afr. **C.** 345 (1895); *Bak.* l.c. 386; *Perk.* l.c. 77. *P. cyanea* *Gürke* l.c. *P. leptophylla* *Bak.* in Kew Bull. 161 (1898), et in Dyer, Fl. Trop. Afr. **5**, 386 (1900); *Perk.* l.c. *P. Hanningtonii* *Bak.* in Dyer, Fl. Trop. Afr. l.c. 384; *Perk.* l.c. *P. Bussei* *Gürke* in Engl. Jahrb. **36**, 131 (1905); *Perk.* l.c.

TANGANYIKA TERRITORY. Usagara; Tubugwe, about 900 m., *Stuhlmann* 213. Ugogo, *Hannington* s.n. Kondoa District; Sambala, 1470 m., *Burt* 2014. Mpwapwa, 1050 m., *Hornby* 248. Lindi District, 500 m., *Busse* 2834.

PORTUGUESE EAST AFRICA. Gorongoza District, near Gouveia, *Carvalho* s.n. (type in Berlin Herb.). East Coast of Lake Nyasa, *Johnson* 69. Island of Likoma, *Johnson* 37.

NYASALAND. Between Kondowe and Karonga, 600-1800 m. *Whyte* s.n. Without locality, *Buchanan* 873.

NORTHERN RHODESIA. Namwala, *Gordon Reade* 38, 65.

SOUTHERN RHODESIA. Salisbury, *Eyles* 8538.

10. *P. gracilis* R. Good in Journ. Bot. 69, Suppl. 2, 164 (1931).

ANGOLA. Benguela; by the Longa River, *Gossweiler* 2982; By the River Cuatiri, *Gossweiler* 4035 both these numbers are cited in the type description but no type number has been selected. (British Museum and Kew Herb.)

11. *P. ruandensis* De Wild. Pl. Bequaert. 4, 401 (1928). *P. clinodon* Mildbr. in Notizbl. Bot. Gart. Berlin, 11, 405 (1932).

BELGIAN CONGO. Between Kirinda and Lubengera, 1900 m., *Robyns* 2449 (type in Brussels and Kew Herb.).

TANGANYIKA TERRITORY. Lupembe, near Iringa, *Schlieben* 1053. North of Lake Nyasa, *Whyte* s.n. Kyimbila District; Bundale Mts., 1600-1800 m., *Stolz* 787, 1281.

NYASALAND. Nyika Mts., 1200-1800 m. *Whyte* s.n.

12. *P. congensis* Gürke in Bull. Herb. Boiss. 4, 819 (1896); Baker in Dyer, Fl. Trop. Afr. 5, 380 (1900); Perk. in Notizbl. Bot. Gart. Berlin, 8, 71 (1921).

BELGIAN CONGO. Samba, *Descamps* 28 (type in Brussels Herb.).

NORTHERN RHODESIA. Mwinilunga District, 1200-1500 m., *Marks* 75.

13. *P. Kassneri* De Wild. in Contrib. Fl. Katanga 172 (July 1921), et in Ann. Soc. Sci. Brux. 41, 2, 54 (1921) descr. ampl. *P. carigensis* Gürke ex De Wild. Etud. Fl. Katanga 2, 135 (1913) nomen.

BELGIAN CONGO. West Kundelunga, *Kassner* 2794 (type in Kew Herb.). Between Pweto and Baudouinville, *Robyns* 2045. Mugila Mts., *Kassner* 2967.

14. *P. coerulea* Hook. Exot. Fl. 3, 202 & fig. (1825); Perk. l.c. 69 in obs. *P. micrantha* Gürke in Engl. Pflanzenw. Ost-Afr. C. 345 (1895); Bak. in Dyer, Fl. Trop. Afr. 5, 381; Perk. l.c. *P. stenostachys* Bak. l.c. 380; Perk. l.c. *P. brevipetiolata* De Wild. Pl. Bequaert. 4, 394 (1928).

BELGIAN CONGO. Kaisafu, Rutshuru River, *Bequaert* 5972.

UGANDA. Kibibi; Buruma, *Maitland* 1069. Kigezi District; edge of Lake Chaliati, 1860 m., *Gilbert Rogers* 354. Kinabu Gap, 2350 m., *Chandler* 2656. Butale, near Kabale, 1800 m., *Synge* 1199, 1219. Toro; Kitakwenda, 1200 m., *Bagshawe* 1248, 1249. N.W.

or Lake Bunyoni, *Taylor* 2147. Entebbe, 1170 m., *Brown* 224, 336; 1140 m., *Maitland* 623. Nubi village, 1110 m., *Godman* 28. Unyoro District; sides of the Nile, *Speke et Grant* s.n. Kampala; Fort Portal, 2100 m., *Tothill* 232. Lake Nabugabo; Masaka, 1200 m., *Synge* 1945.

KENYA COLONY. Naivasha, 1800 m., *Napier* 1839; 1870 m., *Mearns* 700; 1920 m., *Chandler* 2375.

TANGANYIKA TERRITORY. Bukoba, *Stuhlmann* 3718. Speke Gulf, near Mwanza, 1110 m., *Burt* 2469. Kyimbila, 550 m., *Stolz* 757, 758.

NORTHERN RHODESIA. Mazabuka, *Trapnell* 485.

MADAGASCAR. Cult. Mr. Barclay, Bury Hill, seeds from plant in Herb. Hook., coll. Bojer et *Helsing* (type in Kew Herb.). Emirna Province; Ramssina, *Bojer et Helsing* s.n. Without locality, *Lyall* 329. Ampotaka, near Tananarivo, *Hildebrandt* 3482. Without locality, *Blackburn* s.n.; *Baron* 381, 935, 3310, 4937, s.n. Between Homoburtha and Ombonibombo, *Forsyth Major* 716. Near Ankeramadinika, *Scott Elliot* 1765. Near Angalampena, *Scott Elliot* 2115.

Most of the specimens from Madagascar have rather longer calyx-teeth than those from Tropical Africa, but this is not an invariable rule as a specimen from Kenya (*Napier* 1839) has teeth equal in length to *Hildebrandt* 3482 from Madagascar. This character is therefore not constant and cannot be used for specific separation. In other respects, the specimens from Africa are similar to those from Madagascar so it has not been possible to keep up *P. micrantha* as a distinct species.

15. *P. deflexifolia* Bak. in Dyer, Fl. Trop. Afr. 5, 381 (1900); *P. reticulata* Benth. sec. Perk. l.c. 71 non Benth. quoad *Scott Elliot* 6756. *P. speciosa* Gürke in Engl. Pflanzenw. Ost-Afr. C. 345 (1895) quoad *Fischer* 510; Bak. l.c. 382.

UGANDA. Mt. Debasien, 1800 m., *Eggeling* 2658.

KENYA COLONY. Elmenteita, over 1800 m., *Scott Elliot* 6756 (type in Kew Herb.). Njoro road, 2100 m., *Napier* 468. Visoi, 1950 m., *Napier* 2544. Kipkarren, Turbo and Soy, *Broadhurst Hill* 434. Mt. Elgon, 2100 m., *Chaytor-Jack* 189. 1950-2250 m., *Lugard* 134. 2010 m., *Taylor* 3850. Without locality, *Tweedie* 239.

TANGANYIKA TERRITORY. Massai, *Fischer* 510. Kikori, *Burt* 2695. Kondoa District; Sambala, 1470 m., *Burt* 2055, 2128. Mpwapwa, 1200-1500 m., *Burt* 3859. Iringa, *Emson* 581.

The specimens from Tanganyika differ from the Uganda and Kenya material in having slightly larger flowers and longer calyx-teeth. It was at one time thought that this might constitute a new species, *P. intermedia*, but considering the variation which occurs within other species it has been decided to include the material under *P. deflexifolia*. This species comes very close to *P. speciosa* from which it is distinguished by the smaller flowers.

16. *P. niamniamensis* Gürke in Engl. Jahrb. 22, 145 (1895) ; Bak. l.c. 383 ; Perk. l.c. 71. *P. Petherickii* Bak. l.c. 383 ; Perk. l.c. *P. decussata* Bak. l.c. 382. *P. reticulata* Benth. sec. Bak. l.c. 382, pro parte non Benth. quoad Speke & Grant. s.n. *P. Lindblomii* Th. C. E. Fries in Notizbl. Bot. Gart. Berlin, 11, 24 (1930).

ANGLO-EGYPTIAN SUDAN. Niamniam ; east of River Huuh, *Schweinfurth* 3750 a (type in Berlin Herb.). White Nile, *Petherick* s.n.

UGANDA. Unyoro ; Ukidi forest, *Speke et Grant* s.n. Near Kafu River, 900 m. *Bagshawe* 955.

KENYA COLONY. Mt. Elgon ; Kitosh, *Lindblom* s.n. Kavirondo, *Scott Elliot* 7155. 1st and 2nd days march from Munias, *Whyte* s.n. North Nandi, 1950 m., *Dale*, 3411. Lolgerien, 1620 m., *Napier* 5406.

17. *P. pseudospeciosa* Busc. et Musch. in Engl. Jahrb. 49, 486 (1913). *P. mausaensis** Gürke ex De Wild. Etude Fl. Katanga 2, 135 (1913) nomen, et Notes Fl. Katanga 7, 47 (1921) descr. *P. ballotoides* Perk. in Notizbl. Bot. Gart. Berlin 8, 72 (1921).

BELGIAN CONGO. Mt. Senga, *Kassner* 2920 a, 2930 a.

NORTHERN RHODESIA. Lake Bangweulu, 1300 m., *Elena D'Aosta* 1002 (type in Berlin Herb.).

18. *P. nepetifolia* Bak. in Dyer Fl. Trop. Afr. 5, 383 (1900) ; Perk. l.c. 72.

KENYA COLONY. Kavirondo District ; Nandi Range, 2100-2400 m., *Scott Elliot* 6471 (type in British Museum & Herb. Kew).

19. *P. Chevalieri* Briq. in Bull. Soc. Bot. France 1911, 58, Mem. 8, 193 (1912).

OUBANGI-CHARI. Dar Banda, Kaga Dje to Kaga Pongourou, *Chevalier* 6565 (type in Chevalier & Kew Herb.). Kaga Dje to Bamingui, *Chevalier* s.n.

20. *P. reticulata* (E. Mey.) Benth. in DC. Prod. 12, 83 (1848) ; Perk. l.c. 71 pro. parte. *P. Kirkii* Bak. l.c. 381. *P. purpurascens* Briq. in Bull. Herb. Boiss. 2, 3, 998 (1903). *P. Schlechteri* Briq. l.c. 999. *P. holophylla* Briq. l.c. 1000. *P. uliginosa* Gürke in Engl. Bot. Jahrb. 30, 396 (1901). *P. reticulata* (E. Mey.) Benth. var. *B. angustifolia* Benth. l.c. *Echinostachys reticulata* E. Mey. in Comm. Pl. Afr. Austr. 243 (1837).

TANGANYIKA TERRITORY. Ubena, 1900 m. *Goetze* 806. Lupembe ; upper Ruhudje, *Schleiben* 666.

NYASALAND. Manganja Hills, 900-1200 m., *Kirk* s.n. Unagu to Lake Shiré, 900-1350 m., *Johnson* 36. Without locality, *Buchanan* 70, 700.

TRANSVAAL. Macalisberg, *Burke* 111. Witwatersrand, *Hutton* 878. Barbeton District : White River, 990 m., *Rogers* 2294. Umlomati valley, *Galpin* 1318 ; *Thornicroft* 4344. Lydenburg District ; Spitzkop Goldmine, *Wilms* 1122 ; 1122 b. Pilgrims Rest,

Rogers 14521 ; *Roe* 2647. Pretoria District ; Wilge River, *Pole Evans* 3539. Aapies Poort, *Rehmann* 4111. Rayton, *Rogers* 20471. Aapies River. *Leendertz* 1108. Johannesburg District ; Rooikop Farm, *Gilfillan* 7142 ; *Laidley* 347. Witpoortze Kloof, *Moss* 4769. Roodepoort, *Rand* 1238, 1291 ; *Nylstrom*, *Repton* 547. Belfast District ; Schoemanskloof, *Smuts* 53A. Zoutpansberg, *Schweickerdt et Verdoorn* 518. Portgietersrust, *Galpin* 9068. Marovougpe, *Junod* 1607. Houtbosh ; Woodbush Mts., *Nelson* 438 ; *Rehmann* 6174.

SWAZILAND. Hlatikulu, *Stewart* 99.

ORANGE FREE STATE. Without locality, *Cooper* 1070.

NATAL. Near Durban, *Drege* s.n. (type in Kew Herb.) ; *Krauss* 329 ; *Medley Wood* 1016. Without locality *Gerrard* 101. Indiana, 440 m., *Medley Wood* 59. Highland Station, 1600 m., *Kuntze* s.n. Alexandra District ; Dumisa, 600 m., *Rudatis* 369. Estcourt, *Galpin* 11752. Mount aux Source, *McClean et Bayer* 233. Oribi Flats, *McClean* 391. Mt. Elomdspruit, *Schlechter* 3884. Ispingo, *Schlechter* 2802.

CAPE DIVISION. East Griqualand ; Clydesdale, 900 m., *Tyson* 859, 2753. Mt. Frere, *Schlechter* 6406. Kentani, *Pegler* 417. Pondoland, *Bachmann* 1181.

P. reticulata is a very variable species and it is difficult to decide on its limits as the different forms grade into one another. The South African material shows the following variation in leaf form : the narrowly lanceolate acuminate type (*Leendertz* 1108 and *Galpin* 9068), the rather broader form with very conspicuous toothed (Schweickerdt & Verdoorn 518), the type with broadly lanceolate, subacute leaves and inconspicuous teeth (*Rehmann* 6174) and lastly the broad blunt form with conspicuous teeth (*Krauss* 329). Between these different extremes there are a number of intermediate forms, so that although the specimens at opposite ends of the range look very different they can be connected by intervening links.

The characters of the inflorescence can be dealt with in the same way. In most cases there are several spikes on lateral branches but single ones can be found (*Galpin* 1318 & *Rehmann* 4111) ; the calyx-teeth are normally pubescent to the apex with rather short hairs but sometimes they are glabrous at the apex and have longer hairs below (*Junod* 1607, *Nelson* 438 & *Rehmann* 6174), so that although considerable variation occurs within the species, it is not constant and therefore not of specific value.

The Tropical African material when compared with the bulk of material from South Africa shows the following variation : shorter, comparatively broader, less acuminate, inconspicuously toothed leaves ; longer hairs on the calyx teeth which tend to be glabrous at the apex and rather stiffer less acuminate bracts. Specimens can, however, be picked out from the South African material which conform to those from Tropical Africa in one or other of these points, so that no satisfactory separating characters can

* This has been variously spelt : *mansaensis*, *mausaensis* and *nausaensis*.

be found. The material is therefore considered to be one species, within which there is great variability. *P. uliginosa* is included as an extreme broad-leaved form.

21. *P. Schweinfurthii* Briq. in Engl. Bot. Jahrb. **19**, 191 (1894); Bak. l.c. 380; Perk. l.c. 70. *P. togoensis* Perk. l.c. 69; Hutch. & Dalz. Fl. West Trop. Afr. **2**, 288 (1931).

GOLD COAST. Ashanti; Dubwesein, *Chipp* 621. Afram plains, *Irvine* 890.

TOGOLAND. Between Kete and Volta, *Baumann* 404. Krakye, *Krause* s.n.

ANGLO-EGYPTIAN SUDAN. Bongoland; Dukuttu, *Schweinfurth* 2770 (type in Kew Herb.).

TANGANYIKA TERRITORY. Ngudu District, Maliaraguru, 1170 m., *Burt* 5110.

P. togoensis was separated from *P. Schweinfurthii* on its sessile, not shortly petiolate leaves. This difference does not appear to be very sharply defined, as in both cases the lamina is narrowed to the base and it is difficult to tell where the lamina ends and the "short petiole" commences. There are leaves on *Chipp* 621, which might be termed subsessile, and are equivalent to some of those on the type of *P. Schweinfurthii*. As this distinction is unsatisfactory *P. togoensis* has been reduced to synonymy.

22. *P. Stuhlmannii* Gürke in Engl. Pflanzenw. Ost-Afr. **C. 345** (1895); Bak. l.c. 380; Perk. l.c. 70 pro parte. *P. remotifolia* Bak. l.c. 381. *P. Bequaertii* De Wild. Contrib. Fl. Katanga, 171 (1921). *P. longifolia* De Wild. l.c. 172.

BELGIAN CONGO. Dembo-Shinsenda, *Bequaert* 425. Welgelegen-Dembo, *Bequaert* 562. Elizabethville, 1440 m., *Rogers* 10922.

UGANDA. Ngaramo, West of Lake Victoria, *Stuhlmann* 1630 (type in Berlin Herb.). Entebbe, *Fyffe* 148. Teso District; Serere, 1080 m., *Chandler* 78, 854. Kiebbe; Katera, *Thomas* 1327. Mabira Forest, 1200 m., *Dawe* 167.

KENYA COLONY. S. W. slopes of Mt. Elgon, *Fawcett* 117. Mt. Elgon, 1950 m., *Lugard* 19; 1950-2100 m., *Chater Jack* 20, 122. Trans-Nzoia District, 1800-2100 m., *Gardner* 3725. Gishu Plateau, *Dowson* 669; 2100 m., *Harvey* 110. Between Nandi and Mumias, *Whyte* s.n. Kipkarren, *Brodhurst Hill* 688. Without locality, *Brodhurst Hill* 425.

TANGANYIKA TERRITORY. North West Uzinza; West Mwanza, 1200 m., *Burt* 6575. Iringa District; Mbosi, 1500 m., *Horsburgh-Porter* s.n.

NYASALAND. Fort Hill, 1050-1200 m., *Whyte* s.n.

NORTHERN RHODESIA. Broken Hill, *Rogers* 8032. Luangwa Escarpment, 1200 m., *Young* s.n. Mufulira, *Eyles* 8275, 8199.

SOUTHERN RHODESIA. Near Salisbury, *Craster* s.n. Salisbury, 1500 m., *Eyles* 1613. Umtali Division; Odanzi River valley, *Teague* 44. Without locality, *Hislop* 55. Miami, *Rand* 73.

This species is very variable in leaf size and pubescence, and in the presence or absence of a short petiole, but as in *P. reticulata* a gradation can be traced, which links up these different forms, so the material has been considered as a single species. The Kenya form tends to have shorter and broader leaves, whereas the material from Rhodesia has narrower, glabrescent leaves and rather larger flowers, approaching *P. Schweinfurthii*, but distinguished from it by the firmer texture of the leaves and by having the lateral nerves arising at a wide angle from the midrib.

23. *P. speciosa* Gürke in Engl. Pflanzenw. Ost-Afr. **C. 345** (1895) quoad *Fischer* 499; Perk. l.c. 70; Bak. l.c. 382, pro parte. *P. affinis* Gürke in Engl. l.c.; Perk. l.c. 71; Bak. l.c. *P. Dawei* N.E. Br. in Gard. Chron. **41**, 18 (1907); Perk. l.c. 77.

UGANDA. Mabira; Chagwe, 1200 m., *Dawe* 153. South Buddu, *Dawe* 331. Budda, 1230 m., *Brown* 138. Tenth March from Mumias, fourth day from Usogo, one day from Lubwas, *Whyte* s.n. Entebbe, *Maitland* 235. Kampala, *Hargreaves* T. 1193. Masaka District; Katera, 1140 m., *Thomas* 1292. Masaka, 1200 m., *Hansford* 2352.

TANGANYIKA TERRITORY. East shore of Victoria Nyanza, *Fischer* 499 (type in Berlin Herb.). Tabora District; Ugogo-Nyembe, *Braun* 5402. Musoma, *Emson* 333. Kazikazi, 1260 m., *Burt* 4526. Shinyanga, 1080 m., *Burt* 2435; *Bax* 363. Muansa, *Stuhlmann* 4693.

CULTIVATED. Raised from seed received from *Mr. Dawe*, Uganda, in 1905. *Hort. Wallace*, type of Bot. Mag. t. 8450. *Cult. Ganashkind Garden*, Kirkee, Bombay in 1909.

Both *Fischer* 499 and 510 are cited in the type description of *P. speciosa*: the former has been selected as the type as it conforms to the description, "... corollis maximis caeruleis." *Fischer* 510 differs in its much smaller flowers and has been placed in *P. deflexifolia*. This species and *P. speciosa* are very closely related as has already been mentioned in the citation of *P. deflexifolia* (no. 15).

24. *P. sphaerocephala* Bak. in Kew Bull. 162 (1898), et in *Dyer* Fl. Trop. Afr. **5**, 382; Perk. l.c. quoad *Whyte* 139.

NYASALAND. Nyika Plateau, 1800-2100 m., *Whyte* 139 (type in Kew Herb.).

This is separated from *P. Whytei* by the very much shorter, winged calyx-teeth.

25. *P. angolensis* G. Tayl. in Journ. Bot. **69**, Suppl. **2**, 164 (1931).

ANGOLA. Anha, Casima rivulet, *Gossweiler* 1734 (type in B.M. Herb.). Benguela, between Ganda and Caconda, 1700 m., *Hundt* 934.

26. *P. Perkinsii* E. A. Bruce nom. nov.—*P. Kassneri* Perk., in Notizbl. Bot. Gart. Berlin **8**, 73 (Sept. 1921) non De Wild. Contrib. Fl. Katanga, 172 (July 1921).

BELGIAN CONGO. Mt. Mugila, *Kassner* 2991a (type in Kew and British Museum Herb.).

NYASALAND. Tanganyika Plateau, *Carson* s.n.

27. *P. Whytei* Bak. in Dyer, Fl. Trop. Afr. **5**, 383 (1900). *P. sphaerocephala* Perk. l.c. 73, quoad *Whyte* s.n.

TANGANYIKA TERRITORY: Iringa Province; Mbosi, 1500 m., *Horsbrugh-Porter* s.n.

NYASALAND. Tanganyika Plateau; Fort Hill, 1050-1200 m., *Whyte* s.n. (type in Kew Herb.).

28. *P. Elliotii* S. Moore in Journ. Linn. Soc. Bot. **38**, 275 (1908). *P. urticifolia* Hook. sec. Bak. l.c. 387 pro parte non Hook. *P. Volkensii* Gürke sec. Perk. l.c. 75 pro parte non Gürke. *P. butaguensis* De Wild. Pl. Bequaert. **4**, 389 (1928). *P. Bequaertii* De Wild. l.c. 393 non De Wild. Contrib. Fl. Katanga 171 (1921). *P. cinerascens* Robyns et Lebrun nom. nov. in Rev. Zool. et Bot. Afr. **16**, 352 (1928).

BELGIAN CONGO. Ruwenzori; Butagu, c. 3000 m., *Bequaert* 3715. Lamia, c. 2500 m., *Bequaert* 4287. Semiliki River, *Kassner* 2085 vel 3085. Ruwenzori slopes, *Kassner* 3115.

UGANDA. Ruwenzori, *Scott Elliot* 7719. Bikomi, *Taylor* 2718, 2865. Nyinabitaba, 2510 m., *Eggeling* 1356; 2400 m., *V.E.H.* **1**; 2550 m., *Fishlock* et *Hancock* 26. Toro, *Fyffe* 15. Bwamba Pass, 2400 m., *Hazel* 164. Nyamgasani Valley, 2400 m., *Syngé* 1477; 2700 m., *Wollaston* s.n. (type in British Museum Herb.); *Longfield* 58; 2100 m., *Humphreys* s.n. Nakitawa, 2400 2700 m., *Godman* 363.

P. Mildbraedii Perk. in Wiss. Ergebn. Deutsch. Zentr. Afr. Exped. 1907-8, **2**, pt. 1, 548 (1913) is most probably synonymous with *P. Elliotii* S. Moore. The type of the former species, *Aldolf Friedrich* 2537, from the Butagu valley, Ruwenzori has not been traced in Berlin, where it was requested on loan. Miss Perkins does not cite the species or the type number in her revision of the Tropical African species of *Pycnostachys* in Notizbl. Bot. Gart. Berlin **8**, 63 (1921), but at the end of the original description of *P. Mildbraedii* she states that *Kassner* 3085 belongs to that species. This number, however, is cited above under *P. Elliotii*, so that unless Miss Perkins has misidentified *Kassner* 3085, *P. Mildbraedii* Perk. is synonymous with *P. Elliotii* S. Moore.

29. *P. Batesii* Bak. in Dyer, Fl. Trop. Afr. **5**, 386 (1900); Perk. l.c. 76.

CAMEROONS. Efulen, *Bates* 372 (type in Kew Herb.) Between Jaunde and Dengdeng, *Mildbraed* 8449.

UGANDA. Budongo Forest, *Eggeling* 1429.

30. *P. umbrosa* (Vatke) Perk. in Notizbl. Bot. Gart. Berlin, **8**, 77 (1921). *Coleus umbrosus* Vatke in Linnaea **43**, 91 (1880-1882); Bak. l.c. 434.

KENYA COLONY. Ukamba District; Kitui, *Hildebrandt* 2743. Taita District; N'dara, *Hildebrandt* 2424 (type in Berlin Herb.). Mwatate, 600 m., *Johnston* s.n.; *Napier* 945. Taita Hills; Wusi, 1350 m., *Napier* 1077. Kibwesi District; 1000 m., *Scheffler* 65; 160, 462; 900 m., *Dummer* 5108. Makindu River, *Kassner* 566. Nairobi Arboretum, *Gardner* 1399.

TANGANYIKA TERRITORY. Kilimanjaro; Kwa Ngowe, *Volkens* 357. Usambara District; Kwa Mshuza, 1570 m., *Holst* 9159. Magoma-Kalange, *Braun* 2716. Muafu, *Buchwald* 621. Western Usambaras, above 900 m., *Swynnerton* 4. Makuyuni District, 400-1000 m., *Kortischoner* 789, 912. Kilimanjaro; Useri, 1350 m., *Haarer* 1740. Loitokitok, 1800 m., *Schlieben* 5121.

31. *P. Eminii* Gürke in Engl. Bot. Jahrb. **22**, 145 (1895); Bak. l.c. 385; Perk. l.c. 72. *P. ruwenzoriensis* Bak. l.c. 384. *P. rotundata-dentata* De Wild. Pl. Bequaert. **4**, 391 (1928).

BELGIAN CONGO. At the foot of Ruwenzori, Kisuki, 1300-1400 m., *Bequaert* 4701.

UGANDA. Ruwenzori, 1500 m., *Scott Elliott* 7621. North Ruwenzori; Mahyoro, 2400 m., *Makere College* 146/36. Entebbe, 1150 m., *Maitland* 533. 4 miles from Entebbe Road, 1200 m., *Laboratory Staff* 2350. Near Kampala, 1200 m., *Dummer* 3210. Toro; Bunganyalo, 1500-1800 m., *Snowden* 660. Fort Portal, *Taylor* 2586. Ibonde Pass; Bwamba, 2550 m., *Thomas* 770. Hunga, *Bagshawe* 382.

KENYA COLONY. Kisii, 1620 m., *Napier* 5405.

TANGANYIKA TERRITORY. Bukoba; Katoki, *Braun* 5569. Kanesse, west of Lake Victoria, *Stuhlmann* 943 (type in Berlin Herb.).

32. *P. Erici-Rosenii* R. E. Fries, Wiss. Ergebn. Schwed. Rhod.-Kongo-Exped. 1911-12, **1**, 281 (1916). *P. Robynsii* De Wild. Pl. Bequaert. **4**, 398 (1928). *P. albidoviolacea* De Wild. l.c. 400.

BELGIAN CONGO. Ninagongo, c. 2000 m., *Fries* 1588 (type in Uppsala Herb.). Boswenda, *Bequaert* 6087. Near Busiga, 1900 m., *Robyns* 2356.

UGANDA. Kigezi; *Sanford* T. 1213. Kinabu Gap, 2350 m., *Chandler* 2657. Nakalembe, 2220 m., *Gilbert Rogers* 291. North slopes of Mahavura, 2700 m., *Gilbert Rogers* 343b. Behungi, 2400 m., *Thomas* 1071; 1800-2400 m., *Godman* 224.

P. Robynsii has been included under this species, though there are slight differences between it and the type of *P. Erici-Rosenii*. In *Robyns* 2356 (the type of *P. Robynsii*) the leaves are less pubescent and the secondary nerves more conspicuous below, whilst the corollas are rather more pubescent and the calyx-teeth less stout, than in the type of *P. Erici-Rosenii*. These small differences, however, do not seem sufficient to warrant specific separation when the variation within other species of the genus is taken into consideration. *P. Robynsii* is therefore treated as synonymous with *P. Erici-Rosenii*.

33. *P. urticifolia* Hook. in Bot. Mag. t. 5365 (1863); Bak. l.c. 386 excl. *Scott Elliot* 7719; Perk. l.c. 74. *P. pubescens* Gürke in Engl. Pflanzenw. Ost-Afr. C, 345 (1895). *P. urticifolia* Hook. var. *pubescens* Gürke in Engl. Bot. Jahrb. 22, 146 (1895).

TANGANYIKA TERRITORY. Kyimbila, 1350 m., *Stolz* 837. Mts. East of Lake Nyasa, *Johnson* s.n. Lyamungo Expr. Sta., 1350 m., *Greenway* 4525.

PORTUGUESE EAST AFRICA. Mozambique District, near Gorungosa, *Carvalho* s.n.

NYASALAND. Cult. Messrs. Backhouse, seeds sent by Dr. Livingstone from Mt. Zomba, Bot. Mag. t. 5365 (type in Kew Herb.). Zomba, *Clements* 369; *Burt Dary* 1863. Manganja Hills, 1500 m., *Meller* s.n. Mbame, 900 m., *Kirk* s.n. Mlanje 900 m., *Gunns* 107. Shiré Highlands; Blantyre, *Buchanan* 152, 207; *Webb* s.n.; *Adamson* 64. Mt. Chiradzulu, 1200 m., *Whyte* s.n. Without locality, *Buchanan* 61, 296, 586; 1050 m., *Godman* 182; *Moss* 15092.

SOUTHERN RHODESIA. Zimbabwe, *Pole Evans* 2722. Manica District; Odzani River valley, *Teague* 217. Singesi River, *Myres* 416. Near Chipete Forest, 1140 m., *Seynerton* 521. Outskirts of Cherinda, 1140 m., *Seynerton* 334. Cult. Mr. Ayres, seeds sent from Bulawayo. Cleveland Dam, East of Salisbury, *Gilliland* 35; *Moss* 16948. Rua River, 1500 m., *Eyles* 1324. Matopo Hills, 1500 m., *Eyles* 54. Victoria, *Monro* 354, 1052. Salisbury, *Rand* 525.

TRANSVAAL. Near Barberton, c. 360 m., *Bolus* 9745; 900 m., *Galpin* 943. Woodbush Mts., *Barber* 4. Without locality, *Saunders* 140.

34. *P. abyssinica* Fres. in Flora 2, 608 (1838); Bak. l.c. 385; Perk. l.c. 77. *P. longiacuminata* Perk. l.c. 76 pro parte.

ABYSSINIA. near Gonda, *Schimper* 1351. Sidamo; Lake Abassa, *Ellenbeck* 1728a quoad specim. sinistr. *Rüppell* (Type in Senkenberg Herb. Frankfurt). Unfortunately the type, though requested on loan, was not obtainable, so has not been examined.

35. *P. Goetzenii* Gürke in Engl. Pflanzenw. Ost-Afr. A. 135 (1895) nomen, et in Goetzen, Durch Afr. v. Ost nach West, Sonderabdr. 8 [1896]; Bak. l.c. 385; Perk. l.c. 74.

UGANDA. Virunga Mts.; Ruanda, 2500 m., *Goetzen* 98 (type in Berlin Herb.). Mgahinga, 2550 m., *Eggeling* 1069; 2400-2700 m., *Snowden* 1582. Ninagongo, *Linder* 2145. Between Mts. Sabinio and Mgahinga, 2550 m., *Syngé* 1255; 2550 m., *Longfield* 98; 2400 m. *Taylor* 1863. Muhavura, 3000 m., *Taylor* 1746. Ruchiga, *Bagshawe* 420.

36. *P. Schliebenii* Mildbr. in Notizbl. Bot. Gart. Berlin, 11, 405 (1932). *P. oblongifolia* Bak. l.c. 385, quoad *Whyte* s.n. *P. Volkensii* Perk. l.c. 75, quoad *Whyte* s.n.

TANGANYIKA TERRITORY. Iringa District; Lupembe, *Schlieben* 713 (type in Berlin Herb.). East Mufindi, 1930 m., *Greenway* 3491, and raised from seed at Kew. North of Lake Nyasa, *Whyte* s.n. Masuka Plateau, 1950-2100 m., *Whyte* s.n. Kyimbila, 2000 m., *Stolz* 2109.

37. *P. Meyeri* Gürke in Engl. Hochgebirgsfl. Afr. 362 (1892); Bak. l.c. 384; Perk. l.c. 73. *P. Volkensii* Gürke in Engl. Pflanzenw. Ost-Afr. C. 344 (1895); Bak. l.c.; Perk. l.c. 75 excl. *Whyte* s.n. *P. oblongifolia* Bak. l.c. quoad *Scott Elliot* 7883; Perk. l.c. 76. *P. bowalensis* A. Chev. in Journ. de Bot. 22, 126 (1909). *P. longiacuminata* Perk. l.c. quoad specim. dextr. *P. longebracteata* De Wild. Pl. Bequaert. 4, 388 (1928). *P. ovoidea-conica* De Wild. l.c. 396.

FRENCH GUINEA. Fouta Djallon; Dalaba-Diaguissa Plateau, 1000-1300 m., *Chevalier* 18707. Between Dalaba and Mamou, *Chevalier* 20343.

BRITISH CAMEROONS. Cameroon Mt., *Preuss* 688; 2400-3000 m., *Johnston* 37. 2800 m., *Mildbraed* 10877; 2100 m. *Dunlop* 207; 1800 m. *Mann* 1222, 1960; 1800-2280 m., *Maitland* 643, 1020.

FERNANDO PO. Clarence Peak, 2700 m., *Mann* 280.

BELGIAN CONGO. Ruwenzori; Lamuri, c. 1800 m., *Bequaert* 4490. Mukule-Mokoto, *Bequaert* 6325.

ABYSSINIA. Sidama; Lake Abassa, *Ellenbeck* 1728a, quoad specim. dextr.

ANGLO-EGYPTIAN SUDAN. Imatong Mts.; Katire to Itiboe, 1800 m., *Thomas* 1621.

UGANDA. Toro District; Wimi valley, *Scott Elliot* 7883. Ruwenzori; Mubuku valley, 1500 m., *Maitland* 942. Nyamgasani valley, 1950 m., *Syngé* 1618. Mt. Elgon; Butandiga-Bulambuli, *Snowden* 1195. Ruwenzori, Bekoni, 2250 m., *Taylor* 2735. Kilembe 1200-1500 m., *Taylor* 2475. Forest near Kyanjoki, 1950 m., *Taylor* 3144.

KENYA COLONY. Eastern Aberdares; Tusu, 2250 m., *Napier* 6073A. Southern foothills of Aberdares, Katamayo, 2550 m. *Taylor* 1060. Cherangani Hills; Pope's Nose, 2550 m., *Dale* 3381. Muhoroni, 1200 m., *Batiscombe* 277. 2nd day's march from Eldoma, *Whyte* s.n.

TANGANYIKA TERRITORY. Kilimanjaro; Ruabach, 1900-2300 m., *Meyer* 279 (type in Berlin Herb.); *Schlieben* 5074. Marangu; Mawenzi, 2100 m., *Volkens* 823; 2000 m., *Volkens* 1293, 1899. Kilimanjaro; Bismark, 3000 m. *Grote* 8225. South Meru, c. 2800 m., *Uhlig* 616. Kingo-Kwai, *Braun* 2842, 3040. Usambara, Mlalo, *Holst* 3707. Kyimbila, 1800 m., *Stolz* 2041.

This is a widespread and very variable species, which contains a large range of material. The characters of indumentum and leaf-size fluctuate greatly within the species. The West African material is characterized by constantly pubescent leaves and

calyx-teeth but the leaf shape is variable. The Belgian Congo specimens include those with pubescent and glabrous calyx teeth but with fairly constant leaf-shape and indumentum. Among the East African specimens there are several combinations of these variations, e.g., small leaves, pubescent on the nerves and glabrous calyx-teeth (*Battiscombe* 277) and large glabrous leaves and glabrous calyx-teeth (*Napier* 6073). In view of these inconstancies the only possible solution is to treat the material as a single variable species.

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LXI—NOTES ON SOME MALAYAN RUBIACEAE.

H. N. RIDLEY.

GARDENIEAE.

The genus *Randia* as defined in the Genera Plantarum and Pflanzenfamilien includes a large series of very different plants, which have, however, been grouped into sections. One of these is Sect. *Anisophyllea* Hook. f., based on *Gardenia anisophylla* Jack, of the Malay Peninsula. I have raised this section to generic rank under the name *Porterandia*, commemorating the name of George Porter, who first collected *Randia anisophylla* in Penang.

The trees are of no great height, about 40 to 60 feet, with a large spreading head, growing in open lowlands. They have dense cymes of small white flowers, the corolla tube often hardly longer than the calyx and usually covered with silky hairs. The fruit is globular, about an inch through, with a thin green outer coat covering a thin woody one. The small flat seeds are enclosed in a white pithy substance.

Porterandia Ridley, gen. nov.

Arbores mediocres, dense comosi, saepe hirti. *Folia* subcoriacea, inaequalia, ovata vel ovato-lanceolata, saepissime hirta, longipetiolata vel subsessilia. *Stipulae* coriaceae, majusculae, oblongae, obtusae vel rarius acuminatae, basibus breviter connatae, raro liberae, extra hirtae vel glabrae, intus pilis longiusculis barbatae. *Cymae* in axillis superioribus pedunculatae, rarissime sessiles, saepe multiflorae, hirtae. *Bractae* minimae, ovatae, acutae. *Calyx* tubulosus, pubescens, dentibus 5 acutis. *Corolla* alba, tubo cylindrico extra sericeo calyce vix longiore, lobis 5 brevibus oblongis extra pubescentibus intus glabris. *Stamina* 5, filamentis brevissimis vel subnullis, antheris linearibus in medio tubo dorsifixis haud exsertis. *Stylus* tubo brevior, cylindricus, integer, clavatus. *Ovarium* biloculare, ovulis plurimis. *Bacca* globosa, saepe tubo calycis coronata, viridis, pericarpio tenui, endocarpio lignoso tenui. *Semina* plurima, parva, plana, semiovata, in pulpa alba immersa.

Randia Sect. *Anisophyllea* Hook. f. in Hook. f. Fl. Brit. Ind. 3, 113 (1880), et in Benth. et Hook. f. Gen. Pl. 2, 89 (1883).

Species 9: Peninsula Malayana 2, Borneo 7.

Key to the Species.

- Leaves hairy beneath, petiolate; cymes compact, short :
 Leaves large.....1. *P. anisophylla*.
 Leaves small, 14-16 cm. long.....2. *P. minor*.
 Leaves hairy, subsessile :
 Leaves large; stipules very large, bearded; calyx strongly toothed.....3. *P. grandifolia*.
 Leaves small; stipules small; calyx entire.....4. *P. subsessilis*.
 Leaves glabrous, petiolate :
 Cymes short, lax, many-flowered :
 Leaves large, oblanceolate.....5. *P. Scortechinii*.
 Leaves large, obovate, rounded.....6. *P. catappifolia*.
 Cymes short, few-flowered; leaves small, lanceolate.....
 7. *P. glabrifolia*.
 Cymes elongate, few-flowered; leaves oblanceolate.....
 8. *P. pauciflora*.
 Flowers sessile in sessile capitula; leaves ovate or rotundate.....
 9. *P. sessiliflora*.

1. **Porterandia anisophylla** (Jack ex Roxb.) Ridley, comb. nov. *Gardenia anisophylla* Jack ex Roxb. Fl. Ind. ed. Carey et Wall. 2, 561 (1824); Wall. Cat. 8399A (1847-8); Miq. Fl. Ind. Bat. 2, 230 (1857). *Randia anisophylla* (Jack ex Roxb.) Hook. f. in Hook. f. Fl. Brit. Ind. 3, 114 (1880); King in Journ. As. Soc. Beng. 72, 2, 209 (1903); Ridley, Fl. Mal. Pen. 2, 77 (1923); S. Moore in Journ. Bot. 63, Suppl. 50 (1925).

MALAY PENINSULA, very common: Singapore, Malacca, Selangor, Penang, Rhio.

SUMATRA. Forest S. of Rupit river and E. of Suka Rajah, Palembang, H. O. Forbes 2954, 3088.

2. **Porterandia minor** Ridley, sp. nov., a *P. anisophylla* (Jack ex Roxb.) Ridley, cui affinis, foliis multo minoribus supra glabris, pedicellis longioribus, bracteis minoribus, corollae lobis brevioribus differt.

Arbor, ferme omnino glabra. *Folia* oblanceolata, breviter cuspidata, acuta, basibus longe attenuatis, supra glabra, subtus costa nervis et nervulis hirtis, majora 14-16 cm. longa, 6.5-7.5 cm. lata, minora 4-6 cm. longa, 2-5 cm. lata, petiolis hirtis 1.5-2 cm. longis. *Stipulae* lanceolatae, utrinque hirtae, acuminatae, 1 cm. longae. *Cymae* laxae, patentes, hirtae, ramis 3-4, 6 cm. longae, 6.5 cm. latae. *Bractaeae* ovatae, acuminatae, 5 mm. longae. *Pedicelli* 5 mm. longi. *Calyx* cupularis, 6 mm. longus, dentibus 5 brevissimis vix 1 mm. longis. *Corollae* tubus cylindricus, appresse sericeo-hirtus, 1.5 cm. longus, lobis dorso albo-sericeis supra glabris 6 mm. longis 2 mm. latis.

BRUNEI. Limbang, Haviland 697 (c.o.c.m.).

SARAWAK. Rejang, Belaga, Haviland 2161 (typus, Herb. Kew.); Miri, Hose 660.

This has much smaller nearly glabrous leaves, and the pedicels of the flowers longer, the flowers of *P. anisophylla* being nearly or quite sessile. The corolla lobes are also longer.

3. **Porterandia grandifolia** Ridley, sp. nov., a *P. anisophylla* (Jack ex Roxb.) Ridley, cui affinis, foliis sessilibus supra glabris, stipulis magnis intus albo-barbatis extra dense rufo-hirtis, floribus multo majoribus differt.

Arbor, ramulis hirtis. *Folia* coriacea, obovata vel oblanceolata, breviter apiculata, basibus angustatis, sessilia, supra costa elevata hirta excepta glabra, 13-30 cm. longa, 7-15 cm. lata, nervis 18-paribus cum costa elevata rufo-hirtis, nervulis transversis parallelis undulatis; folia minora 9-18 cm. longa, 7-11 cm. lata. *Stipulae* oblongae, obtusae, 2-5 cm. longae, 1 cm. latae, extra dense rufo-hirsutae, intus pilis sericeis albis longis barbatae. *Flores* plures, in cymis compactis axillaribus sessiles. *Bractaeae* ovatae, dense rufo-hirtae, 2 mm. longae. *Calyx* infundibuliformis, 1 cm. longus, viridis, dense pubescens, dentibus 5 acutis 2 mm. longis. *Corollae* tubus crassiusculus, superne sensim dilatatus, extra pubescens, intus glaber, 1.5 cm. longus, lobis 5 oblongis obtusis extra hirtis supra glabris 7 mm. longis 2 mm. latis. *Stamina* 5, filamentis brevissimis vix 1 mm. longis, antheris in medio tubo dorsifixis linearibus 9 mm. longis. *Ovarium* biloculare, ovulis paucis 3-4 pro loculo. *Stylus* validus, clavatus, 1.6 cm. longus. *Bacca* viridis, globosa, ligulosa, puberula, 3.5 cm. longa, 3.4 cm. lata.

SARAWAK. Beccari 760; near Kuching, Haviland 1892 (typus, Herb. Kew.), Haviland & Hose 3420.

This has much larger leaves than *P. anisophylla*, and they are sessile. The stem and stipules are covered with very dense red velvety hairs, and the stipules are remarkable for the long white hairs on the inner surface.

4. **Porterandia subsessilis** (Valeton) Ridley, stat. nov. *Gardenia anisophylla* Jack. var. *subsessilis* Valeton in Engl. Bot. Jahrb. 44, 558 (1910).

This is allied to *P. grandifolia* Ridley in its subsessile leaves which, however, are smaller, the cymes are decurved on short thick peduncles, the calyx is softly pubescent, not hairy, with very short or no teeth, the corolla tube more narrowed to the base, 1.3-1.6 cm. long, the lobes 1 cm. long, longer than those of *P. grandifolia*. The stipules are elongate, ovate, acute, 2 cm. long, and not white-bearded inside.

It was found in DUTCH BORNEO at Hayup, Winkler 2563, between Lumo Sibak and Muarah Benangin, Winkler 2916, and between Lampeung and Patung, Winkler 3339.

5. **Porterandia Scortechinii** (King et Gamble) Ridley, comb. nov. *Randia Scortechinii* King et Gamble in Journ. As. Soc. Beng. 72, 2, 210 (1903); Ridley, Fl. Mal. Pen. 2, 78 (1923)

MALAY PENINSULA: Selangor, Negri Sembilan, Perak and Penang. Absent from the south of the Peninsula.

This tree has much the habit of *P. anisophylla*, but its leaves are completely glabrous and shining and attain a much greater size.

6. **Porterandia catappifolia** Ridley, sp. nov., a *P. Scortechinii* (King et Gamble) Ridley, cui affinis, foliis obovato-rotundatis, petiolis longis, calyce dense pallide hirsuto dentibus 5 differt.

Arbor ferme omnino glabra. *Folia* coriacea, glabra, obovata, apice lato rotundato, basibus longe attenuatis, majora 15-18 cm. longa, 10-11 cm. lata, petiolis 3 cm. longis, minora 6 cm. longa, 4-4 cm. lata, petiolis 1 cm. longis, nervis 11-paribus in minoribus 7-paribus utrinque conspicuis subtus cum costa et nervis transversis parallelis parce puberulis. *Stipulae* oblongae, acutae, 1 cm. longae, extra pubescentes, intus pilis paucis praeditae. *Cymae* laxae, hirtae, 2 cm. longae. *Bracteae* ovatae, acutae, hirtae, 1-5 mm. longae. *Pedicelli* hirti, 2 mm. longi, vel nulli. *Calyx* uniformis, 1 cm. longus, hirtus, dentibus 5 triangularibus acutis brevibus. *Corollae* tubus crassiusculus, cylindricus, extra sericeo-hirtus, intus glaber, 1 cm. longus; lobi oblongi, extra puberuli, intus glabri, 5 mm. longi. *Filamenta* brevissima, e medio tubo, antheris dorsifixis 4 mm. longis. *Stylus* crassus, stigmatibus clavato basi paullo dilatato sericeo, ceterum glaber, 1 cm. longus.

SARAWAK. Beccari 2599 (Herb. Kew.).

This is allied to *P. Scortechinii* (King et Gamble) Ridley, of the Malay peninsula, but the leaves are obovate with a rounded top. There are traces of pubescence on the costa beneath, and the calyx has short distinct teeth. In *P. Scortechinii* the leaves taper somewhat towards the top and are completely glabrous, and the calyx has a completely entire margin.

7. **Porterandia glabrifolia** Ridley, sp. nov., a *P. catappifolia* Ridley, cui affinis, foliis parvis lanceolatis angustis, floribus paucis in cymis laxis differt.

Arbor, innovationibus exceptis glabra. *Folia* coriacea, lanceolata vel oblanceolata, basibus angustatis, apicibus breviter acuminatis, majora 11-12 cm. longa, 3-5 cm. lata, minora 6 cm. longa, 2 cm. lata, nervis 10-paribus, nervulis transversis paucis undulatis, petiolis 1 cm. longis. *Stipulae* lanceolatae, sericeae, 1 cm. longae. *Cymae* parvae, in axillis subterminalibus ortae, 5-florae, velutinae. *Bracteae* ovatae, 1-5 mm. longae. *Pedicelli* 2 mm. longi. *Calyx* infundibuliformis, sericeus, 6 mm. longus, dentibus 5 sublancoelatis acutis 1 mm. longis. *Corollae* tubus cylindricus, superne sensim dilatatus, velutinus, 1-3 cm. longus; lobi 5, puberuli, oblongi, 5 mm. longi, 2 mm. lati. *Antherae* apice exsertae. *Ovarium* biloculare.

SARAWAK. Beccari 1686 (Herb. Kew.).

Very distinct from all other species in the small lanceolate glabrous leaves and small few-flowered cymes.

8. **Porterandia pauciflora** Ridley, sp. nov., a *P. sessiliflora* Ridley, cui affinis, cymis elongatis paucifloris pedunculatis, calyce multo majore dentibus longis differt.

Arbor glabra. *Folia* subcoriacea, glabra, oblanceolata, obtusa, minute cuspidata, basibus longe attenuatis, majora 20-21 cm. longa, 9 cm. lata, minora 9 cm. longa, 4 cm. lata, nervis ascendentibus in majoribus 6-9-paribus in minoribus 5-paribus, petiolis 3 cm. longis in minoribus 1 cm. longis. *Stipulae* coriaceae, oblongae, obtusae, basi connatae, extra glabrae, intus parce barbatae, marginibus hirtis. *Cymae* pauciflorae, elongatae, axillares, glabrae, 6 cm. longae, ramis 2-3 validulis 2 cm. longis. *Bracteae* lanceolatae, acuminatae, glabrae, 2 mm. longae. *Pedicelli* validi, 1 cm. longi. *Calyx* infundibuliformis, pubescens, 9 mm. longus, dentibus 5 subulatis acuminatis 2 mm. longis. *Corollae* tubus crassus, cylindricus, sericeus, 1 cm. longus; lobi oblongi, rotundati, extra sericei, intus glabri, 3 mm. longi.

SARAWAK. Niah, Haviland & Hose 3421 (Herb. Kew.).

This is certainly a tree, with leathery glabrous leaves, but with long few-flowered axillary cymes and a longer calyx with longer teeth than in *P. sessiliflora* Ridl.

9. **Porterandia sessiliflora** Ridley, sp. nov., a *P. Scortechinii* (King et Gamble) Ridley, cui affinis, glabritate, foliis remotis, floribus in capitulis axillaribus congestis sessilibus conspicue differt.

Arbor? glabra. *Folia* remota, coriacea, crassiuscula, ovata vel late rotundata, breviter cuspidata, basibus obtusis, glabra, 10-15 cm. longa, 7-8 cm. lata, nervis in utraque pagina elevatis 7-8-paribus, nervulis invisibilibus, petiolis 10-12 cm. longis. *Stipulae* coriaceae, glabrae, usque ad basin liberae, oblongo-lanceolatae, obtusae, 1-5 cm. longae. *Flores* in capitulis sessilibus axillaribus sessiles. *Bracteae* ovatae, marginibus ciliatis, 3 mm. longae. *Calyx* urceolato-tubulosus, glaber, viridis, margine obscure 5-lobato ciliato, 1 cm. longus. *Corolla* alba, sericea, tubo crasso cylindrico 1 cm. longo, lobis 5 extra sericeis ovato-rotundatis 3 mm. longis. *Stamina* 5, filamentis brevissimis, antheris oblongo-linearibus in medio tubo dorsifixis 5 mm. longis. *Stylus* brevis, crassus, superne clavato-fusiformis. *Bacca* globosa, glabra, tubo calycis coronata, 2-2.5 cm. longa, bilocularis, septo lignoso, pericarpio lignoso. *Semina* plura.

SARAWAK. Kuching, calyx green, corolla white, 25 Nov. 1892, Haviland 1961; ibid., 9 Oct. 1894, Haviland & Hose " = 1961 " A (typus, Herb. Kew.), " = 1961 " K; ibid., 31 Oct. 1894, Haviland & Hose " = 1961 " Z.

SUMATRA. Indragiri, Sungei Laloh, Curtis 3543.

MUSSAENDEAE.

Mussaenda lanuginosa Ridley, sp. nov., a *M. sumatrensi* Roth, cui affinis, floribus minoribus paucioribus in cymis laxioribus, sepalis longioribus, petalis angustioribus acutis, alabastris acutis nec globosis differt.

Frutex, ramis ferrugineo-hirtis. *Folia* membranacea, elliptica, breviter vel longiuscule acuminata, basi longius attenuata decurrente, supra sparse setulosa, 9–13 cm. longa, 4–7 cm. lata, carina subtus elevata cum nervis 9-paribus et nervulis transversis undulatis conspicuis hirta, petiolis dense ferrugineo-hirtis 1.5–2 cm. longis. *Stipulae* bifidae, basibus triangularibus, lobis lanceolatis longe acuminatis, extra hirtae, 7 mm. longae. *Cymae* subterminales, hirtae, pauciramosae, pedunculis 4 cm. longis, ramis 2–3 cm. longis. *Bracteae* lanceolatae, acuminatae, subulatae, extra rufo-hirtae, 4 mm. longae. *Calycis* tubus urceolatus, hirtus, 3 mm. longus, lobis subaequilongis lanceolatis acuminatis hirtis, lobo phyllomorpha albo ovato subabrupte acuminato obtuso basi breviter attenuato trinervio 6 cm. longo 4 cm. lato sparse setuloso, nervis densius hirtis, nervulis conspicuis, petiolo 1.5 cm. longo gracili hirta. *Corolla* extra viridis, lobis rubris mox luteis, tubo gracili hirta cylindrico 2.5 cm. longo, lobis lanceolatis 3 mm. longis extra sericeis.

SARAWAK. Kuching, corolla green externally, segments red internally, later becoming yellow, *Haviland* 2870 (typus, Herb. Kew.); Kuching, Saheb, *Ridley* 16318.

Mussaenda sumatrensis Heyne ex Roth, Nov. Pl. Sp. 152 (1821).

This plant which, like many other species, has been referred to *M. frondosa* L., is probably identical with the plant described by me as *M. hirsuta* in Journ. As. Soc. Mal. 1, 68 (1923). The latter is the commonest species in Sumatra and has also been collected in SARAWAK at Lio Matu, Upper Baram, by *Moulton* (no. 6702). Roth gives no locality for the species, which was based on Heyne's specimens, but, from the name given it by the collector, it is, I presume, Sumatran.

Mussaenda celebica Ridley, sp. nov., a *M. angustiscapala* Ridley, cui affinis, foliis basi rotundatis, cymis laxis, calycis lobis tubo subaequilongis differt.

Frutex puberulus, pilis longiusculis sparse dissitis. *Folia* membranacea, elliptica, cuspidato-acuminata, basibus rotundatis, supra areolata, glabra, 10.5–11 cm. longa, 5.5–6 cm. lata, costa subtus elevata cum nervis 8-paribus pilosa, petiolis pilosis 5 mm. longis. *Stipulae* integrae, late triangulares, acuminatae, pilosae, 5 mm. longae. *Cymae* elongatae, pilosae, multiflorae, 6–9 cm. longae. *Bracteae* lineares, acuminatae, pilosae, 5 mm. longae. *Calyx* pilosus, tubo fusiformi 5 mm. longo, lobis linearibus angustissimis aequilongis, lobo phyllomorpha albo ovato subobtusum basi breviter attenuato supra costa excepta glabro subtus piloso 7-nervio 9 cm. longo 8 cm. lato, petiolo hirta 1.2 cm. longo. *Corolla* extra sericea, tubo superne dilatato 1.5 cm. longo intus albo-sericeo, lobis ovatis obtusis 4 mm. longis. *Filamenta* 2 mm. longa; antherae lineares, 5 mm. longae.

S. W. CELEBES. Malino, 280 metres, *Bünnemeyer* 10772 (Herb. Kew.).

The flowers in this specimen are all males.

Mussaenda Motleyi Ridley, sp. nov., *M. grandiflorae* Rolfe affinis, sed calycis lobis multo majoribus cum corollae tubo puberulis exceptis ferme glabra.

Frutex ferme glaber. *Folia* membranacea, ovato-elliptica, subacuta, basibus attenuatis decurrentibus, pilis paucis in costa exceptis glabra, 7–7.5 cm. longa, 3–4.2 cm. lata, nervis 6-paribus, nervulis transversis pluribus subparallelis undulatis, petiolis glabris 1 cm. longis. *Stipulae* bifidae, longe lineares, acuminatae, pubescentes, 4 mm. longae. *Cymae* pauciramosae, pedunculis 1 cm. longis pubescentibus. *Calycis* tubus obconicus, pubescens, 1 mm. longus, lobis oblongo-linearibus acutis 7 mm. longis 1 mm. latis, lobo phyllomorpha albo ovato obtuso basi breviter attenuato decurrente supra glabro 7 cm. longo 5 cm. lato, costa nervisque subtus sparse pilosis, petiolo gracili 2 cm. longo. *Corollae* tubus cylindricus, superne dilatatus puberulus, 3 cm. longus; lobi 5, subtriangulares, minute apiculati, 6 mm. longi, 3 mm. lati, superne papillosi.

DUTCH S. E. BORNEO. Banjarmasin, *Motley* 695 (Herb. Kew.).

Asemanthia (Stapf) Ridley, gen. nov.

Frutices ramosi, 2–3 m. alti. *Folia* membranacea, ovata vel lanceolata, petiolata. *Stipulae* triangulares, acutae. *Flores* speciosi, plures in cymis sessilibus terminalibus. *Bracteae* lanceolatae, parvae. *Calyx* subsessilis, tubo brevi, lobis 5 lanceolatis similibus parvis. *Corollae* tubus longus, cylindricus, superne paululum dilatatus, in ore villosus; lobi 5, magni, valvati, lanceolato-triangulares, acuti, tubo ferme aequilongi, superne primo rubri, dein flavi vel aurantiaci. *Stamina* 5, in medio tubo vel infra villositate tubi sita, filamentis brevissimis, antheris linearibus apiculatis elongatis prope bases dorsifixis. *Stylus* elongatus vel brevis, gracilis, filiformis, stigmatibus 2 linearibus acuminatis papillosis. *Discus* annularis. *Ovarium* oblongum, breve, ovulis pluribus. *Bacca* viridis, oblonga, saepe sepalis coronata. *Semina* plurima.

Mussaenda Sect. *Asemanthia* Stapf in Trans. Linn. Soc. ser. 2, 2, 173 (1894), in obs.

Species 4: Peninsula Malayana 2, Borneo 2.

This name was proposed by Stapf for a small number of plants originally described as belonging to the genus *Mussaenda* but differing in the large size of the corolla and in the absence of the white phyllomorphic calyx lobes so conspicuous in that genus. For these plants, occurring in the Malay Peninsula and Borneo, I propose to retain Stapf's name generically. There are also some plants in Tropical Africa, e.g., *Mussaenda elegans* Schum. et Thonn., which seem closely allied to this genus and might perhaps be referred to it.

1. **Asemanthia Maingayi** (Hook. fil.) Ridley, comb. nov.
Acranthera Maingayi Hook. fil. in Hook. fil. Fl. Brit. Ind. **3**, 92 (1880).

Acranthera Griffithii Hook. fil. l.c.

- Mussaenda mutabilis* Hemsl. in Hook. Icon. Pl. **18**, t. 1718 (1887); Ridley, Fl. Mal. Pen. **2**, 58 (1923).

MALAY PENINSULA.

The specimens described as *Acranthera Griffithii* Hook. fil. were unlocalised in Griffith's herbarium but on account of the paper they were found in were believed to have been obtained by Griffith in the Eastern Himalayas, probably Sikkim. No species of the genus *Asemanthia* has been found by any collector in that area since. The plant is identical with that of the Malay Peninsula, and there can be little doubt that it was obtained by Griffith in Malacca.

2. **Asemanthia spectabilis** (Ridley) Ridley, comb. nov.
Mussaenda spectabilis Ridley in Journ. Roy. As. Soc. Str. Br. **79**, 78 (1918); Fl. Mal. Pen. **2**, 59 (1923).

MALAY PENINSULA. Pulau Tioman, coast of Johor.

3. **Asemanthia coccinea** (Stapf) Ridley, comb. nov.
Mussaenda coccinea Stapf in Trans. Linn. Soc. ser. 2, **4**, 171 (1894).

BORNEO. Kinabalu (Haviland), Dahombang River (Low), Sarawak (Beccari), Kalaka (Bartlett).

4. **Asemanthia Lobbii** Ridley, sp. nov., ab *A. Griffithii* (Hook. fil.) Ridley, cui affinis, foliis lanceolatis glabris, bracteis minoribus lanceolatis, sepalis brevissimis, tubo corollae longiore differt.

Frutex metralis, glaber. *Folia* chartacea, glabra, lanceolata, acuminata, acuta, basibus attenuatis, 13-15 cm. longa, 5.5-6 cm. lata, nervis puberulis elevatis 8-paribus, petiolis 1-1.5 cm. longis. *Stipulae* triangulares, acutae, pubescentes, 5 mm. longae. *Cymae* sessiles, subterminales, binae, sexflorae. *Bractae* lanceolatae, acuminatae, pubescentes, 5 mm. longae. *Flores* speciosi, sessiles. *Calycis* tubus obconicus, pubescens, 1 cm. longus; lobi 5, lanceolati, acuti, pubescentes, 2 mm. longi. *Corolla* rubra, tubo cylindrico 3 cm. longo appresse hirta ore flavo-villoso, lobis 6 ovato-lanceolatis acutis, nervis extra hirtis. *Stamina* 5-6 in medio tubo, filamentis brevibus, antheris linearibus. *Stylus* gracilis, 2.5 cm. longus, stigmatibus 2 linearibus 5 mm. longis. *Bacca* oblonga, 1 cm. longa.

SARAWAK. Shrub 5 feet, *Lobb* (typus, Herb. Kew.); Mount Buan, limestone, shrub, corolla segments red, *Haviland* 2028; Bidi, limestone, colour orange, *C. J. Brooks* 7.

MORINDEAE.

Prismatomeris Thwaites.

A genus of shrubs, rarely treelets, about 4 to 15 feet tall, with lax spreading branches, the branchlets covered by a thin fawn-coloured bark which readily peels off; leaves thinly or rather

thickly coriaceous, lanceolate to ovate, acute or subacute, nerves few, inarching within the margins; flowers in umbels, terminal, rarely axillary also, white, pendulous, fragrant; pedicels usually long, slender, more rarely short; calyx urn- or cup-shaped, with 5 short teeth or entire; corolla tube long slender or short, lobes 5 very rarely 4, linear or lanceolate; fruit pisiform, purple or black, 1- rarely 2-seeded.

Species about 20, ranging from Assam to the Philippine Islands, most abundant in Siam.

The genus was based on an endemic Ceylon plant, *P. albidiflora* Thwaites. Unfortunately Hooker in Fl. Brit. Ind. **3**, 159 (1880), gave as a synonym *Coffea tetrandra* Roxb., an entirely different species, native of Assam (*Prismatomeris tetrandra* (Roxb.) K. Schum. emend. Ridley), and Valetton identified *Coffea glabra* Korthals of Borneo as a *Prismatomeris* and recorded it also as *P. tetrandra* Val. Most of the species of the genus when discovered have been referred to *P. albidiflora* Thw.

The species may be separated into (A) those with subsessile flowers; (B) those with long-pedicelled flowers, with long-tubed corolla, type form *P. tetrandra* K. Schum.; (C) those with long pedicels and short-tubed flowers with broader corolla lobes.

(A) *P. mollis* Craib, Siam; *P. subsessilis* King et Gamble, Malay Peninsula; *P. sessiliflora* Pierre, Indo-China; *P. Griffithii* Ridley, Tenasserim; *P. lepidophloia* Ridley, Banca and Borneo; *P. brachypus* Ridley, Philippines.

(B) *P. tetrandra* K. Schum., Assam, Yunnan; *P. malayana* Ridley, Malay Peninsula, Siam; *P. multiflora* Ridley, Siam; *P. glabra* Val., Borneo; *P. ovalifolia* Ridley, Anambas Islands; *P. memecyloides* Craib, Siam.

(C) *P. albidiflora* Thw., Ceylon; *P. parviflora* Ridley, Mergui, Cambodia, Malay Peninsula; *P. Parkinsonii* Ridley, Tenasserim; *P. obtusifolia* Merrill, Philippines; *P. neurophylla* Ridley, Banca, Borneo; *P. fragrans* Geddes, Siam; *P. Harmandi* Pierre, Annam, Cambodia; *P. filamentosa* Craib, Siam, Cambodia; *P. javanica* Ridley, Java; *P. andamanica* Ridley, Andamans.

Excluded from the genus are:

P. Henryi (Lévl.) Rehd. (*Canthium Henryi* Lévl.; *P. brevipes* Hutch.). China. *P. linearis* Hutchinson. China.

Prismatomeris lepidophloia (Miq.) Ridley, comb. nov.

Coffea lepidophloia Miquel, Fl. Ind. Bat. Suppl. **548** (1860).

Species a *P. malayana* Ridley, cui affinis, floribus subsessilibus, calycis dentibus glandulosis, corollae tubo infra limbum dilatato differt.

Frutex glaber, cortice pallido desquamato. *Folia* coriacea, rigidula (sicca flavescentia), elliptica vel ovato-lanceolata, acuminata, basibus angustatis, 8.5-16 cm. longa, 4.5-7 cm. lata, nervis

6-paribus supra inconspicuis subtus cum secundariis et reticulationibus elevatis conspicuis inter se intra margines inarcuantibus, petiolis crassis 5 mm. longis. *Stipulae* coriaceae, flavescentes, carinatae, ovatae, acutae, inferne connatae. *Flores* albi, fasciculati, terminales, 5-6 in fasciculo, subsessiles. *Bractae* ovatae, coriaceae, carinatae, 2 mm. longae. *Pedicelli* 1 mm. longi vel nulli. *Calyx* obconicus, limbo cupulato 2 mm. longo, dentibus 5 minutis, marginibus glandulosus. *Corolla* alba, tubo 1 cm. longo crassiusculo, lobis lanceolatis obtusis 5 mm. longis. *Stamina* 5, antheris lineari-oblongis. *Stylus* brevis, lobis stigmaticis oblongo-linearibus stylo ferme aequilongis. *Drupa* globoso-ovoidea, 7 mm. longa. *Semen* unicum, globosum.

SUMATRA. Siak, Sungei Kelantan, Ridley 8967.

BANCA. Teysmann (typus).

SARAWAK. Kuching, Haviland 615, 2980.

I have not seen Miquel's type, collected in Banca by Teysmann, but I have no doubt that the Borneo and Sumatra plants described above are identical. The subsessile flowers with glandular calyx and stiffer ovate leaves are very characteristic. The style is remarkably short and the rather large stigmatic lobes nearly as long.

Prismatomeris brachypus Ridley, sp. nov., a *P. lepidophloia* (Miq.) Ridley, cui affinis, floribus multo majoribus, pedicellis longioribus, foliis tenuioribus oblongo-lanceolatis differt.

Frutex, ramulis validulis. *Folia* subcoriacea, oblongo-lanceolata, obtusa, breviter cuspidata, basibus attenuatis, 15 cm. longa, 4-5 cm. lata, costa utrinque elevata crassiuscula, nervis primariis 8-paribus tenuibus intra margines inarcuantibus, secundariis tenuioribus aequae conspicuis, reticulationibus laxis, petiolis 1-5 cm. longis. *Stipulae* coriaceae, acuminatae, acutae, 3 mm. longae. *Umbella* pedunculo crasso 5 mm. longo suffulta, pedicellis crassis 2 mm. longis. *Calyx* urniformis, 2 mm. longus, dentibus 5 minutis. *Corollae* tubus crassiusculus, 1-5 cm. longus; lobi 5 lineares, acuti, 1-2 cm. longi. *Filamenta* brevissima, antheris oblongo-linearibus. *Stylus* validulus, lobis stigmaticis oblongis.

PHILIPPINES. Luzon: Province of Cagayan, Jan. 1912. H. M. Curran 17784 (Herb. Kew.).

P. tetrandra (Roxb.) K. Schum. in Engl. et Prantl, Nat. Pflanzenfam. IV. 4, 138 (1891), partim. *Coffea tetrandra* Roxb. Fl. Ind. ed. Carey et Wall. 2, 193 (1824). *Octotrochis terminalis* C. B. Clarke in Journ. Linn. Soc. 25, 33, t. 17 (1889).

This plant was well described by Roxburgh, and there is an excellent painting of it by him in the Kew Library. Hooker referred the species to *P. albidiflora* Thw., and Schumann l.c. puts *P. albidiflora* as a synonym of *P. tetrandra*.

Though usually pentamerous, forms occur in which the flowers are tetramerous, as Roxburgh points out. They are usually few, five or six in an umbel, but sometimes as many as 13.

YUNNAN. Henry 13573.

ASSAM. Khasiya, Silhet, Wallich 6242; Chittagong, Hooker & Thomson; Bocajan, Naga hills, C. B. Clarke.

var. **philippinensis** Ridley, var. nov.

Folia rigidiora, latiora, 10-15 cm. longa, 3-5 cm. lata. *Stipulae* brevius cuspidatae. *Flores* minores, 3-4. *Calyx* basi angustatus. *Corolla* brevior, lobis 5 mm. longis.

PHILIPPINES. Luzon, Tayabas, Ramon 13187, 13315.

Prismatomeris multiflora Ridley, sp. nov., a *P. tetrandra* (Roxb.) K. Schum., cui affinis, floribus pluribus, pedicellis brevibus, calyce margine integro differt.

Frutex 4-metralis, ramis patentibus angulatis cortice cervino tectis. *Folia* subcoriacea, elliptico-lanceolata, longe acuminata, acuta, basibus attenuatis, 12-16 cm. longa, 4-5-6 cm. lata, nervis tenuibus 8-9-paribus intra margines inarcuantibus, petiolis 1 cm. longis. *Stipulae* dentibus 2 acutis 2 mm. longis instructae. *Umbellae* terminales, sessiles, 9-12-florae; umbellae laterales paucae, 4-7-florae. *Pedicelli* 5 mm.-1 cm. longi, graciles. *Calyx* cupuliformis, margine integro, 2 mm. longus, ore 2 mm. lato. *Corolla* alba, fragrans, tubo cylindrico 2-2.5 cm. longo, lobis 4 rarius 5 lanceolato-linearibus 1-1.4 cm. longis 3 mm. latis. *Stamina* 4 vel 5, in ore tubi, filamentis 1 mm. longis, antheris linearibus apiculatis 3 mm. longis apicibus projicientibus. *Stylus* gracilis, brevis, 6 mm. longus vel 1-2 cm. longus, lobis stigmaticis lanceolato-linearibus obtusis. *Drupa* globosa, 1 cm. longa (sicca).

SIAM. Doi Angka Noi, near summit, 1540 metres, evergreen jungle, shrub about 3-5 m., 27 June 1927, Garrett 390 (typus, Herb. Kew.). Me Song, alt. 210 m., shrub 0-6 m. high, Luang van Pruk 305. Doi Sootep, Chiang Mai, 420 m., by a stream, a thin shrub, 1-2 m., 17 June 1909, Kerr 683A. Muang Kaurj, Chingdao, 900 metres, about 2 m. high, Kerr 5536. Doinang Ka, Chiangmai, fruit Nov. 17, Put 3455.

Certainly near *P. tetrandra*, but with many more flowers on much shorter pedicels, and an entire calyx. Most of the flowers are tetramerous but some are pentamerous. The style seems to vary in length and the plants are probably heterostyled. The filaments are shorter than in *P. tetrandra*.

Prismatomeris ovalifolia Ridley, sp. nov., a *P. malayana* Ridley, cui affinis, foliis majoribus ovalibus, floribus majoribus, corollae lobis lanceolatis acuminatis basibus latioribus, umbella pedunculata differt.

Frutex glaber, ramis 7 mm. crassis, ramulis angulatis. *Folia* subcoriacea (sicca supra fusca nitida, subtus olivacea), ovata, acuta, basibus latis brevissime attenuatis, 9-13 cm. longa, 4-6 cm. lata, nervis 6-paribus in utraque pagina elevatis gracilibus, secundariis et reticulationibus parvis inconspicuis, petiolis 1 cm. longis. *Stipulae* triangulares, bicuspidatae, cuspidibus nigris, coriaceae,

flavescentes, 4 mm. longae. *Pedunculi* axillares et terminales, 2.5–4 cm. longi. *Flores* 2–6 in umbella patente. *Bractae* minutae, ovatae, cuspidatae. *Pedicelli* graciles, 1 cm. longi. *Calyx* obconicus, 4 mm. longus, dentibus 5 acutis. *Corollae* tubus cylindricus, 6 mm. longus, lobis 5 lanceolatis acuminatis furfuraceis 9 mm. longis 2 mm. latis.

ANAMBAS ISLANDS. Tanjong Suka, Siantan, on rocks at sea-level, *Henderson* 20228 (typus, Herb. Kew.); same locality, *Van Steenis*.

This is very distinct from all others in the oval leaves drying black, and the peduncled umbel. The stamens and pistils have been destroyed by insects in the only flowering specimen I have seen.

***P. glabra* (Korth.) Valeton** in Engl. Bot. Jahrb. **44**, 569 (1910).

Coffea glabra Korth. in Nederl. Kruidk. Arch. **2**, 2, 254 (1851).

Species a *P. neurophylla* Ridley, cui affinis, foliis tenuioribus angustioribus nervis pluribus inconspicuis, floribus paucis, pedicellis longioribus, calyce urniformi differt.

Frutex, ramulis cortice cervino desquamantibus. *Folia* tenuiter coriacea, lanceolata, utrinque acuminata, acuta, subtus pallidiora, 10–14 cm. longa, 3–4.6 cm. lata, costa utrinque elevata in pagina superiore canaliculata, nervis tenuibus subconspicuis 7-paribus prope margines inarcuantibus, petiolis rugosis 2–3 mm. longis. *Stipulae* triangulares, acute cuspidatae, in vaginam decurrentes, circiter 2 mm. longae. *Flores* 2–3 in umbella terminali dispositi, pedicellis 4–5 mm. longis (sub fructu 1 cm. longis). *Calyx* urniformis, 2 mm. longus, lobis brevibus glandulosis. *Corollae* tubus gracilis, 1.2 cm. longis; lobi 5, valvati, lineares, acuti, 1 cm. longi. *Antherae* 5, lineari-oblongae. *Stylus* gracilis, 5 mm. longus, tubo aequilongus, lobis stigmaticis 1.5 mm. longis oblongis. *Drupa* pisiformis, 5 mm. longa (sicca).

SARAWAK. *Beccari* 1825.

DUTCH S. E. BORNEO. Martapura, *Korthals* (typus); Hayup, *Winkler* 2331, 2543.

Korthals' description of his *Coffea glabra* is too incomplete to identify even the genus, but Valeton identifies Winkler's plants with it and has apparently seen Korthals' type. He refers it properly to the genus *Prismatomeris* but gives no description at all. I have seen Winkler's no. 2331, which is only in fruit, and have carefully compared it with Beccari's flowering plant from Sarawak, which seems in foliage and general habit to be identical.

***P. albidiflora* Thw.** in Hook. Journ. Bot. Kew Gard. Misc. **8**, 269 (1856); Trimen, Handb. Fl. Ceyl. **2**, 355 (1894).

This species occurs rarely in the moist regions of Ceylon and was distributed by Thwaites under the number 728, collected in 1846. A variety *Fergusonii* (Bedd.) Trim. (*P. Fergusonii* Beddome, Fl. Sylv. For. Man. cxxxiv–10: 1873) was described from plants collected at Colombo by Ferguson; of this I have seen no specimen.

It is described as having 5 to 10 flowers in the umbels and less fleshy corolla-lobes, and Beddome states that the latter were imbricate.

In the Kew Herbarium I find, also under *Thwaites* 728, Ceylon, but collected in 1866, a plant which appears quite different from *P. albidiflora* Thw. It has bigger, more lanceolate leaves, 10 cm. long and 4 cm. wide, pedicels 5 in an umbel, very slender, 1.5 cm. long, calyx very much smaller and limb saucer-shaped, margin entire, 2 mm. long, 1.5 mm. wide, corolla lobes rather longer than the tube, whole corolla 1.7 cm. long, style 1.5 cm. long.

In the type form of *P. albidiflora* Thw. the leaves are ovate, 7 cm. long, 3.5 cm. wide, the pedicels of the umbel 1 to 3, rather stout and 2.5 cm. long, calyx cup-shaped obscurely toothed, 5 mm. long, and 3 mm. wide, corolla tube 1 cm. long, lobes 5 mm. long, style 1.5 cm. long. The different leaves, more numerous pedicels and entirely different shape and size of the calyx, in the plant collected in 1866, are very striking. It is possible that this is the var. *Fergusonii*.

***Prismatomeris parviflora* Ridley**, sp. nov., a *P. Harmandi* Pierre, cui affinis, foliis minoribus tenuioribus, floribus parvis axillaribus et terminalibus, pedicellis longioribus, calyce dentato differt.

Frutex metralis, ramis gracilibus pallidis desquamantibus. *Folia* pergamacea, lanceolata, acuminata, basibus cuneatis, 7–12 cm. longa, 2.4–5 cm. lata, nervis gracilibus 8-paribus in utraque pagina conspicua, petiolis 2–10 mm. longis. *Stipulae* 3 mm. longae, coriaceae, flavescentes, ovatae, cuspidatae. *Flores* in umbella 4–6, axillares vel terminales, pedicellis gracillimis 1.5 cm. longis. *Calyx* cupulatus, 2 mm. longus, dentibus 5 acutis. *Corollae* tubus 4 mm. longus, crassiusculus, lobis 5 oblongo-lanceolatis obtusis carnosus 4 mm. longis. *Stamina* 5, filamentis in ore tubi brevibus, antheris oblongis minute apiculatis 3 mm. longis. *Stylus* 6 mm. longus, gracilis. *Discus* circularis, elevatus.

MALAY PENINSULA. Perlis, at Chupeng, *Ridley* 15000 (typus, Herb. Kew.). Penang, shrub 1.8–2.4 m., *King's Collector* 1567. Mergui, *Griffith*.

CAMBODIA. Knang Requen, crescit in montibus, *Pierre* 672. Montagnes de Pursat, *Godefroy Lebeuf* 553.

This has the smallest flowers of any known and is also remarkable for the thin texture of the leaves, which usually dry black.

***Prismatomeris Parkinsonii* Ridley**, sp. nov., a *P. albidiflora* Thw., cui affinis, floribus majoribus pluribus, pedicellis brevioribus, calyce minore, lobis corollae late lanceolatis differt.

Arbor parva, 5-metralis, cortice albescente. *Folia* chartaceo-coriacea, tenuia, elliptica, acute acuminata, 6 cm. longa, 3.3 cm. lata, nervis gracilibus 7–10-paribus, reticulationibus subtus minute conspicuis elevatis, petiolis 1 cm. longis. *Stipulae* subtriangulares, acute cuspidatae. *Flores* terminales, 5–7-umbellatae, pedicellis

1-1.4 cm. longis. *Calyx* urniformis, basi attenuata, 2 mm. longus, dentibus 5 acutis. *Corollae* tubus crassus, 1 cm. longus, lobis 5 lanceolatis obtusis 1 cm. longis basi 2 mm. latis. *Stamina* 5, filamentorum parte libera brevissima, antheris linear-oblongis. *Stylus* longior, filiformis, lobis stigmaticis 2 linearibus exsertis.

TENASSERIM. About sea level at Nyaungbinkin, *Parkinson* 1933 (Herb. Kew.).

Vernacular name : *pa the po* (Karen).

This species is very remarkable from the corolla-lobes being lanceolate, broad at the base and tapering to a blunt point.

***Prismatomeris javanica* (Valeton) Ridley, stat. nov.**

P. albidiflora Thw. var. *javanica* Valeton in Bull. Inst. Bot. Buitenz. 8, 6 (1901) et Bijdr. Boomsoorten Java, 8, 201 (1902).

P. tetrandra K. Schum., sec. Valeton, Atl. Baumarten Java, 3, t. 560 (1915), non K. Schum., nec *Coffea tetrandra* Roxb.

This species, apparently confined to Java, is well figured in the "Baumarten." It is entirely distinct both from *P. albidiflora* Thwaites and from *Coffea tetrandra* Roxb. (*Prismatomeris tetrandra* (Roxb.) K. Schum. emend. Ridley) of northern India. It is a small tree, about 15 feet tall, with the corolla-tube short and thick and hardly longer than the five lanceolate lobes, and the anthers projecting beyond the mouth, whereas *C. tetrandra* Roxb., of which there is an excellent coloured drawing by Roxburgh in the Kew library, is a shrub, with a long slender tube, and four or five narrow acuminate lobes, much shorter than the tube, in which the 4 or 5 stamens are rather deeply sunk.

In *P. javanica* (Valeton) Ridley the leaves are thin-textured as in *P. malayana* Ridley, the stipules have bifid lobes, the flowers are long-pedicelled, the calyx teeth 5, short, acute, the corolla short, the lobes thick, lanceolate, subobtus.

***Prismatomeris neurophylla* (Miq.) Ridley, comb. nov.**

Coffea neurophylla Miq. Fl. Ind. Bat. 2, 1079 (1859).

Species a *P. malayana* Ridley, cui affinis, foliis majoribus coriaceis, pedicellis longioribus, calyce margine glanduloso, corollae lobis oblongis brevioribus tubo subaequilongo differt.

Frutex, ramis subangulatis pallidis. *Folia* rigida, coriacea, ovata vel ovato-lanceolata, acuminata, acumine obtuso, basibus breviter angustatis, 5-10.5 cm. longa, 3-4 cm. lata, nervis 5-paribus tenuibus conspicuis subtus elevatis, costa subtus elevata crassiuscula, petiolis 5 mm. longis. *Stipulae* triangulares, carinatae, cuspidatae, 2 mm. longae. *Flores* in ramulis brevissimis pseudo-axillares, 6-7 in umbella, pedicellis gracilibus 1 cm. longis. *Calyx* campanulatus, 2 mm. longus, dentibus brevibus acutis glandulosis. *Corolla* alba, 1.5 cm. longa, tubo cylindrico 5 mm. longo, lobis 5 lanceolatis obtusis 4 mm. longis. *Stamina* 5, in tubo inclusa, antheris oblongis elongatis. *Stylus* 6 mm. longus, lobis oblongis obtusis. *Drupa* pisiformis.

BANCA. *Horsfield* (typus).

DUTCH S.E. BORNEO. Banjermasin, *Motley* 913, 1286.

This plant is noticeable from the umbels of flowers being borne on such short axillary branches that they themselves appear to be axillary. This occurs too in *P. malayana* Ridley to some extent, but actually terminal flowers on the ends of fully developed branches also occur on these.

***Prismatomeris andamanica* Ridley, sp. nov., a *P. fragrans* Geddes, cui affinis, foliis multo majoribus ovalibus, floribus pedicellatis in pedunculis tribus terminalibus, corollae lobis linearibus acuminatis differt.**

Arbor parva, cortice ramorum albescente. *Folia* coriacea, elliptica, breviter obtuse cuspidata, basibus breviter cuneatis, 14-15 cm. longa, 6-7 cm. lata, summa minora, nervis 5-6-paribus gracilibus, petiolis 1 cm. longis. *Stipulae* rigidae, coriaceae, acute bifidae, subtriangulares, 4 mm. longae. *Flores* albi, pedunculis 3 terminalibus 1.9 cm. longis, pedicellis in pedunculo medio 3 in lateralibus 2 brevibus crassis 2 mm. longis. *Calyx* campanulatus, 5 mm. longus, 3 mm. latus, integer. *Corollae* tubus crassiusculus, 2 cm. longus, cylindricus, lobis 5 linearibus acuminatis recurvis 2 cm. longis. *Stamina* 5, in ore corollae affixa, antheris linearibus 2 mm. longis. *Stylus* filiformis, 1.3 cm. longus, lobis linearibus.

ANDAMANS. Long Island, small tree, C. E. *Parkinson* (typus, Herb. Kew.). S. Andaman, *Kurz*.

Allied to *P. fragrans* Geddes, of Siam, but the lower leaves are very much larger and coriaceous, the biggest leaves in any species known to me. The flowers are borne on three peduncles, umbellate in the terminal axils; the central peduncle has three pedicellate flowers, the two side ones two each. The corolla lobes are linear, acuminate, recurved. In *P. fragrans* Geddes there is no peduncle, all the flowers being borne in separate pedicels. It resembles this species in the tree-like habit, broad entire calyx and general shape of the flowers.

Rennellia Korth.

Low shrubs, rarely tree-like, with showy fragrant violet flowers in racemes or rarely panicles. The flowers connate by the calyces in twos, threes, or fours on a peduncle, 4- or 5-merous. Korthals described his genus *Tribrachya* as being tetramerous and the *Rennellias* as pentamerous, but the genus varies much in this respect.

The species occur in jungle from S. Tenasserim to Siam, the Malay Peninsula, Borneo and Sumatra.

Inflorescence racemose :

Low shrublet; capitula crowded in a short raceme, flowers 5-merous.....*R. speciosa* Hook. fil.

Big shrubs ; raceme elongate :

Capitula sessile :

Flowers 5-merous ; stems smooth.....

R. elongata (King et Gamble) Ridley.

Flowers 4-merous ; stems pustulate.....

R. borneënsis Baill. ex Ridley.

Capitula remote on long peduncles, flowers 4-merous.....

R. morindiformis (Korth.) Ridley.

Inflorescence paniculate ; tree.....*R. paniculata* King et Gamble.

DUBIAE. *R. elliptica* Korth. in Nederl. Kruidk. Arch. **2**, 2, 257 (1851) ; Miq. Fl. Ind. Bat. **2**, 248 (1857) (*Morinda sumatrana* Miq. in Ann. Mus. Bot. Lugd.-Bat. **4**, 213 : 1868-9). Allied to *R. elongata*, but 4-merous. Sumatra.

R. ovalis Korth. l.c. ; Miq. Fl. Ind. Bat. l.c. Sumatra.

Rennellia elongata (King et Gamble) Ridley, stat. nov.

R. speciosa Hook. fil. var. *elongata* King et Gamble in Journ. As. Soc. Beng. **73**, 90 (1904).

Species a *R. speciosa* Hook. fil., cui affinis, statura majore, foliis oblongis majoribus, racemo elongato, corollae lobis linearibus angustis longioribus differt.

Frutex 3-metralis vel elatior. *Folia* coriaceo-carnosa, oblonga, breviter acuminata, basibus angustatis, 27 cm. longa, 11 cm. lata, nervis 7-8-paribus subtus elevatis intra margines inarcuantibus, petiolis 2-3 cm. longis. *Stipulae* basi connatae, cupuliformes, lobis 2 acutis. *Capitula* sessilia, remotiuscula, in rhachi 8-11 cm. longa disposita. *Calyx* cupulatus, puberulus, 4 mm. longus. *Corolla* purpurea, tubo gracili puberulo 2-4 cm. longo basi dilatato, lobis 5 linearibus 1 cm. longis. *Stamina* 5, filamentis brevissimis, antheris versatilibus. *Ovarium* subglobosum, 2-loculare. *Stylus* linearis. *Bacca* globosa, purpurea.

MALAY PENINSULA. PROV. WELLESLEY : Ara Kudah, Ridley. PERAK : Larut Hills, *Kunstler* 3926. SELANGOR : Ulu Gombak, Ridley ; Semangkok Pass, *Curtis*. JOHOR : Ulu Kahang, *Holtum* 10934.

SUMATRA. Kayu Tanam, *Curtis* 48 : "shrub, 6 to 8 feet tall, purple flowers."

SARAWAK. Matang, *Haviland* 224 : "corolla purple, berry purple." Ibid., Ridley 11747.

This plant is very distinct from *R. speciosa* Hook. fil., of which King and Gamble made it a variety. The whole shrub is considerably larger, and the leaves much bigger, while the inflorescence is an elongate raceme, not a condensed tuft, and the flowers are longer with much narrower thinner corolla-lobes. It may be the plant intended by Korthals under the name *Renellia elliptica* Korth. (Nederl. Kruidk. Arch. **2**, 2, 255), but his description is insufficient and I have seen no type.

Rennellia borneënsis (Baill.) Ridley, comb. nov. cum descr. amplif. *Morinda borneënsis* Baillon in Bull. Soc. Linn. Par. **1**, 205 (1879), *nomen subnudum*.

Species a *R. elongata* Ridley ramis petiolis calyce pustulatis, foliis lanceolatis acutis tenuioribus, capitulis breviter pedicellatis, corolla minore lobis oblongis obtusis differt.

Frutex, ramis atro-brunneis pustulatis. *Folia* coriacea, oblongo-lanceolata, acuminata, basibus angustatis obtusis, 23-24 cm. longa, 6.4-10 cm. lata, nervis 9-paribus intra margines arcuantibus cum secundariis et reticulationibus subtus elevatis, petiolis 1 cm. longis pustulatis. *Stipulae* coriaceae, flavescens, in cupulam 4 mm. longam connata, lobis 2 late ovatis. *Racemus* 10 cm. longus. *Capitula* triflora, breviter pedicellata, 1 mm. longa, 4 mm. dissita. *Calyx* vix 2 mm. longus, obconicus, pustulatus, limbo obscuro dentibus 5 minutis. *Corolla* minute pubescens, 1.7 cm. longa, lobis 5 obtusis lanceolato-oblongis carnis 6 mm. longis. *Antherae* 3 mm. longae. *Ovarium* subglobosum, biloculare, biovulatum.

SARAWAK. *Beccari* 2060 (typus, Herb. Kew.) ; near Kuching, *Haviland* 1690 ; Matang, *Haviland* 1704.

The pustulate branches, petiole and calyx, lanceolate stiff leaves and smaller corolla with shorter thicker blunt lobes distinguish this plant at once from *R. elongata* Ridley. *Beccari*'s specimen, the type, is only in young bud ; *Haviland*'s are in flower. The plant has never previously been described.

Rennellia morindiformis (Korth.) Ridley, comb. nov.

Tribrachya morindaeformis Korth. in Nederl. Kruidk. Arch. **2**, 2, 255 (1851) ; Miq. Fl. Ind. Bat. **2**, 247 (1857) ; Boerl. Handl. Fl. Ned. Ind. **2**, 1, 95 (1891).

Morinda Korthalsiana Miq. in Ann. Mus. Bot. Lugd.-Bat. **4**, 212 (1868-9).

Frutex "pseudo-parasiticus." *Folia* tenuia, acuminata, basibus angustatis, 10-14 cm. longa, 4.2 cm. lata, nervis 6-8-paribus 3-5 mm. a margine inarcuantibus, petiolis 1.5 cm. longis. *Stipulae* 4 mm. longae, in cupulam connatae, apicibus acutis brevibus. *Capitula* 3-flora, in racemo 4.5 cm. longo disposita, ramis 1.5 cm. longis. *Calyx* cylindricus, 2 mm. longus, margine scarioso, sessilis. *Corolla* 1 cm. longa, "alba," "tubo brevissimo," lobis 5 "lanceolatis trigonis valvatis." *Stamina* 5, ad faucem inserta, filamentis brevissimis antheris oblongis dorsifixis. *Discus* carnosus, annularis. "Stylus teres, stigmatibus indiviso cylindrico-clavato basi excavato."

SUMATRA. Mt. Singalan, *Korthals*.

The words in " " are taken from *Korthals*' description. I suppose "pseudo-parasiticus" means epiphyticus. The description is mainly taken from a syntype in Herb. Kew.

Zeuxanthe Ridley, gen. nov.

Arbores vel *frutices*, ramulis cortice pallido desquamato obtectis. *Stipulae* simplices vel bifidae. *Folia* chartacea vel pergamacea, lanceolata, acuminata. *Flores* 2-3 in apicibus radorum gracilium

umbellae ope calycum connati. *Calyx* oblongus vel obconicus, dentibus 5. *Corolla* alba, tubulosa, lobis angustis tubo subaequilongis. *Stamina* 5, in ore tubi affixa, filamentis brevibus, antheris oblongis vel linearibus ad dorsum basifixis. *Ovarium* biloculare, ovulis in loculo singulis. *Stylus* corollae tubo brevior, saepe bifidus.

Species 3, Borneënses.

This genus is based on *Morinda Beccariana* of Baillon (Bull. Soc. Linn. Par. 1, 205 : 1879), who cited it as the type of his section *Dibrachia* of *Morinda*. It has also been referred to *Morinda* by Schumann in Engler and Prantl, Nat. Pflanzenfam. IV. 4, 138. It has, however, no real affinity with *Morinda* beyond its flowers being in connate pairs or threes. It is allied to *Prismatomeris*, from which it only differs in the connate flowers. *Morinda Beccariana* Baill. was only described very briefly, so it is necessary to give a more complete description of it. There are two other species of the genus, both likewise from Borneo. *Dibrachia* is antedated as a generic name by *Dibrachya* Ecklon et Zeyher, Enum. 74 (1835) (= *Pelargonium* spp.).

Folia tenuia, lanceolata :

Arbor ; stipulae bifidae.....1. *Z. Beccariana*.

Frutex ; stipulae ovatae, integrae...2. *Z. Moultonii*.

Folia coriacea, late elliptica.....3. *Z. prismatomeriformis*.

1. ***Zeuxanthe Beccariana* (Baill.) Ridley**, comb. nov. cum descr. amplif.

Morinda Beccariana Baill. in Bull. Soc. Linn. Par. 1, 205 (1879) ; Boerl. Handl. Fl. Ned. Ind. 2, 1, 95 (1881).

Arbor, ramulis angulatis, cortice pallido desquamato. *Folia* chartacea (sicca supra olivacea, subtus flavescentia), elliptico-lanceolata, longe acuminata, acuta, basibus angustatis, 6.5-10.5 cm. longa, 2-3.5 cm. lata, nervis gracilibus subtus elevatis 8-paribus 2 mm. a margine inarcuantibus, nervis secundariis et reticulationibus subtus conspicuis, petiolis 7 mm. longis. *Stipulae* bifidae, lobis lanceolatis acuminatis 4 mm. longis. *Flores* pauci, saepissime terni, pedunculis 3 terminalibus 7 mm.-1 cm. longis. *Calyces* connati, oblongi, dentibus 5 acutis, 2 mm. longi. *Corollae* tubus cylindricus, 1.4 cm. longus, lobis 5 lanceolatis acuminatis 1.5 cm. longis. *Stamina* 5, filamentis brevissimis, antheris oblongis minute apiculatis. *Stylus* cylindricus, elongatus, lobis stigmaticis 2 oblongis obtusis. *Ovarium* triloculare, biovulatum.

SARAWAK. *Beccari* 1994, 2238 ; Matang, a tree, *Haviland* 656.

2. ***Zeuxanthe Moultonii* Ridley**, sp. nov., a *Z. Beccariana* (Baill.) Ridley, cui affinis, foliis basi rotundatis, stipulis integris ovatis, floribus pluribus minoribus in umbella pedunculata differt.

Frutex glaber, ramis superne 4-angulatis flavescentibus. *Folia* pergamacea (sicca olivacea), lanceolata, cuspidato-acuminata, basibus rotundatis, 9-15 cm. longa, 3-4 cm. lata, nervis 8-paribus in utraque pagina elevatis 3 mm. intra marginem inarcuantibus, nervis

secundariis pluribus brevioribus, reticulationibus parvis, petiolis 3 mm. longis. *Stipulae* coriaceae, ovatae, 3 mm. longae, flavescentes. *Pedunculus* terminalis, angulatus, flavescent, 1-1.5 cm. longus. *Umbellae radii* 14, graciles, puberuli, 1 cm. longi. *Flores* in apicibus 2, connati. *Calyces* obconici, puberuli, connati, 2 mm. longi, dentibus 5 brevibus acutis. *Corolla* alba, extra puberula, 1.2 cm. longa, tubo gracili, lobis 5 anguste linearibus 4 mm. longis. *Stamina* 5, in ore tubi inserta, filamentis brevibus, antheris oblongis obtusis 2 mm. longis basin versus dorsifixis. *Stylus* linearis, tubo brevior, apice integro.

SARAWAK. Upper Baram, Lio Matu, 150 m., flowers white, *Moulton* 6719 (typus, Herb. Kew.).

BRIT. N. BORNEO. Bettotan, plain, alt. 22.5 m., 29 March 1933, *Oroflo* in *For. Dept.* 2858 : "Tree, 10 ft. high, 6 in. girth ; flower white." Vernacular name : *kopi-kopi* (Kedayan).

3. ***Zeuxanthe prismatomeriformis* (Merr.) Ridley**, comb. nov. *Rennellia prismatomeriformis* Merrill in Univ. Calif. Publ. Bot. 15, 296 (1929).

BRIT. N. BORNEO. Tawao, Elphinstone Prov., *Elmer* 20599, 20831.

HEDYOTIDEAE.

***Hedyotis Everettii* Ridley**, sp. nov., ab *H. buruensi* (Miq.) Val., cui affinis, foliis majoribus, floribus majoribus in cymis pedunculatis terminalibus dispositis differt.

Herba glabra, ramosa, sicca viridis, ultra 30 cm. alta. *Folia* herbacea, lanceolata, obtusa, basibus rotundatis vel acutis, 3-5.5 cm. longa, 1.5 cm. lata, nervis 6-paribus, costa supra depressa subtus elevata, petiolis 3 mm. longis. *Stipulae* triangulares, lobis 3 subulatis marginibus fimbriatis. *Cymae* pedunculatae, pedunculis 5 mm.-1 cm. longis, pauciflorae. *Bracteae* herbaceae, lanceolatae, 3 mm. longae. *Flores* in umbellis dispositi, 3-4 pro umbella, pedicellis 1-2 mm. longis. *Calycis* tubus urceolatus ; lobi 4, triangulari-lanceolati, acuminati, virides, 2 mm. longi. *Corolla* vix longior, tubo brevissimo, lobis oblongis obtusis. *Stamina* 4, filamentis brevibus, antheris fuscis oblongis obtusis minute appendiculatis. *Capsula* laevis, elliptica, 3 mm. longa.

CELEBES. Bonthain Peak, 2100-3000 m. alt., *A. H. Everett* 36 (Herb. Kew.).

***Hedyotis pinaster* Ridley**, sp. nov., ab *H. tenelliflora* Bl., cui affinis, caule erecto sublignoso simplici, foliis latioribus densis, fructibus minoribus differt.

Herba suffruticosa, erecta, 5-12 cm. alta, vix ramosa, caule sublignoso basi foliis delapsis nudo, internodiis 2-4 mm. longis. *Folia* crassiuscula, anguste lanceolata, glabra, enervia, utrinque acuminata, 2.5-3 cm. longa, 4 mm. lata, petiolis 5 mm. longis. *Stipulae* lanceolatae, hirtae, 3 mm. longae. *Flores* parvi, usque 10 in glomerulis subsessilibus axillaribus dispositi. *Calyx* campanulatus, lobis 4 ovatis. *Corolla* deest. *Capsula* ovoideo-globosa, laevis, sepalis incurvis coronata, 1 mm. longa.

SARAWAK. Upper Baram, Lio Matu, Moulton 6734 (Herb. Kew.).

Hedyotis anachoreta Ridley, sp. nov., ab *H. pedunculari* Ridley, cui affinis, foliis latoribus, capitulis haud pedunculatis, calycis lobis longioribus recurvis differt.

Herba simplex, glabra, 14–27 cm. alta, caule angulato, internodiis 3 cm. longis. *Folia* herbacea, oblongo-lanceolata, acuta, basibus acuminatis, 1.5–4 cm. longa, 4 mm.–1 cm. lata, nervis 2-paribus subtus elevatis, petiolis 2 mm. longis. *Stipulae* lanceolato-lineares, integrae, 4 mm. longae, liberae. *Flores* albi, in glomerulis sessilibus densis 8 mm. latis in axillis superioribus et uno terminali dispositi. *Pedicelli* brevissimi. *Calyx* urceolatus, lobis 4 lineari-subulatis spinulosis 1 mm. longis. *Corolla* 2 mm. longa, tubo cylindrico, lobis 4 multo brevioribus oblongo-linearibus. *Stamina* 4, antheris oblongis ex ore tubi extrusis. *Capsula* laevis, ellipsoidea, 3 mm. longa, sepalis 4 persistentibus recurvis terminata, bilocularis. *Semina* pauca, ellipsoidea, atro-brunnea, transversim rugosa.

SARAWAK. On a grassy spot on the top of Mt. Matang, July 1903, Ridley 11745 (Herb. Kew.).

I gathered this plant again in the same spot in January 1915, but it had then become very scanty. I only saw a few plants left. The species is closely allied to *H. peduncularis* Ridley, of Kedah Peak in the north of the Malay Peninsula. There are some other allied species, both in the latter area and in Siam, with very similar inflorescences, most of them from dry or high mountain regions, but I know no others of this group in the Malay Archipelago or beyond it.

Hedyotis Moultonii Ridley, sp. nov., ab *H. flexuosa* Ridley, cui affinis, foliis lanceolatis, calycis lobis anguste linearibus acuminatis differt.

Herba glabra, ascendens, 32 cm. alta. *Folia* subcarnosa, lanceolata, acuminata, basibus angustatis, 7 cm. longa, 1 cm. lata, nervis invisibilibus, petiolis 2 mm. longis. *Stipulae* triangulares, acuminatae, marginibus denticulatis, 3 mm. longae. *Cymae* axillares et terminales, laxae, 3–7.5 cm. longae, pedunculis gracilibus, ramis paucis brevibus. *Bractae* foliaceae, 1 mm. longae; bracteolae lineares, 4 mm. longae. *Flores* parvi, albi, pedicellis gracillimis 2–3 mm. longis. *Calyx* urceolatus, lobis 4 anguste linearibus acuminatis tubo longioribus 1 mm. longis. *Corolla* non visa. *Capsula* obovoidea, bilocularis, 2 mm. longa, calycis lobis coronata.

SARAWAK. Summit of Mt. Murud, Moulton 119 (Herb. Kew.).

This is allied to *H. flexuosa* Ridley, of the Malay Peninsula, but the calyx lobes are very narrow, linear and longer than the tube. The capsule much resembles that of *H. stolonifera* Ridley, but the whole habit of the plant is different. The only specimen collected is a poor one.

Hedyotis coronata Wall.

BRIT. N. BORNEO. Kudat, Fraser.

Not previously recorded from Borneo.

Oldenlandia stolonifera Ridley, sp. nov., ab *O. santubongensi* W. W. Smith, cui affinis, foliis rosulatis sessilibus elongatis, caule gracili radicante differt.

Herba repens, caule gracili elongato, internodiis 5–6 cm. longis, nodis radicanibus. *Folia* crassiuscula, sessilia, congesta, glabra, lineari-oblonga, acuminata, apicibus glandulis singulis terminatis, basibus paullum angustatis, 15 cm. longa, 2–2.4 cm. lata, nervis 3-paribus inconspicuis costae subparallelis. *Stipulae* lanceolatae, 5 mm. longae, marginibus denticulatis. *Paniculae* axillares, graciles, elongatae, laxae, hirtae, 8–15 cm. longae, ramis paucis remotis 5 cm. longis, ramulis 3 umbellatis 1–3 cm. longis. *Flores* pauci, albi, pedicellis 2 mm. longis. *Bractae* lanceolatae, 1 mm. longae. *Calyx* urceolatus, 3 mm. longus, dentibus 4 triangulari-lanceolatis acuminatis. *Corolla* 7 mm. longa, hirta, tubo 3 mm. longo, lobis 4 ovatis 4 mm. longis. *Stamina* 4, e tubo corollae vix protrusa, antheris oblongis utrinque obtusis. *Stylus* corolla longior, gracilis, filiformis, stigmatibus 2 crassis obtusis obconicis. *Capsula* obovoidea, hirta vel glabra, 2 mm. longa, sepalis coronata, bilocularis. *Semina* plurima, angulata, atra.

SARAWAK. Beccari 981; Mt. Singhi, on rock, corolla white, Haviland 2151 (typus, Herb. Kew.).

This plant is unique in the genus in having a long slender creeping stem, emitting large tufts of narrow sessile leaves at intervals. Haviland's specimens have short hairy pubescence on the panicle, calyx and fruit; the other specimens are glabrous. It is certainly allied to *Oldenlandia santubongensis* W. W. Smith, as well as to the paniculate mountain forms of *Hedyotis*.

LXII—NEW SPECIES OF LOMARIOPSIS.

R. E. HOLTUM (Botanic Gardens, Singapore).

During a recent period of leave in Europe, I attempted a study of all known species of the genus *Lomariopsis*, which extends throughout the wetter parts of the tropics. This study is a continuation of earlier work on the climbing acrostichoid ferns of the Malayan region, which covered only a part of the genus. The present paper includes descriptions of such new species as appear to be represented among the available specimens, with the exception of those from Madagascar, which are to be published elsewhere. I hope later to prepare a full comparative survey of the genus.

The Directors of the following herbaria have kindly lent specimens for study, or have granted me facilities for work: Berlin (B.), the British Museum (Natural History) (B.M.), Brussels (Br.), Cambridge (C.), Kew (K.), New York (N.Y.), Paris (P.), and the U.S. National Herbarium (W.). I wish to express my thanks for this

assistance, particularly to the Director and staff at Kew, where most of the work was carried out. The abbreviations given in brackets above are used in citing specimens.

The general characters of the genus in the Malayan region were described in my paper of 1932 (Gardens Bulletin, Straits Settl. **5**, 264–266), and a study of the species from the other parts of the tropics has not revealed any considerable modification. The chief differences to be noted are in young plants, in the apical pinna of certain species, and in the spores.

Young plants in many species have fronds with several small pinnae, the apical one not greatly larger than the lateral ones. The type of young plant which has at first large simple fronds, followed later by fronds with an increasing number of lateral pinnae, universal among Malayan species, occurs also in other parts of the tropics, side by side with the other type. It is to be noted that, as in other climbing ferns with simply pinnate leaves, the characters of the young plants are often more distinctive than those of the adult stage, and the species cannot be understood fully without a study of them.

The *apical pinna* of nearly all species of *Lomariopsis* is continuous with the rachis, whereas all lateral pinnae are articulated. In three species from Cuba and Jamaica (see figs. 1, 2), and in two species from Madagascar, the apical pinna is almost or completely aborted (often represented by a small rudiment), and the apical position is taken by an articulated pinna which, morphologically, should be considered as a lateral one.

The *spores* of all species of *Lomariopsis* appear to have a perispore, but not all have the same copious convoluted envelope as that which surrounds the spores of the Malayan species. Some species in the American tropics have almost smooth spores, while others have a more or less well-developed spiny covering; still others have flattened appendages of irregular size and shape, these providing an intermediate stage between the spiny condition and the complete envelope. The spore characters are often important diagnostically.

THE SPECIES OF CUBA AND JAMAICA WITH ABORTED APICAL PINNAE.

The following key will serve to distinguish the three species in this group. *L. Underwoodii* is a new species, described below; ***L. jamaicensis*** (Underw.) Holtt. is a new combination, based on *Stenochlaena jamaicensis* Underw. in Bull. Torr. Bot. Cl. **33**, 595 (1906).

Annulus of about 20 cells, spores twice as long as broad:

Pinnae up to about 7 pairs, very narrow at base.....*L. Wrightii*

Pinnae up to about 14 pairs, wider at base.....*L. Underwoodii*

Annulus of 12–14 cells, spores ovoid.....*L. jamaicensis*

Lomariopsis Underwoodii Holttum, sp. nov. (figs. 1, 2); affinis *L. Wrightii*, a qua pinnis 14-jugis basi multo latioribus differt;

a *L. jamaicensis* sporangiorum annulo e cellulis 20 constato, sporis elongatis valde distincta.

Rhizome and bases of *stipes* covered with red-brown, spreading, lanceolate scales. *Stipes* about 16 cm. long. *Sterile lamina* up to 60 cm. long, pinnae up to 14 pairs, lowest few pairs somewhat reduced, apical pinna aborted or represented by a small rudiment. *Pinnae* at about 60° to rachis, largest about 14 cm. long by 2.5 cm. wide, shortly stalked, base unequally narrowly cuneate, edges almost parallel, shortly and irregularly toothed throughout, more deeply near apex; apex suddenly narrowed and then caudate, cauda 15 mm. long; texture stiff, subcoriaceous; colour brown when dry; veins clearly raised on both surfaces. *Fertile pinnae* up to 14 pairs, apical pinna aborted, basal pinnae hardly reduced; pinnae stalked up to 4 mm.; largest about 11.5 cm. long and 5 mm. wide, base more or less rounded, apex gradually attenuate. *Sporangia* with annulus of about 20 cells; spores long-ellipsoid, about twice as long as broad, surface granular but not spiny.

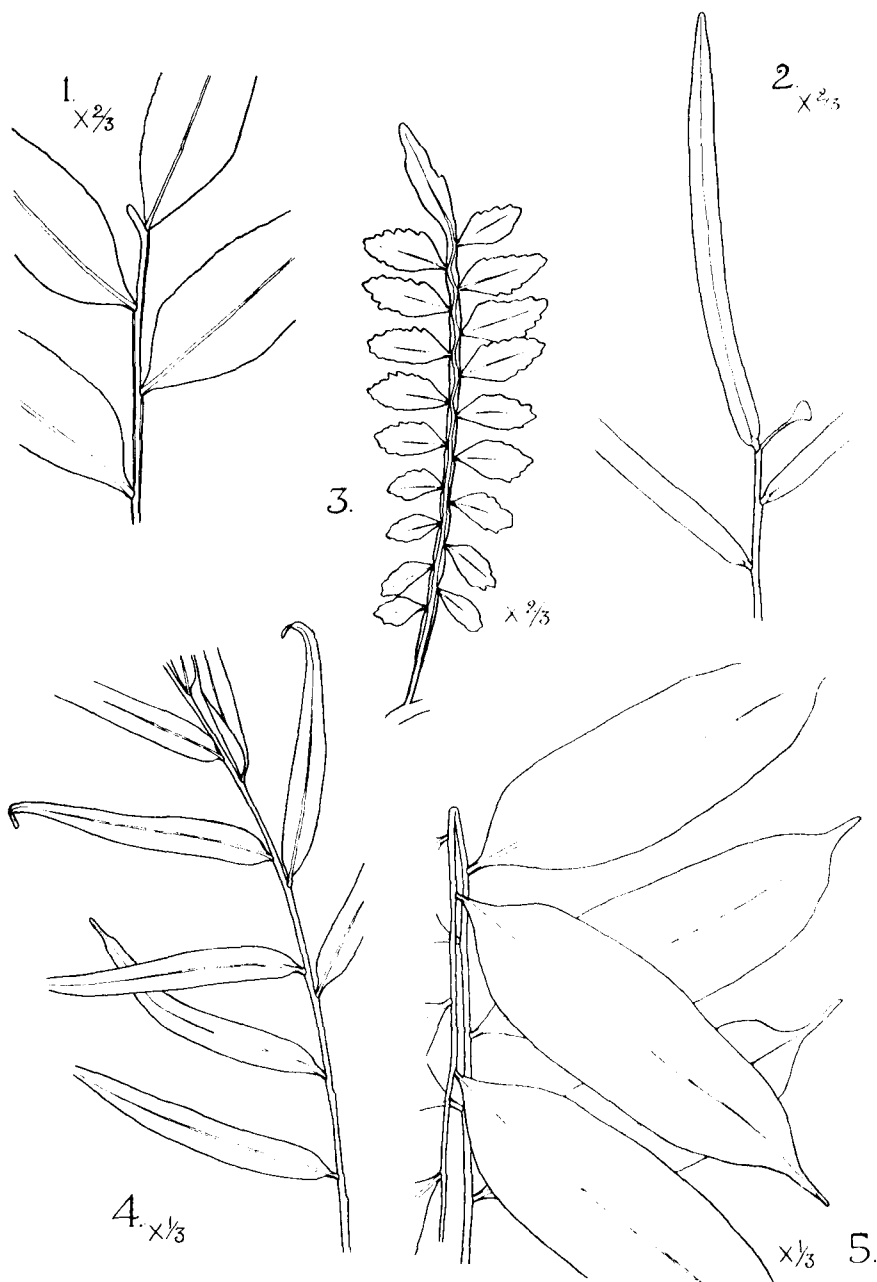
Young plants have fronds with small pinnae; e.g., a frond 21 cm. long (including the stipe) is 9-jugate, the largest pinna being about 4.5 cm. long and 1.3 cm. wide; the edges of the pinnae more toothed than in the adult plant, and the rachis winged throughout. A very young plant in the British Museum herbarium has a 6-jugate frond 9 cm. long, and pinnae with edges toothed almost as in young plants of *L. sorbifolia*, the apical pinna being continuous with the rachis.

JAMAICA. Jenman s.n. (type, N.Y.). Hart 333 (W.). Near Troy, 450–600 m., Underwood 2866 (N.Y., W.), 2887 (N.Y.). Mabess River, 900 m., Underwood 1242 (N.Y.). Below Tweedside, 600 m., Underwood 1609 (N.Y.). Gossamer Park, St. Thomas, 750–900 m., Maxon 9222 (N.Y., W.). Above Tweedside, 600–900 m., Maxon 968 (W.). Purdie s.n., 1843 (N.Y., K.). Bot. Dept. Jamaica s.n., 1885 (W.). Herb. Langlois, leg. I.H., 1885 (W.). Wilson 750, “high mts. and very moist places” (K.). Harris 7727 (K.). G. C. Joad s.n. (K.).

CUBA. Loma San Juan, 900 m. Hioram 6998 (W.). Loma del Gato & vicinity, Cobra range of Sierra Maestra, Leon, Clement & Bioca 10385 (N.Y., W.).

The species is named in honour of the late L. M. Underwood, who collected young plants and thought them distinct from *L. jamaicensis*, but in the absence of adult material was unable to describe them himself. The very fine series of specimens collected by Jenman and now in the New York herbarium show the species to be a very distinct one; in some characters more nearly allied to *L. Wrightii* than to *L. jamaicensis*. It is, however, very distinct from *L. Wrightii* in the shape of the pinnae and in their much greater number. Its occurrence on the mountains in the south-east of Cuba (the part nearest Jamaica) is of interest.

L. Underwoodii differs from *L. jamaicensis* not only in the sporangia and spores, but also in the much greater number of pinnae



1. *L. Underwoodii* (Jenman, NY). Apex of sterile frond, with rudimentary terminal pinna. 2. *L. Underwoodii* (Jenman, NY). Apex of fertile frond. 3. *L. sorbifolia* (Guadeloupe, Duss 4139, NY). Frond of young plant. 4. *L. nigropaleata* (Peru, Klug 2082, NY). Fertile frond. 5. *L. nigropaleata* (Peru, Klug 2082, NY). Sterile frond.

on the fronds of adult plants (only about 7 pairs in *L. jamaicensis*), the more coriaceous texture of the pinnae, the sterile pinnae longer and narrower at the base, and the fertile pinnae also longer. Young plants of the two species are not always easy to distinguish; on the whole, young plants of *L. jamaicensis* have fewer, larger pinnae of thinner texture, but there are some specimens which I could not clearly assign to one species or the other. It is probable that field workers will find a good distinction.

THE GROUP OF *L. SORBIFOLIA*.

The species of this group are characterized by having young plants with numerous small lateral pinnae with more or less sinuate or toothed margins (fig. 3), and fronds of adult plants with rather numerous, narrow pinnae and a rachis winged almost throughout, the spores almost smooth or covered with flattened appendages. The species range over the Antilles, and from southern Mexico southwards through Central America to Brazil. The following belong to the group:

1. *L. amydrophlebia* (Slosson) Holttum, comb. nov. *Stenochlaena amydrophlebia* Slosson apud Maxon in Journ. Wash. Acad. Sci. **14**, 141 (1924).

2. *L. Fendleri* D. C. Eaton in Mem. Am. Acad. II. **8**, 195 (1860).

3. *L. Kunzeana* (Underw.) Holttum, comb. nov. *Olfersia Kunzeana* Presl, Tent. Pterid. 235 (1836) (nom. nud.). *Stenochlaena Kunzeana* Underw. in Bull. Torr. Bot. Club, **33**, 196 (1906).

4. *L. latiuscula* (Maxon) Holttum, comb. nov. *Stenochlaena latiuscula* Maxon in Contr. U.S. Nat. Herb. **10**, 502 (1908).

5. *L. Maxoni* (Underw.) Holttum, comb. nov. *Stenochlaena Maxoni* Underw. in Bull. Torr. Bot. Club, **33**, 599 (1906).

6. *L. mexicana* Holttum, sp. nov. (description below).

7. *L. recurvata* Fée, Hist. Acrost. 68, t.28 (1845).

8. *L. sorbifolia* (Linn.) Fée, Hist. Acrost. 69 (1845). *Acrostichum sorbifolium* Linn. Sp. Plant. 1069 (1753).

9. *L. vestita* Fourn. in Bull. Bot. Soc. France, **19**, 250 (1872).

Lomariopsis mexicana Holttum, sp. nov.

Rhizoma stipitesque ignota. *Rhachis* pallide straminea, fere usque ad basin alata, glabrescens vel paleis linearibus brunneis sparsis munita. *Lamina sterilis* c. 42 cm. longa et 18 cm. lata; pinnae c. 12-jugae, 2.5–3 cm. inter se distantes, e rhachi angulo fere recto ortae, superiores et inferiores quam mediae leviter minores. *Pinnae steriles* mediae usque 10 cm. longae et 2.5 cm. latae, basi e petiolulo alato 1 mm. longo subito dilatatae, late rotundato-cuneatae, postice quam antice latiores, margine minute sinuosae, apicem versus subito contractae, apice breviter caudatae vel subcaudatae; textura tenues; colore siccitate pallide virides; venae pallidae, graciles, supra et subtus prominentes, angulum 70° cum costa efformantes, c. 1–2 mm. inter se distantes. *Pinnae fertiles* c. 13-jugae, usque 12 cm. longae et 3 mm. latae, petiolulis alatis 1–2 mm. longis munitae, basi late rotundatae, apice acuminatae.

MEXICO. "Forêt vierge de Patrero, 19 août '65, Herb. de la Commission scientifique de Mexique, recueilli par M. Hahn, 1865-1866, no. 56" (type, P.). Estado de Vera Cruz, La Junta, c. 100 m., H. Ross 1112, in Herb. Bonaparte. "Croît le long des arbres dans les forêts près de Tabasco" (Br.).

The type specimen was recognised by Underwood (Bull. Torr. Bot. Cl. 33, 603) as representing a distinct species, which, however, he compared to *L. erythrodes*, whereas its relationship appears to me to be with *L. sorbifolia*, from which species indeed it may be difficult to find a clear distinction. The geographical separation of Mexico from the Lesser Antilles, where alone *L. sorbifolia* is known to occur, and the absence of *L. sorbifolia* from the extensive collections made in Cuba, indicates a quite distinct distribution for the two species. The clearest distinction may be in the shape of the fertile pinnae. From *L. recurvata*, the most nearly related species in Mexico, *L. mexicana* differs in the shorter sterile pinnae with much broader base, and in the wider fertile pinnae.

THE GROUP OF *L. JAPURENSIS*.

So far as at present known, the young plants of this group of species have at first simple lanceolate fronds, which reach a considerable length (20 to 30 cm.) before fronds with lateral pinnae appear. The sterile fronds of adult plants have usually broad pinnae, and the rachis is winged towards the apex only. Spores are either almost smooth or covered with spines. The species range widely in continental America from Guatemala southwards to Bolivia and Brazil, but are absent from the West Indies. The species at present known are as follows:

1. *L. elongata* Fée, Hist. Acrost. 67 (1845).
2. *L. erythrodes* (Kze.) Fée, Hist. Acrost. 67 (1845). *Acrostichum erythrodes* Kze. in Flora, 22 (1), Beibl. 46 (1839).
3. *L. japurensis* (Mart.) J. Sm., Hist. Fil. 140 (1875). *Acrostichum japurense* Mart. Ic. Pl. Crypt. Bras. 86, pl. 24 (1834).
4. *L. lanceolata* Holttum (described below).
5. *L. nigro-paleata* Holttum (described below).
6. *L. Prieuriana* Fée, Hist. Acrost. 66, pl. 25, fig. 1 (1845).
7. *L. speciosa* Holttum (described below).

L. japurensis is the most widespread species of the group, and is also the one best represented in collections, particularly in the U.S. National Herbarium. The species of southern Brazil, of which two are here described as new, need much further field study. They are apparently closely related, and present a problem quite similar to that of the allied group of species in West Africa.

***L. nigro-paleata* Holttum**, sp. nov. (figs. 4, 5); *L. japurensi* affinis, sed paleis brevibus nigris adpressis, pinnis sterilibus plerumque latioribus petiolulatis, pinnis sterilibus et fertilibus basi angustius cuneatis, sporis spinulosis differt.

Scales on rhizome and bases of stipes appressed, up to about 4 mm. long, black, with red-brown margins formed of irregular hairs; small red-brown scales, irregularly orbicular, also present, giving a rusty appearance to the lower part of the stipe. *Stipes* up to 25 cm. long; sterile lamina up to about 70 cm. long and 30 cm. wide, pinnae about 8 pairs below the terminal pinna, lowest pinnae somewhat reduced. *Sterile pinnae* oblique, up to about 17 cm. long by 5 cm. wide, base subequally cuneate, rather narrow, sides parallel, apex mucronate-caudate, the narrowed tip 15-20 mm. long, edges very slightly sinuate; texture firm papyraceous, colour olive green when dry, paler beneath, surfaces glabrous except for scattered brown stellate hairs beneath; stalk about 3 mm. long; veins simple or forked, at about 70° to the costa, about 1.2 mm. apart. Fertile pinnae about 10 pairs, stalked as are the sterile ones up to about 12 cm. long by 1.2 cm. wide, cuneate, widest near base and gradually tapering to apex, apex suddenly contracted, the narrow terminal portion up to about 8 mm. long, sterile. *Spores* shortly ellipsoid, densely spinulose, the spines up to half the length of the spore.

PERU. Dept. Loreto: Florida, Rio Putumayo, at mouth of Rio Zubineta, alt. 200 m., forest, G. Klug 2082 (type, W. Syntypes in N.Y., K, B.M.). Santa Rosa, Lower Rio Huallaga, 135 m, dense forest, Killip & Smith 28823 (N.Y., W), 28794 (N.Y., W), Balsa-puerto, Lower Huallaga basin, 150-350 m., Killip & Smith 28594 (N.Y., W).

Dept. Junín: Cahuapanas, on Rio Pichis, 340 m., dense forest, Killip & Smith 26754 (N.Y., W).

Prope Tarapoto, E. Peru, Spruce 4738 (K, P, C, W).

BRAZIL. Rio Juruá, E. Ule 5757 (B, K).

This species is clearly distinguishable from *L. japurensis* in the characters mentioned in the Latin diagnosis. It has so far only been collected in Peru and western Brazil, but may perhaps also occur in the adjacent parts of Colombia and Ecuador. There is no information about young plants. Some specimens differ from the type in having stalks of sterile pinnae up to 6 mm. long, and fertile pinnae up to 14 by 1.5 cm.

***Lomariopsis lanceolata* Holttum**, sp. nov.; *L. erythrodi* affinis, sed pinnis sterilibus pro rata angustioribus, e basi fere truncata sensim attenuatis, colore pallidioribus, pinnis fertilibus angustioribus (usque 6 mm. latis) differt.

Rhizome unknown. *Stipes* incomplete, apparently about 10 cm. long, light brown when dry, when young bearing red-brown scales 2.5 mm. wide, dark at the peltate base, paler towards the acuminate apex. *Rachis* not winged, light brown, bearing some broad scales and many small long-fimbriate brown peltate scales. *Lamina* about 70 cm. long and 30 cm. wide; pinnae sessile, slightly oblique, about 20 pairs, uppermost and lowest somewhat reduced, lowest few pairs more distantly spaced. *Middle pinnae* up to 17 cm. long

and 2.6 cm. wide, upper (anticous) base broadly cuneate or sub-truncate, lower (posticous) base broadly rounded, sides very gradually tapering from near the base to near the apex, usually slightly constricted about 1.5–2 cm. from the acuminate, not caudate, apex; margins minutely sinuous; texture thin but firm, colour when dry medium brown-olivaceous above, paler beneath, costae castaneous above, paler beneath; veins slender, clearly raised on both surfaces when dry, at 70°–80° to the costa, about 13 per cm. *Fertile fronds*: stipe 10 cm. long, pinnae 22 pairs, upper and lower smaller, middle pinnae up to 13 cm. long by 6 mm. wide, sessile, base broad, gradually tapering towards the apex, apex shortly caudate (2 mm.), sterile. *Spores* thin-walled, shortly spiny.

BRAZIL. *Sellow*, s.n. (type, B.) (*Olfersia lanceolata* Klotzsch in sched.).

Sellow's travels were in S.E. Brazil, which is the territory of *L. erythrodes*. *L. lanceolata* differs clearly from that species in the shape of the sterile pinnae and in the narrow fertile pinnae. In addition to the type, there are two probable further specimens (at Kew and Cambridge), both labelled *Gardner* 101, Organ Mts. These specimens both consist of the upper part of a frond, and the pinnae have more cuneate bases than in the type; but the type itself, as commonly in this group of ferns, has the upper pinnae more cuneate than the lower. The spores of the Kew specimen appear to be smooth, but those of the Cambridge specimen are shortly spiny; the spines of spores of this type often seem to be rubbed off when old, and this may be the case here. *Gardner's* two specimens seem to be quite similar in other respects.

***Lomariopsis speciosa* Holttum**, sp. nov.; *L. erythrodi* affinis, sed pinnis sterilibus angustioribus (usque 2 cm. latis), pinnis fertilibus angustioribus (usque 4 mm. latis), sporis laevibus differt.

Rhizome stout, densely covered towards apex with red-brown scales; scales about 1 cm. long and 1 mm. wide, the edges ciliate. Stipes 5–6 cm. long, red-brown; rachis red-brown, with narrow brown scales, not winged. *Sterile lamina* up to about 55 cm. long and 20 cm. wide; pinnae 15 pairs, oblique, sessile, about 3.5 cm. apart; pinnae towards apex much smaller than the middle pinnae, lowest pinnae somewhat smaller. *Middle pinnae* up to about 13 cm. long and 2 cm. wide, subequally cuneate at base (angle about 40° on each side), very gradually tapering from near base, apical third narrowed more rapidly to caudate apex; margins subdenticulate (projection at the end of each vein), caudate apex nearly entire; texture thin but firm, colour rather reddish when dry, especially rachis and costae above; veins slender, raised on both surfaces, at an angle of about 70° to the costa, about 12 per cm. *Fertile frond*: stipes up to 9 cm. long, pinnae 15 pairs, up to 9 cm. long and 4 mm. wide, on stalks 1 mm. long, base cuneate, apex shortly caudate. *Spores* not spiny.

BRAZIL. *Sellow* 370 (type, B.). (*Olfersia speciosa* Klotzsch in sched.). Bahia, *Luschnath* 86 p.p. (B). Bahia, ex herb. de Candolle (B. A young plant, not typical). Iguape, Peroapara, Estado São Paulo, *Brade* 8222 (N.Y.).

Brade's specimen quoted above matches the type closely. It was evidently collected at the same time and place as his no. 8223, which seems to me to be typical *L. erythrodes*, with broad pinnae and spiny spores. *Luschnath* 86 at Berlin consists of two specimens, one being *L. speciosa*, the other *L. erythrodes*; another indication that the two grow together. The difference is, however, so striking that I believe the two to be quite distinct.

THE AFRICAN SPECIES.

With the exception of *L. Warneckeii*, and an undescribed species from Uganda, represented by a solitary sterile specimen at Kew, all known species from the mainland of Africa are from the western side of the continent. These species are not so clearly divisible into groups as those of the American tropics. Three species (*L. decrescens*, *L. hederacea*, *L. Mannii*), have a very large number of pinnae, placed close together; the others have a much smaller number, usually broader and more widely spaced. As regards young plants, some members of this second group start life with simple fronds, and some with pinnate fronds; the adult plants do not show any clear distinctions corresponding with their young stages, and one species has a more or less intermediate young stage. Spore characters have proved helpful in distinguishing these African species. I recognise the following species:

1. ***L. congoënsis* Holttum**, sp. nov. (described below).
2. *L. decrescens* (Bak.) Kuhn in Verh. zool. bot. Ges. **19**, 571 (1869). *Acrostichum polyphyllum* Hook. Spec. Fil. **5**, 243 (1864) (not l.c. 269). *A. decrescens* Bak. in Hook. et Bak. Syn. Fil. 412 (1868).
3. *L. guineënsis* (Underw.) Alston in Journ. Bot. Suppl. 1934, 5. *Stenochlaena guineënsis* Underw. in Bull. Torr. Bot. Cl. **33**, 46 (1906). *Lomariopsis guineënsis* Kuhn, Fil. Afr. **53** (1868) (nom. nud.).
4. *L. hederacea* Alston in Journ. Bot. Suppl. 1934, 5.
5. *L. Mannii* (Underw.) Alston in Journ. Bot. Suppl. 1934, 6. *Stenochlaena Mannii* Underw. in Bull. Torr. Bot. Cl. **33**, 47 (1906).
6. ***L. muriculata* Holttum**, sp. nov. (described below).
7. ***L. nigrescens* Holttum**, sp. nov. (described below).
8. *L. palustris* (Hook.) Mett. ex Kuhn, Fil. Afr. **53** (1868). *Acrostichum palustris* Hook. Spec. Fil. **5**, 214 (1864).
9. ***L. Rossii* Holttum**, sp. nov. (described below).
10. *L. Warneckeii* Hieron. in Engl. Jahrb. **46**, 383 (1911).

Note on *L. guineënsis*.

I have examined the type of this species in the Kew herbarium (fig. 6) and also a number of other specimens which I tentatively refer to this species. It is possible that some of these specimens may

represent distinct but closely allied species, but with the material at my disposal I have been unable to see any clear distinctions, though specimens representing extremes of size appear very different from each other. In view of the fact that three other species are here described as new, a note on the essential characters of *L. guineënsis* seems necessary. These characters are as follows:—*Young plant* probably with simple fronds to a rather large size. *Rhizome scales* broad, dark, dull, not shining. *Sterile pinnae*: base narrowly cuneate (lower pinnae distinctly stalked), apex abruptly mucronate-caudate. *Fertile pinnae* short-stalked, base rather broad, apex caudate and sterile. *Spores* almost smooth, with few spines.

The characters of the young plant are not shown in the type collection, but have been seen in collections from the Belgian Congo (fig. 7). *L. palustris* agrees with *L. guineënsis* in its young stages, and also in its spore characters, but it never develops pinnate fronds.

***Lomariopsis congoënsis* Holttum, sp. nov.** (figs. 8, 9); *L. guineënsi* affinis, sed frondibus plantae juvenilis pinnatis, rhizomate adulto paleis lucidis atro-rubris (fere nigris) vestito, pinnis sterilibus basi latioribus apice breviter subcaudatis, pinnis fertilibus latioribus (usque 1.2 cm. latis) usque ad apicem sporangiiferis, sporis perisporio convoluto munitis differt.

Scales of the rhizome dark, shining, up to almost 2 mm. wide, edges copiously brown-ciliate when young. *Stipes* of sterile fronds up to about 18 cm. long, pale brown, scaly at base; rachis coloured as stipe, winged towards apex. *Sterile lamina* as much as 42 cm. long and 24 cm. wide; pinnae up to about 10 pairs (type has 6 pairs), middle pinnae about 5 cm. apart, upper closer, lower more distant, up to 7 cm. apart), sub-basal largest, upper oblique, lower spreading, all sessile. Largest pinnae about 13 cm. long and 3.8 cm. wide, upper (anticous) base cuneate, rather less than 45°, lower (posticous) base rather narrowly rounded (more broadly on upper pinnae), sides subparallel for most of their length, edges undulate or crisped, rather suddenly contracted to a short subcaudate apex less than 1 cm. long; texture thin but firm, colour olivaceous, slightly paler beneath, midribs medium brown; veins slender, distinctly raised on both surfaces, concolorous with lamina, about 10 per cm., at about 70° to midrib. *Fertile pinnae* as much as 9 cm. long and 1.2 cm. wide, sessile, base rather broad, apex gradually and almost evenly attenuate, entirely fertile, not caudate. *Spores* with copious folded perisporie.

PORTUGUESE CONGO. Mayumbe, Gossweiler 8219 (type, B.M.). "Climbing on the trunks of forest trees; spore-bearing fronds terminal. In wet situation near the village Caio—Hombe region—Rio Lufo, Maiombe. April 1919."



6. *L. guineënsis* (Type). Sterile frond. 7. ? *L. guineënsis* (Reding 36, Br.). Young plant. 8. *L. congoënsis* (Vanderyst 7525 Br.). Young plant. 9. *L. congoënsis* (Type). Sterile frond. 10. *L. muriculata* (Vanderyst 12113, Br.). Fronds from young plants.

BELGIAN CONGO. Without locality, *Jespersen* 192 (Br.). Ipamu, *Vanderyst* 12097, 12308, 12114 (Br.). Kinsona, *Vanderyst* 6175 (Br.). Entre Ipamu et Kikiat, *Vanderyst* 9846 (Br.). Sankuru, Bena-Dibela territory, *J. M. Jensen* 62 (in herb. C. Christensen).

Young plants are represented in the Brussels herbarium. They are pinnate from a very young stage, with winged stipe and rachis. The earliest stage has a deeply lobed lamina (2 lobes on each side) 2.5 cm. long; the lobes are replaced by articulated pinnae in later fronds. A frond with a lamina 8 cm. long has 2 pairs of pinnae; a later frond with the lamina 13 cm. long has 5 pairs of pinnae, up to 3.5 cm. long and 1.7 cm. wide, the base as in the mature plant, the apex evenly narrowed and rather blunt; the apical pinna larger with the base decurrent into the wing of the rachis.

Specimens of young plants (all Br.). Région de Mjese (Nsele, Moyen Congo), *Vanderyst* 7525. Lukombe, *Vanderyst* 2678. Ipamu, *Vanderyst* 12062.

This species is distinct from *L. guineënsis* in its young plants and its spores; from *L. muriculata* it differs most strikingly in the broad dark shining scales; from *L. Rossii* it differs in scales, in broader fertile pinnae, and in sterile pinnae with short not caudate apex.

***Lomariopsis muriculata* Holttum**, sp. nov. (fig. 10); *L. guineënsi* affinis, sed frondibus plantae juvenilis integris usque 8 cm. longis, majoribus pinnatis, rhizomate adulto paleis angustis vestito, pinnis sterilibus adultis basi latioribus, pinnis fertilibus petiolulatis apice obtusis usque ad apicem sporangiiferis, sporis perisporio convoluto munitis differt.

Rhizome clothed near apex with narrow dull brown scales, base shortly peltate, margins slightly ciliate, up to about 1 cm. long and less than 1 mm. wide; older parts of rhizome covered with small warts, the bases of fallen scales. *Stipes* of sterile fronds 10–15 cm. long, of fertile fronds 15–20 cm., dull brown, clothed towards base with scales like those on the rhizome. *Rachis* of same colour as stipe, glabrous when frond is fully expanded, not winged in adult plant. *Sterile lamina* up to about 65 cm. long and 25 cm. wide, pinnae up to about 12 pairs, about 3–4 cm. apart, oblique, upper and lower somewhat reduced, upper sessile, lower slightly stalked. Largest pinnae 15 cm. long and 4 cm. wide (pinnae of type up to 13 by 3.5 cm.), base subequally cuneate, each side at 45° or less to costa, the upper base often more remote from rachis than the lower; sides subparallel for most of the length of the pinna, apex usually rather abruptly mucronate, shortly subcaudate (up to 1.5 cm.), edges entire; texture thin but firm, colour dark brown above when dry, paler olivaceous beneath, midrib and veins brown; veins slender, distinctly raised on both surfaces, at about 70° to midrib, about 10 per cm. *Fertile pinnae* up to about 12 pairs, up to about 9 cm. long and 9 mm. wide, dark brown, venation distinct on upper surface, lowest pinnae with stalks about

3 mm., base narrowly cuneate, apex gradually attenuate, narrowly rounded, fertile throughout, without a sterile tip. *Spores* with copious perispore.

BELGIAN CONGO. Youga, *Jespersen* 26 (type, Br.). Lisala, route de Gali, *Robyns* 1111, "forestière marécageuse, fougère arboricole à rhizomes s'accrochant par des crampons aux troncs" (Br.). Vaku, *Wellens* 351 (Herb. Mayombe), "Varenplant groeiend op boomen welke op vochtige plaatsen staan. De stengel, omslingerend heel den boom en is tot 6 meter lang." Entre la Lulue et la Luange, *Vanderyst* 12341. Région de Masla, *Vanderyst* 12577. Popo Kasongo, *Vanderyst* 17594. Yambuya, *Bequaert* 1306, "Forêt marécageuse ombragée."

Young plants are well represented in the Brussels herbarium. They have at first simple fronds, which attain a length of about 8 cm., with stipe 2.5 cm.; width of lamina 1.7 cm. Later fronds have one pair of lateral pinnae about 5 cm. long by 1.3 cm. wide and stipe 7 cm.; subsequent and larger fronds have progressively more lateral pinnae. The edges of laminae of young plants are somewhat crisped when dry, but have the pale cartilaginous margin characteristic of the genus. Such young plants are ascribed to the species by inference only, as there is no single collection showing all stages; there are, however, a few collections showing intermediate stages, and I do not think I am wrong in ascribing the young plants to this species. They certainly do not belong to any other species here mentioned.

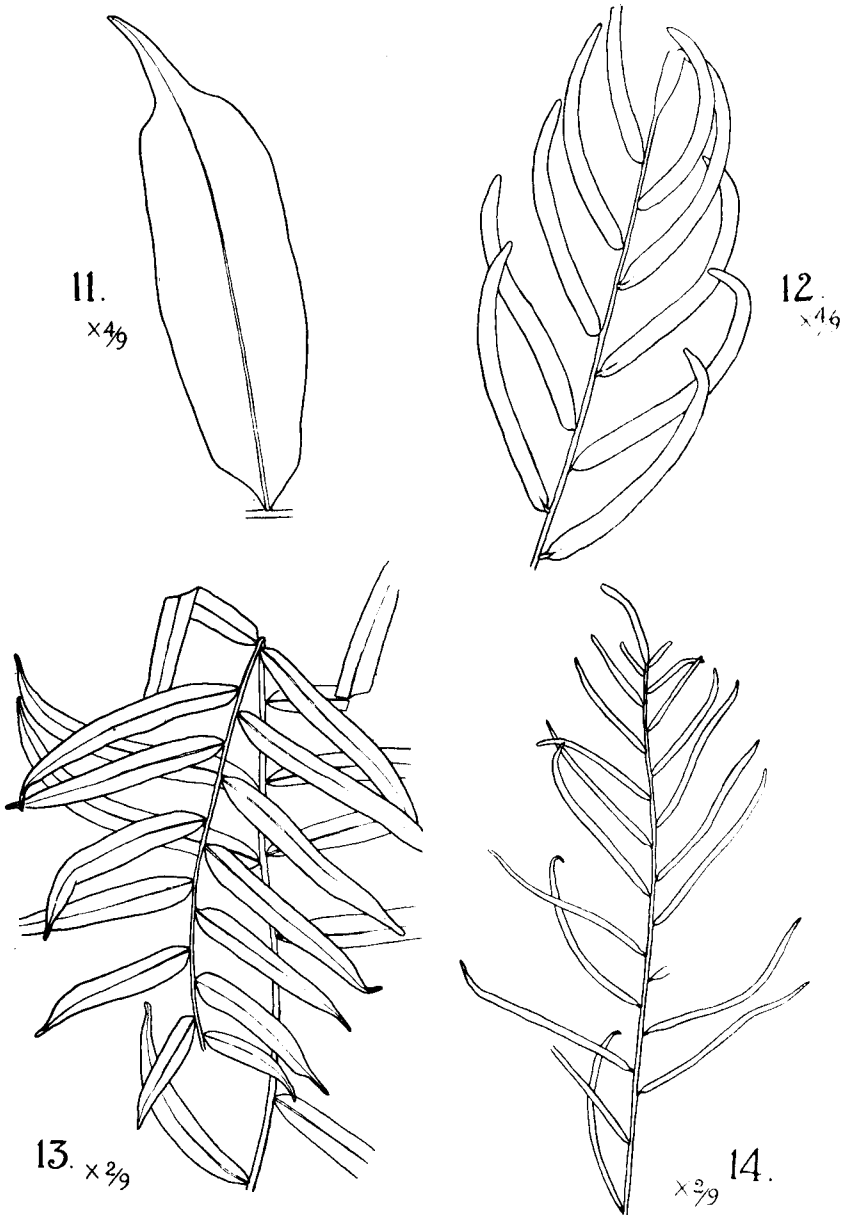
Specimens of young plants. Région des Bamfunuka, Bankana, *Vanderyst* 5478 (Br.). Ipamu, *Vanderyst* 12113, 12061a, b, c (Br.). (These specimens constitute a series, c being the youngest stage, a approaching *Robyns* 1111.)

The type which I have selected seems to me the single specimen best representative of the species, but, if I am right in including certain other specimens, the species may attain a size considerably larger than the type. The rugulose character of the rhizome after the fall of the scales is well shown by *Robyns* 1111, which is rather a small plant, showing a connexion with juvenile stages; unfortunately the spores do not appear to be fully mature. It indicates that probably this species is fertile from a rather small size.

This species seems to me best characterized by its peculiar young stage, and by the long narrow rhizome scales which leave rather prominent warts when they fall.

***Lomariopsis Rossii* Holttum**, sp. nov. (fig. 11, 12); *L. guineënsi* affinis, sed frondibus plantae juvenilis pinnatis, paleis plantae adultae pallidioribus, pinnis sterilibus basi late cuneatis apice minus abrupte contractis, pinnis fertilibus usque ad apicem non caudatum sporangiiferis, sporis perisporio convoluto munitis differt.

Rhizome clothed with light brown scales, their edges shortly ciliate when young, up to about 8 mm. long and 1.5 mm. wide. *Stipe* of sterile frond up to 15 cm. long, pale to medium brown, dull,



11. *L. Rossii* (Type). Middle sterile pinna. 12. *L. Rossii* (Type). Upper part of fertile frond. 13. *L. nigrescens* (Type). Sterile frond. 14. *L. nigrescens* (Type). Fertile frond.

scaly towards the base. *Sterile lamina* up to about 50 cm. long and 20 cm. wide; pinnae about 10 pairs, about 4 cm. apart, oblique, subsessile, upper and lower slightly smaller than rest. Largest pinnae about 14 cm. long by 3.8 cm. wide, base cuneate at about 45° above, more widely cuneate or rounded below, both sides curving throughout, widest at middle, contracted to a subcaudate apex up to 2.5 cm. long; edges entire or minutely sinuous; texture thin but firm, colour when dry dark olivaceous above, slightly paler below; veins slender, distinctly raised on both surfaces, at about 60° to costa, about 9 per cm. *Fertile pinnae* about 10 pairs, up to about 7 cm. long and 7 mm. wide, the upper ones subsessile, the lowest on stalks up to 3 mm. long, base rounded, apex gradually narrowed, bluntly rounded, fertile throughout. *Spores* with copious folded perispore.

NIGERIA. Cambridge Botanical Expedition 1935, Shasha Forest Reserve, Ijebu Province, Baba-Eku, swamp forest, on base of a tree trunk, *Ross* 22 (type, B.M.). Locality as type, *Ross* 235 (B.M.). Niger. Exp. 1857, *Barter* s.n. (K.). River Nun, *Barter* 20110 (K).

FERNANDO PO. *Mann* 444, 374, and s.n. (K.).

Mann's specimens at Kew show both young and adult plants. The youngest specimen has the rachis winged throughout, 7 pairs of pinnae, the largest 7 cm. long and 2.3 cm. wide. It is, thus, not representative of the earliest stage, but the winged rachis is usually associated with plants that are pinnate from the beginning.

Barter's unnumbered specimen includes a fertile frond; his other collection, from River Nun (Niger delta) is sterile, and I am doubtful whether it should be referred here or to *L. muriculata*.

The fertile frond of the type yielded many translucent shrivelled spores as well as those with the folded perispore; the former were presumably either immature or aborted.

***Lomariopsis nigrescens* Holttum, sp. nov. (figs. 13, 14).**

Rhizoma ignotum. *Stipites* tenues, 12 cm. vel ultra longi; paleae brunneae, lanceolatae. *Rhachis* glabrescens, atro-purpureus, apicem versus alatus. *Lamina sterilis* c. 60 cm. longa; pinnae 14-jugae, leviter obliquae, superiores multo redactae, sessiles, infimae haud redactae, petiolulis 2 mm. longis munitae; pinnae maximae c. 14 cm. longae, 1.5 cm. latae, basi subaequaliter cuneatae, acuminatae, apice per c. 1.5 cm. leviter contractae, margine minute irregulariter sinuosae, textura tenues, siccitate supra fere nigrae, subtus olivaceae; venulae obliquae, tenues. *Pinnae fertiles* c. 14-jugae, superiores sensim redactae, sessiles, infimae petiolulis 3 mm. longis munitae; maximae c. 11 cm. longae, 5 mm. latae, basi cuneatae, apice acuminatae.

FERNANDO PO. *Mann* s.n., received Feb. 1861 (type, K.).

The narrow, oblique, rather distant pinnae of this species distinguish it clearly from all others from Africa that I have seen. The type is not a very good specimen, but I think it is quite adequate to characterize the species. In the Kew herbarium is also a specimen

collected on Barter's Niger Expedition, without locality, which perhaps represents a young stage of *L. nigrescens*. The rhizome is slender, stipes 14 cm. long, fronds 30 by 15 cm., about 9 pairs, up to 8 cm. by 1.3 cm. the base more rounded than in the type, colour blackish, rachis winged throughout.

DOUBTFUL SPECIMENS.

In the Brussels herbarium are three specimens from the Belgian Congo which have the same general appearance as the larger specimens referred to *L. guineënsis*, but one of them has spores with a folded perispore. They presumably represent an undescribed species, but without further material, including a better fertile frond, and young stages, the species cannot be adequately characterized. The specimens are as follows:

BELGIAN CONGO. Li Kakola, *Jespersen* 139. Environs Lekada, *Robyns* 1326. Panzo, *Vanderyst* 5845.

LXIII—FRANÇOIS ETIENNE LE JUGE IN MAURITIUS.

RENÉ LE JUGE DE SEGRAIS.

[The following article is an English abstract of a French account by M. de Segras of the work of his ancestor in Mauritius. It supplements in an interesting way the pamphlet by W. Edward Hart entitled "Le Jardin Botanique des Pamplemousses" (Imprimerie du Gouvernement, Port Louis, Île Maurice, 1916), an English abstract of which appeared in K.B. 1919, 279. In a letter M. de Segras tells us that Mongoust was sold at the death of his uncle in 1913 and that the new owners pulled down the house, destroyed the rare plants, and planted the estate with sugar cane. The accompanying photographs, which were taken about fifty years ago, are therefore of special interest.]

On 26th October, 1746, François Etienne le Juge arrived as Counsellor to the Superior Council of the Île de France (Mauritius). He accompanied M. Barthélemy David, whose deputy he had been in the government of Senegal, on the appointment of the latter as Governor General of the Île de France and of Bourbon.

Le Juge had developed a great taste for botany in his youth at the magnificent park of Segras,* where he had been brought up, but his father suffered financial losses, and in 1733, the estate having been sold, the young man had been obliged to seek employment. Through his family's interest in the India Company, he had been made Commandant of Gorée (Senegal) in 1734. He spent twelve years in Senegal, during which time he devoted his leisure to the introduction of fruit trees from Europe, and of a large number of plants which he obtained from America by the agency of slave-trading vessels.

When he arrived in the Île de France, then, the Counsellor already had a certain experience in tropical cultivation: he had

* A castle and estate in the parish of Saint-Sulpice-de-Favières, Department of Seine and Oise, about 25 miles from Paris.



Nephelium longana at Mongoust, planted before 1763.

Photographed in 1880.



also his own method* for importing plants from distant countries, i.e., for their preservation during long sea journeys, their acclimatization, and their propagation. No sooner had he reached the island than he resolved to form a garden for the acclimatization of all plants which he could get from Europe and elsewhere, so that they might be propagated for the general benefit of the Colony. On the 28th March, 1748, he wrote as follows to the Directors of the Company :

“ My establishment† has obliged me to buy a property for £6,000. As the soil is good, I mean to form there a garden, in which I propose to collect not only the fruits and vegetables of the country, but also such trees and plants as I can obtain from elsewhere. I have no doubt that many European fruit trees will flourish wonderfully there, and this emboldens me to ask you, gentlemen, to send me the trees shown on the accompanying list, which comprises those which I think will succeed best. It is not at all my own interest which prompts this request, but the general welfare of the Island, where these trees, being multiplied, will bring great benefit. I know that you have already sent many trees, and I also know, after careful investigation, that they have perished through carelessness, and that that is the only reason why not one of these trees has succeeded. I promise you, gentlemen, that those which you may send to me will be better cultivated. I have grown many

* The following is a description of le Juge's method in his own words : One must have a wooden box, a foot longer than the plants which one is going to put in it, 2 feet deep and as wide as is required for the number of trees. You begin by putting 5 or 6 inches of soil to form a bed in the bottom of the box. This earth must be good and light, free from stones and pebbles. Black, sandy earth is very suitable. It must be in its natural state of humidity and not at all dry. On this bed of soil one lays the plants at full length, after having topped them if they are rather large or without cutting them at all if they are no larger than quills, but one must clip them if they are too long for the box. One damps the roots, trimming and cutting those which are too long as one does when transplanting trees. In a box such as I have described and 2 feet wide, one could put 25 to 30 stumps of trees, i.e., according to the size of the roots, which occupy the greatest space. That is why one must arrange them with the roots facing outwards at either end of the box. When all the plants have been put into the case on top of one another in this way, one begins to put more soil into the box over the trees, sprinkling it with the hands so that all the intervals between the trees and the roots are completely filled. After which, one covers the whole thing with a mass of soil to the depth of 4 or 5 inches. It is most important not to fill the box completely with soil. One must, on the contrary, leave a space of 2 or 3 inches so that air can enter, and to ensure this, one pierces several holes in different parts of the lid. It only remains to nail up the top and put it on board immediately, taking care not to put it in the hold where the great heat and the lack of air would cause the trees to perish, but in an airy place and away from draughts. There will be no need to touch it during the whole journey, even if it lasts for six months or more. It is certain that the trees will arrive fresh and in a good state for transplanting, much better than in open tins or pans.

† He had married Mlle. de Boulac the previous year.

kinds of fruits in the sand of Senegal, which one would not think capable of producing the least thing: there had not been one of them in that part of the concession before I came there, and, therefore, I think that I shall succeed still better in the soil of this island, which is extremely fertile."

The property, which he named Mongoust, was in the district of Pamplemousses, hardly two kilometres from Monplaisir. The Counsellor set to work; he obtained trees and plants of every kind from the four quarters of the globe; he had correspondents in China, in the Straits of Malacca, in India, Madagascar, Mozambique, Brazil, and Senegal. In 1763, he had planted nearly 800 trees, in about 50 species, most of which were adult, and many bearing or about to come into bearing. Of particular importance were 300 mangoes in ten or twelve different kinds, breadfruit, litchis, *longaniers* [*Nephelium longana* Cambess.], avocados, etc. Note that it was he who introduced the cacao*, avocado, custard-apple, *Opuntia*, the *colatier* [*Cola acuminata* Schott and Endl.], several kinds of mangoes, and the famous "*bambous pleins*" | *bambous nains*, *Bambusa multiplex* (Lour.) Raeusch used throughout the colony at the present day for hedges round the houses, which he obtained from the Straits of Malacca. On the 20th November of this year (1763) he sent to the Company a detailed list of all the plants collected in his garden at Mongoust, classified by country of origin, with notes on their acquisition, their cultivation, growth, production, and on the quality and utilisation of their fruits.

Le Juge had these plants distributed throughout the island, but he took care to observe the localities in which particular species succeeded best, and to increase the distribution in those areas.

* According to Adrien d'Epinay, Cossigny de Palma had, since 1760, brought some cacao pods which he had gathered from Manilla trees in the garden of Oulgaret, near Pondicherry; but he adds that the planting of seeds by M. Aublet gave no result, and that consequently Cossigny procured some plants which succeeded well at Palma. It is likely that these plants came from Mongoust, for in 1763 the Counsellor stated that the one and only plant in the two islands was in his garden, and—a curious point—he had almost lost it through fire.

The cacao cultivated in the King's garden some years later with a view to propagation was introduced to Bourbon about 1780, and the first plantation in that island was that of M. Hubert, who had 40,000 plants by the beginning of 1786; M. de Céré specially mentions this in his report for 1785.

With regard to plants whose introduction is due to François Etienne le Juge, M. Elie Pajot, badly informed on the matter, and quite wrongly, in his book "*Simple renseignements sur l'île Bourbon*" (Paris, Challamel, 1887) is pleased to dispute the merits of the Counsellor. Basing his argument on a letter from the latter, dated 1754, thanking M. Lagourgue, an inhabitant of Bourbon, for having obtained for him a plant of Mangosteen, M. Pajot tries to show that it was from Bourbon that this tree came to the île de France. Now, there is no doubt that, from one cause or another, the plant sent by M. Lagourgue failed to grow, for in his catalogue of 1763 Le Juge shows that the eight plants of Mangosteen in his garden were only two years old and that they came from Batavia.

He managed, without any doubt, the garden of Réduit, when David took up residence there. The Governor naturally made use of his capability and devotion, having seen his work in Senegal and being attached to him by a friendship of long standing. Further, after David had left, the Counsellor continued to take a particular interest in the progress of the plants at Réduit; he speaks of them frequently in his "catalogue," while he makes no mention of Monplaisir, which makes one think that at that time this garden was abandoned.

Le Juge died at Port-Louis on 28th January, 1766, at the age of 56.

The Royal Garden of Monplaisir was first formed by La Bourdonnais, but it was Poivre who revived it, developed it on a scientific basis, and who was its real creator. His disciple Céré continued his work, and these two men deserve most of the credit for the garden [see K.B. 1919, 279]. Le Juge did not collaborate with them, for he died a year before Poivre arrived in the Colony, but the Mongoust Orchards were in full bearing at this time, and a great number of the trees and plants which formed the beginnings of the reconstituted garden of Monplaisir came from Mongoust and Réduit.

In addition to being the pioneer, therefore, Le Juge did in a manner share in the creation of the chef d'œuvre, since he provided a part of the material from which it was formed. His scientific knowledge was only equalled by his modesty; his work has passed quite unnoticed except for a brief mention in Bernardin de Saint-Pierre's "*Voyage à l'île de France*." His name appears on the Liénard Column, an obelisk of marble erected in 1860, on which are inscribed the names of benefactors of the Colony.

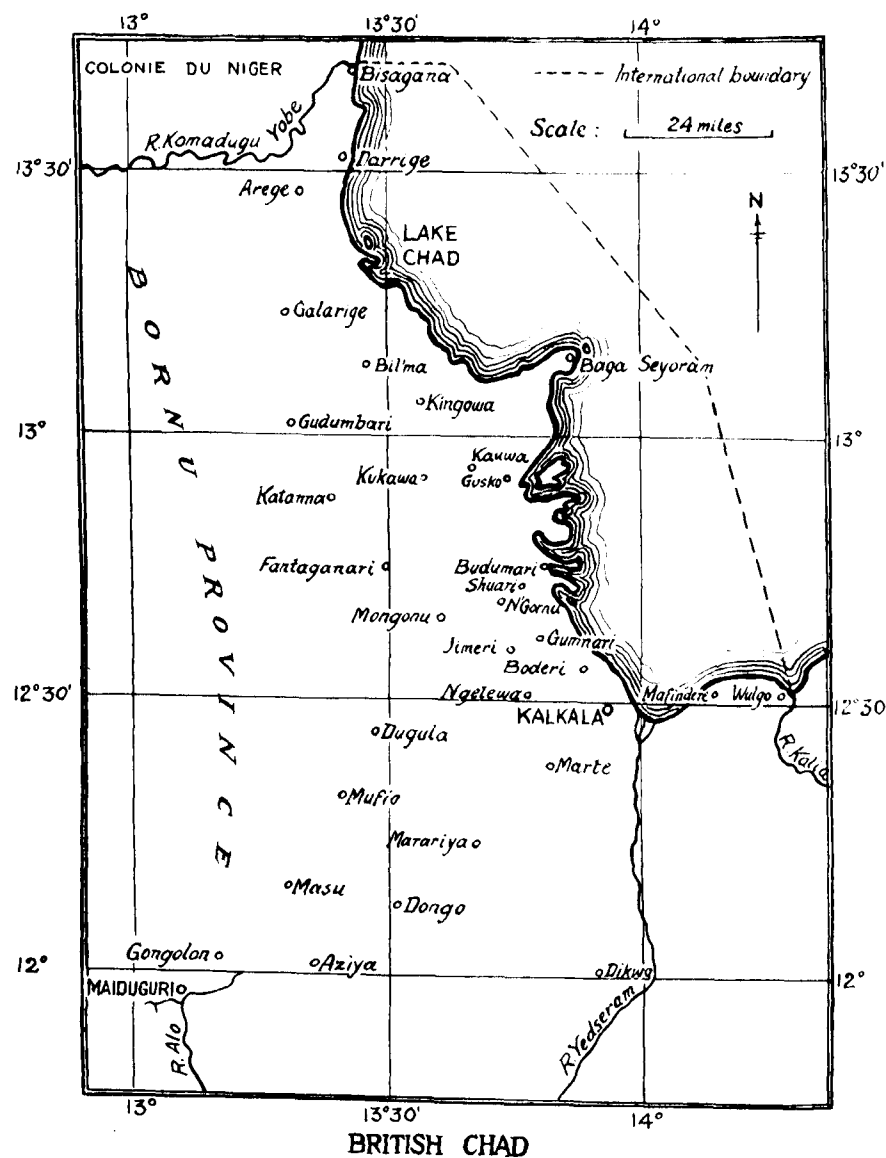
LXIV—NOTES ON THE VEGETATION OF THE NIGERIAN SHORE OF LAKE CHAD. F. D. GOLDING and A. M. GWYNN. (The Department of Agriculture, Nigeria.)

INTRODUCTION.

Approximately 130 miles of the shore of Lake Chad lie in British territory (see map p. 632); of these the most southerly eight miles are situated in mandated Cameroons (administered as the Dikwa Division of the Bornu Province) and the remainder are in the Bornu Emirate.

In recent years the Chad area has been regarded as being a possible outbreak centre of two species of locusts, and the data described below were accumulated during four periods of locust research between 1931 and 1934. An ecological survey was made of the 12 square miles of territory surrounding Kalkala, a village at the south-western corner of the lake, and reconnaissances were carried out along the shore to Bisagana in the north and to Wulgo in the east. Of 17 months spent in the Chad area, about 12 were devoted to the ecological survey and 5 to reconnaissance.

Both species of locusts were found either in grass or farmland habitats and, for that reason, particular attention was paid to grasses, sedges and the weeds occurring on old farmland. Except in the immediate vicinity of villages in 1933, the Kalkala survey area contained only seven trees exceeding fifteen feet in height and most of these have since been killed by the extensive flooding of the lake in 1935 and 1936. The majority of trees in the area under review belong to the genera *Acacia*, *Ziziphus* and *Bauhinia*.



Month and year.	Average max. temp. in shade ° Fahr.	Average min. temp. in shade ° Fahr.	Absolute max. temp. in shade ° Fahr.	Absolute min. temp. in shade ° Fahr.	Average relative humidity. 9 a.m. 3 p.m.	Rainfall in inches.	No. of days on which rain fell.
1933.							
Jan. ...	87.2	59.4	96.8	53.4	38	0	0
Feb. ...	92.5	57.7	108.4	48.0	41	0	0
March ...	99.5	65.3	115.0	60.2	39	0	0
Apr. ...	108.7	70.5	116.0	60.4	42	0.06	1
May ...	105.3	72.1	114.0	62.0	48	2.405	7
June ...	101.1	74.6	111.8	68.0	62	1.37	7
Sept. (9th-30th)	96.1	73.4	100.5	65.0	49	2.79	3
Oct. ...	97.4	66.5	102.5	60.0	39	0	0
Nov. ...	99.9	63.3	103.0	57.5	36.5	0	0
Dec. ...	—	61.1	—	49.5	39	0	0
1934.							
Jan. (1st-21st)	—	57.0	—	53.0	38	0	0
May (24th-31st)	—	—	—	—	—	3.43	3
June ...	97.3	72.7	105.5	69.0	63	1.71	7
July ...	94.6	72.7	104.5	69.5	72	7.03	12
Aug. ...	90.3	72.1	96.0	68.5	81	6.10	15
Sept. ...	94.8	72.6	101.0	69.0	72	1.80	5
Oct. (1st-16th)	100.6	70.5	105.5	62.5	54	0.29	1

Table of meteorological data from the station at Kalkala.

The present paper gives an account of the littoral vegetation at various points along the lake and some notes on the farming methods of the Kalkala villagers, the majority of whom are Shuwa Arabs and the remainder Kanuri.

CLIMATE.

The climate is of the semi-arid type, in which the total rainfall occurs during rather less than six months of the year. Our records indicate that at Kalkala the climate is very similar to that of Maiduguri, a station about 70 miles to the south-west, although the annual rainfall is slightly lower. There is sometimes a shower of rain in April, but the real wet weather does not begin until after the middle of May. The wet season ends with the onset of the arid north-easterly "harmattan" wind in late September or October; this is accompanied by an abrupt fall in atmospheric humidity (see table p. 633). From May to September the prevailing wind is south-west and from October to April it is north-east.

A meteorological station was opened at Kalkala on 1st January, 1933. Records are available for the following periods: 1st Jan. to 30th June, 9th Sept. to 31st Dec. in 1933; 1st Jan. to 21st Jan., 24th May to 16th Oct. in 1934. Maximum and minimum shade temperatures, relative humidity and rainfall are shown in the table on page 633.

Rainfall records for a complete year are not available. In 1934 the precipitation from 24th May to 16th October was 20.36 inches, and it is very improbable that the total rainfall for that year exceeded 21.50 inches. Except for the period 4th to 17th June, records were taken throughout 1932 at Mongonu, a village about 13 miles west of Lake Chad; 19.94 inches of rain fell during the 50 weeks.

ANNUAL FLOODING OF LAKE CHAD.

Each autumn the lake rises and floods large areas to the south and south-west. The northerly section of the shore is protected by ranges of sandhills from 200 yards to 3 or 4 miles from the low water edge of Chad. The borders of the lake are very inconstant, varying not only with the time of year, but also from year to year, depending on the rainfall in the areas which drain into Chad. The extent of the annual flood is also influenced by the strength of the "harmattan." Thus, after a series of wet years the dry-season floods tend to be very extensive and even the low water margin may advance considerably; while after a series of very dry years large areas of the lake may dry up completely (1). It is of interest that the floods have been successively greater each autumn from 1933 to 1936. In 1935, Kalkala was inundated and a new village was built a mile farther inland. In February 1937, eleven of the twelve square miles of the survey area were still under water and the new village was on an island.

Flooding begins in September and reaches its maximum soon after mid-December. During periods of strong "harmattan" the

inundations advance rapidly and then recede when the intensity of the north-easterly wind decreases. The rise and fall of the flood waters at Kalkala were measured between September 1933 and January 1934. The level was constant from 10th to 25th September; there was a rise of 3 inches from the 26th to the 30th, followed by rises of 15 inches in October, 9 inches in November and 8 inches between 1st and 23rd December. It will be seen that the total rise was 35 inches in just under three months. Between 24th December and 27th January there was a fall of 11½ inches. In 1932, the recession of the flood water began a few days before 21st December.

In the littoral area between Gusko and Kalkala there are a number of depressions leading inland from the low water edge of the lake. In years of exceptionally high water the inundations extend for as far as eight miles along certain of the depressions. Sandy areas with an elevation several feet higher than that of the depressions are often entirely surrounded by water from November to March or April. Between Kalkala and Mafindere there are channels which form the delta of the river Yedseram, which flows for only a few months of the year; the first water comes down the river in August.

THE LITTORAL VEGETATION.

During the period when the writers were engaged in locust research (1931 to 1934) in the Chad area the littoral vegetation in the southern section of the shore consisted of well-marked zones running parallel to the shore line. These zones were remarkable in that each was usually dominated by a single characteristic species of grass, often to the almost complete exclusion of any other species. The heavy floods of 1935 and 1936 showed that these zones must be regarded as being inconstant and subject to fluctuation. The bordering zones of vegetation ebb and flow in accordance with variations in the level of the lake. Thus after a series of high water years the hygrophilous zones tend to advance inland and, after a series of dry years, the reverse takes place. In 1933, a map was made (2) showing the distribution of the various species of grasses and other plants in the survey area at that time; an examination of the area after the heavy floods of 1935 and 1936 produced evidence that the advance of hygrophilous species had been very considerable.

The low water level of Lake Chad (in years of inextensive flooding) is fringed by a belt of *Cyperus Papyrus* Linn. In the northern part of the shore this belt varies in width from about five to forty yards and is bounded on its eastern side by open water, dotted here and there with papyrus islands. The south-western part of Chad is almost entirely covered with dense vegetation and there is very little open water. Large areas of *C. Papyrus* were seen near Kalkala, Mafindere and at the mouth of the Kalia river near Wulgo.

The constituents of the vegetative zones and the approximate width of each belt at three points on the northern shore (in 1931) are recorded below.

(a) *Bisagana, 24th October.*

Open water followed by 5 to 30 yards of *Cyperus Papyrus*—50 yards of *Echinochloa pyramidalis* Hitchc. et Chase 120 yards *Peristrophe bicalyculata* (Retz.) Nees and farmland 50 yards *Acacia spp.*—*Peristrophe bicalyculata*, *Pennisetum pedicellatum* Trin. and *Cenchrus biflorus* Roxb.

(b) *Darrige, 22nd October.*

Open water followed by 40 yards of *Cyperus Papyrus* 160 yards of ? *Phragmites communis* Trin.—40 yards of *Echinochloa pyramidalis*, *Cyperus articulatus* Linn. and a little *Phragmites* sp. 250 yards of *Cynodon Dactylon* Pers., *Sporobolus spicatus* Kunth, *Pennisetum pedicellatum*, *Acacia spp.* and *Cenchrus biflorus*.

(c) *East of Arege, 23rd October.*

Open water followed by *Cyperus Papyrus* and ? *Phragmites communis* belts—60 yards *Echinochloa pyramidalis* and a little *Phragmites* sp.—50 yards *Sporobolus spicatus* and old farmland 50 yards dense trees, mostly *Acacia* a slight rise covered with *Cenchrus biflorus*.

The first three belts at Darrige and the first two at Arege were under water.

The shore line to the south of Baga Seyoram is less clearly defined and is characterised by large depressions running inland.

The vegetation in the ecological survey area at Kalkala was studied in some detail and has been described at length elsewhere (2). In this area, the water is at the low-water level for only two or three months in the year. The hygrophilous grasses, *Fossia cuspidata* Griff. and *Echinochloa pyramidalis* occupy the zone on the inland side of the papyrus belt; clumps of *Herminiera elaphroxylon* Guill. & Perr. are not uncommon, but the trees are seldom more than about six feet in height in British Chad. This marsh-grass zone is followed by a plain of *Cynodon Dactylon* which is often about 400 yards in width. In some places there is a narrow belt of *Brachiaria ramosa* Stapf between the marsh-grass and the *Cynodon*; *Brachiaria* is particularly abundant in the Yedseram delta region and extends inland along the watercourses. Patches of the sedges *Cyperus articulatus* and *C. dives* Del. occurred in the lower part of the *Cynodon* belt; during the time when the floods have receded to the *Fossia* the Arab women dig up the roots of *C. articulatus*, which, when placed on a fire, give off an odour repellent to mosquitoes. At high water the network of flooded channels surround sandy islands covered with *Cymbopogon giganteus* Chiov. To the north of Kalkala there is a large sandy peninsula covered with *Cymbopogon* which adjoins the *Cynodon* belt.

In years of normal flood the high water mark is at the inland edge of the *Cynodon*; in places there is a belt of both grasses and, if the inundations are greater than usual, the *Cynodon* advances farther inland and the flooded *Cymbopogon* dies. Patches of *Chloris Gayana* Kunth occur at the edge of the *Cymbopogon* peninsula, and farther out in the channels there are areas of *Brachiaria ramosa*. Excessive flooding leads to the replacement of *Chloris* by *Brachiaria*. Similarly the sedges replace *Cynodon* and, nearer the lake, *Echinochloa* replaces *Brachiaria*. In February, 1937, eleven of the twelve square miles of the survey area were still under water, the *Cymbopogon* peninsula had become a comparatively small island and the changes in vegetation generally were very great. The former *Cynodon* belt was covered with *Cyperus articulatus*, *Brachiaria* and *Echinochloa* or with open water, beneath which could be seen apparently dead plants of *Cynodon*. Much of the *Cymbopogon* appeared to have been killed and will probably be replaced by *Cynodon*.

Before describing the vegetation of the farmland areas, not normally subjected to flooding, it is necessary to mention the dicotyledonous species which occur in the grass habitats. The *Echinochloa* and *Brachiaria* belts contain small patches of *Herminiera elaphroxylon*; *Lippia nodiflora* Rich. is occasionally seen in *Cynodon* areas, while the *Chloris* patches consist solely of that grass. The sandy *Cymbopogon* areas contain patches of *Pavonia hirsuta* Guill. et Perr., *Indigofera pulchra* Willd., *Calotropis procera* Ait., and a few stunted *Acacia* and *Ziziphus*. The old groundnut farms in the belt are populated with many of the annual weeds found on the inland cultivated areas.

In the inland farmed areas, not subject to annual flooding in normal years, patches of *Peristrophe bicalyculata* cover fallow land along the high water mark. The most common weeds of old farmland are *Pulicaria undulata* DC., *Corchorus tridens*, Linn.; *Brachiaria lata* C. E. Hubbard; *Trichodesma africana* (Linn.) R. Br.; *Heliotropium undulatum* Vahl; *Aerva persica* (Burm.) Merrill; *Farsetia ramosissima* Hochst. var. *macrocarpa* Schweinf., and *Leucas martinicensis* R.Br. In addition to the above species the following were collected in January, 1933, on old farmland:

Polycarpaea corymbosa Lam.; *Trianthema pentandra* Linn.; *Celosia laxa* Sch. et Thonn.; *Amaranthus Blitum* Linn.; *Abutilon muticum* (Del.) Webb; *Euphorbia scordifolia* Jacq.; *E. convolvuloides* Hochst. ex Boiss.; *Cassia Aschrek* Forsk.; *Indigofera oblongifolia* Forsk.; *Crotalaria arenaria* Benth.; *Leptadenia lancifolia* Decne.; *Mitracarpum verticillatum* Vatke; *Vicoa auriculata* Cass.; *Pegolettia senegalensis* Cass.; *Dicoma tomentosa* Cass.; *Centaurea senegalensis* DC.; *Lactuca taraxacifolia* Thonn.; *Heliotropium zeylanicum* Lam.; *Physalis angulata* Linn.; *Solanum incanum* Linn. and *Jacquementia capitata* G. Don.

Scattered plants of *Calotropis procera* Ait. occurred in this area.

The following four species of *Papilionaceae* were found in habitats subject to flooding; they flowered at the end of the rains and died early in the dry season: *Indigofera secundiflora* Poir.; *Crotalaria goreensis* Guill. et Perr.; *C. intermedia* Kotschy and *C. sphaerocarpa* Perr. ex DC. *Hibiscus asper* Hook. f. occurred near the limit of the floods.

Clumps of Bulrush (? *Typha australis* Schum. et Thonn.) were observed in very heavy soil in the middle of a depression which was flooded in the dry season. *Sorghum aethiopicum* Rupr. ex Stapf is a very common grass in farmland subject to annual flooding and it occurs in vast belts in the "black cotton soil" of northern Dikwa and in various localities between Gusko and Kalkala.

NOTES ON AGRICULTURAL PRACTICE AT KALKALA.

Agricultural practice at Kalkala is largely influenced by the autumn flooding of Lake Chad. As will be seen from the succeeding paragraphs, the system of cropping is altered in years when the recession of the inundations is later than usual. The incoming flood waters are controlled by means of mud dykes across the narrowest parts of the depression (to the north-west of the village) along which Chad advances to flood the inland farmland. The dykes are kept in position until the Maize harvest is completed; after that the dykes are opened and the flood waters are used for irrigating the dry season Guinea Corn. The local fishermen subsequently build or renovate dykes and catch large quantities of fish in mud-walled traps when the waters recede.

Dry season Guinea Corn or "*mazakwa*."—This crop has been identified at the Royal Botanic Gardens, Kew, as being intermediate between *Sorghum caudatum* Stapf var. *Feterita* Stapf and *Sorghum Durra* Stapf var. *niloticum* (Koern.) Snowden.

Seed-beds are prepared near the village in the first half of August. The seedlings are transplanted between early September and mid-October into land which is not subject to flooding later in the year or which is protected by dykes. In the latter case, irrigating channels are cut and the supply of water in the dyke-protected area is controlled; the water is kept off the fields until about three weeks before harvesting begins.

Harvesting takes place between mid-December and mid-January and is preceded by some weeks of bird-scaring. This is carried out by people who spend the entire day on raised platforms in the fields; frequently one scarer can cover a large area by means of ropes to which are attached pieces of calabashes. The "*mazakwa*" is stooked and the tops of the stooks are covered with weeds to protect the grain from birds, of which the Niger Mourning Dove and the Red-billed Dioc are the worst offenders. In 1932, the grain smut, *Sphacelotheca Sorghi* (Lk.) Clinton, was common in fields where the "*mazakwa*" was standing in water and Witchweed, *Striga senegalensis* Benth., was prevalent in localised areas.

Several other varieties of *Sorghum* are grown. In March, 1933, small areas of land from which the floods had recently receded were planted with *Sorghum* sp. In the second half of September, 1934, guinea corn was harvested; the plants were two to three feet high in early June. *Sorghum nigricans* Snowden var. *peruvianum* and *S. caudatum* Stapf var. *gibbum* Stapf were collected by the writers from the Chad area.

Maize.—In 1933 maize sowing was begun on 29th June in heavy soil (37 per cent. silt and clay) subject to inundation later in the year. In 1934, sowing took place between 13th and 20th July, following a break in the rains of four weeks duration, which ended on 12th July. Harvesting is carried out between mid-September and the end of October. In recent years the crop has been severely damaged by the African Migratory Locust.

Bulrush Millet or "*gero*."—*Pennisetum typhoides* (Burm.) Stapf et Hubbard is sown after the first rains in May on land not subject to inundation (21 per cent. silt and clay). A week or two before the harvest the plants are trampled down with the object of protecting the seedheads from attack by birds and locusts. Harvesting begins in early September and ends in early October.

A dwarf variety known as "*ligi*" is sown in years when the floods are late in receding. It is sown in the very heavy clay soil as the water recedes (probably in February and early March) and it is harvested between mid-May and mid-June.

Cowpeas (*Vigna unguiculata* (Linn.) Walp.)—Cowpeas are sown in the very heavy clay soil as the water gradually recedes; sowing begins in mid-December and ends in mid-March. There are four varieties which are sown in succession and always in the same order. In 1933, the first flowers appeared on the earliest-sown variety on 1st March and, by the 26th of March, some pods were ready for picking. The harvest ended in mid-June and the haulms were then brought to the village and used as fodder. In 1933, no "*ligi*" was sown, but in the following year a considerable area of this millet was planted below the Cowpeas because, owing to the lateness of the recession of the floods, there was not time for late-sown Cowpeas to mature before the beginning of the rains. The young pods were attacked by the larvae of the Noctuid moth, *Prodenia litura* F., and of a Lycamid butterfly (probably *Euchrysops malathana* Bdv.).

Groundnuts (*Arachis hypogaea* Linn.)—This crop is sown in June on sandy soil (10 per cent. silt and clay) and on heavier land not subject to inundation. Groundnuts are sometimes sown through Bulrush Millet; harvesting takes place in early October.

Cotton.—A perennial Cotton is grown in the sandy soil; the area is increased by sowing strips of land at the edge of the field. Young seedlings, spaced from three to five feet apart, were seen in October. All the lint is used locally.

Strips of Cotton are sown in February in the Cowpea land with the object of demarcating the various plots belonging to different farmers.

Wheat.—Most of the wheat is grown by the side of a large pond. The field is divided into beds with raised irrigation channels between them and the water is raised by means of shadoof. Sowing takes place between mid-December and the end of January, and harvesting from mid-March to mid-April.

Other Crops.—A gourd-like plant ("bambusa," *Citrullus vulgaris* Schrad.) is sown in March in the centre of the area formerly flooded. Holes are made in the very stiff clay and a little sand is put in each hole before the seeds are sown. The crop ripens in May and the first part of June; the fruits have a peculiar but pleasant taste and are picked by the Arabs as required.

Tobacco, onions, *Hibiscus esculentus* Linn., *Indigofera* and calabashes are also grown.

A complete list of the plants collected by the writers in Bornu will be found in the appendix.

In conclusion, the writers wish to acknowledge their indebtedness to the Director and staff of the Royal Botanic Gardens for identifying the plant specimens; to Messrs. H. C. Doyne and W. A. Watson for analysing soils and to Mr. J. West for identifying the smut on "mazakwa."

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APPENDIX

LIST OF PLANTS COLLECTED IN BORNU BY F. D. GOLDING AND A. M. GWYNN.

(After each species the author's collecting number, locality, and month of collection are given, in that order.)

CRUCIFERAE

Farsetia ramosissima Hochst. var. *macrocarpa* Schweinf. (70, Kalkala, Jan.).

CARYOPHYLLACEAE

Polycarpha corymbosa Lam. (58, Kalkala, Jan.).

FICOIDACEAE

Trianthema pentandra Linn. (44, Kalkala, Jan.).

AMARANTACEAE

Amaranthus Blitum Linn. (48, Kalkala, Jan.). *Celosia laxa* Sch. et Thonn. (61, Kalkala, Jan.). *Aerva persica* (Burm.) Merrill (56, Kalkala, Jan.).

TILLIACEAE

Corchorus tridens Linn. (133, 134, Kalkala).

MALVACEAE

Abutilon muticum (Del.) Webb (64, Kalkala, Jan.). *Pavonia hirsuta* Guill. et Perr. (25, 97, Bisagana, Baga Seyoram, Oct., Kalkala). *Hibiscus asper* Hook. f. (93, Kalkala).

EUPHORBIACEAE

Euphorbia scordifolia Jacq. (74, Kalkala, Jan.). *E. convolvuloides* Hochst. ex Boiss. (65, Kalkala, Jan.).

CAESALPINIACEAE

Cassia Aschrek Forsk. (62, Kalkala, Jan.).

PAPILIONACEAE

Indigofera secundiflora Poir. (90, Kalkala, May–Sept.). *I. pulchra* Willd. (137, Kalkala). *I. oblongifolia* Forsk. (63, Kalkala, Jan.). *Crotalaria goreënsis* Guill. et Perr. (88, Kalkala, May–Sept.). *C. intermedia* Kotschy (89, Kalkala, May–Sept.). *C. sphaerocarpa* Perr. ex DC. (87, Kalkala, May–Sept.). *C. arenaria* Benth. (51, Kalkala, Jan.). *Herminiera elaphroxylon* Guill. et Perr. (91, Kalkala). *Alysicarpus glumaceus* (Vahl) DC. (96, Kalkala).

ASCLEPIADACEAE

Leptadenia lancifolia Decne. (45, Kalkala, Jan.).

RUBIACEAE

Mitracarpum verticillatum Vatke (54, Kalkala, Jan.).

COMPOSITAE

Pulicaria undulata DC. (57, Kalkala, Jan.). *Vicoa auriculata* Cass. (60, Kalkala, Jan.). *Pegolettia senegalensis* Cass. (68, Kalkala, Jan.). *Dicoma tomentosa* Cass. (75, Kalkala, Jan.). *Centaurea senegalensis* DC. (71, Kalkala, Jan.). *Lactuca taraxacifolia* Thonn. (136, 59, Kalkala, Jan.).

BORAGINACEAE

Heliotropium zeylanicum Lam. (43, Kalkala, Jan.). *H. undulatum* Vahl (98, 99, 47, Kalkala, Jan.). *Trichodesma africanum* (Linn.) R. Br. (100, 46, Kalkala, Jan.).

SOLANACEAE

Physalis angulata Linn. (53, Kalkala, Jan.). *Solanum incanum* Linn. (52, Kalkala, Jan.).

CONVOLVULACEAE

Jacquemontia capitata G. Don (95, 49, Kalkala, Jan.).

VERBENACEAE

Lippia nodiflora Rich. (101, 24, Baga Seyoram, Oct., Kalkala).

LABIATAE

Leucas martinicensis R. Br. (94, 50, Kalkala, Jan.).

CYPERACEAE

Scirpus supinus Linn. (30, Galarige, Oct.). *Fimbristylis exilis* Roem. et Schult. (17, Kauwa, Oct., Baga Seyoram, Oct.). *Cyperus*

dives Del. (81, Kalkala, May). *C. bulbosus* Vahl (14B, Kauwa, Shuari, Marte, Mongonu, Kalkala, Oct. and Nov.). *C. Zollingeri* Steud. (79, Kalkala, May). *C. sphacelatus* Rottb. (116, 135, Ngala, Oct., Kalkala). *C. esculentus* Linn. (14A, Galarige, Oct.). *C. articulatus* Linn. (83, 35, Bisagana, Darrige, Arege, Oct., Kalkala, May). *C. Papyrus* Linn. (23, Bisagana, Darrige, Arege, Baga Seyoram, all Oct.). *Pycnus Mundtii* Nees (112, Baga Seyoram, Dec.).

GRAMINEAE

Eragrostis ciliaris (Linn.) R.Br. (16, Kauwa, Gusko, both Oct.). *E. diplachnoides* Steud. (39, Marte, Nov.). *E. aegyptiaca* Del. (132, Kalkala). *E. biformis* (Kunth) Benth. (110, Baga Seyoram, Dec.). *E. tremula* Hochst. ex Steud. (3, Mongonu, Oct.). *E. albida* Hitchc. (132, Kalkala). *E. cilianensis* (All.) Lutati (2, Mongonu, Oct.). *Diplachne fusca* (Linn.) Beauv. (129, Kalkala, June). *Leptochloa coerulescens* Steud. (33, Arege, Oct.). *Dinebra retroflexa* (Vahl) Panzer (40, Kalkala, Marte, both Nov.). *Dactyloctenium aegyptium* (Linn.) Beauv. (11, Mongonu to Arege, Oct.). *Coclachyrum obligobrachiatum* A. Camus (37, Arege, Oct.). *Chloris pilosa* Schum. (6, Mongonu, Oct.). *C. Gayana* Kunth (78, 21, Gusko, Oct., Kalkala, Jan.). *C. Priouri* Kunth (127, 20, Gusko, Kauwa, both Oct., Shuari, Gumnari, Bodoweri, all Nov.). *Cynodon Dactylon* (Linn.) Pers. (104, 19, Baga Seyoram to Kalkala, Darrige, between Nigornu and Shuari). *Schoenefeldia gracilis* Kunth (7, Mongonu to Arege, Oct.). *Sporobolus spicatus* (Vahl) Kunth (18, Gusko, Shuari, Bodoweri, Darrige, Arege). *S. helvolus* (Trin.) Dur. et Schinz (38, Arege, Gumnari, Bodoweri, Kalkala). *Aristida adscensionis* Linn. (15, 32, Arege, Mongonu, both Oct.). *A. funiculata* Trin. et Rupr. (31, Mongonu to Arege; Kauwa, Oct.). *A. stipoides* Lam. (106, 128, 125, Kalkala, Kauwa, Oct.). *A. pallida* Steud. (29, Kingowa, Oct.). *A. mutabilis* Trin. et Rupr. (126, Kauwa, Oct.). *Leersia hexandra* Sw. (84, Mafindere, Feb.). *Panicum repens* Linn. (105, 26, Baga Seyoram, Oct., Kalkala). *P. glabrescens* Steud. (130, Kalkala). *Sacciolepis africana* Hubbard et Snowden (109, Baga Seyoram, Bisagana, both Dec.). *Setaria verticillata* (Linn.) Beauv. (12, Mongonu). *Echinochloa obtusiflora* Stapf (118, Kasa, common in N. Dikwa Division, Oct.). *E. colonum* (Linn.) Link (119, 9, Mongonu, Gusko, Baga Seyoram, Oct., N. Dikwa Division, Oct.). *E. pyramidalis* (Lam.) Hitchc. et Chase (34, Bisagana, Darrige, Oct., Arege, Shuari, Kalkala). *E. stagnina* (Retz.) P. Beauv. (117, Gajibo, Kasa, both Oct., Asiya, Jan.). *Brachiaria lata* (Schum.) C. E. Hubbard (131, Kalkala). *B. xantholeuca* (Hack.) Stapf (8, Mongonu, Oct.). *B. ramosa* (Linn.) Stapf (78, Kalkala, Jan.). *Eriochloa nubica* (Steud.) Hack. et Stapf (113, Ngala, N. Dikwa Division, Oct.). *Pennisetum ramosum* (Hochst.) Schweinf. (114, 27, Kingowa, Oct., Marte, Ngala, N. Dikwa Division, Oct.). *P. mollissimum* Hochst. (22, Kukawa, between Kauwa and Baga, between Gumnari and Bodoweri, between Kalkala and Marte, Gusko, Oct.). *P. Rogeri*

Stapf et Hubbard (122, Wurge). *P. pedicellatum* Trin. (10, 41, 120, 121, Gusko, Wurge, Oct., Bisagana, Asiya, Maiduguri, Marte Darrige, between Kauwa and Baga). *Cenchrus biflorus* Roxb. (13, Kalkala, Galarige, Fantaganari, between Mongonu and Bisagana). *Imperata cylindrica* Beauv. var. *Thunbergii* (Retz.) Dur. et Schinz (80, Kalkala, May). *Sorghum aethiopicum* Rupr. ex Stapf (77, Kalkala, Jan.). *Schizachyrium exile* (Hochst.) Stapf (5, Mongonu, Oct.). *Andropogon Gayanus* Kunth var. *squamulatus* (Hochst.) Stapf (108, 124, 28, Kingowa, Oct., Kauwa, Oct., Ngala, Oct., Mongonu, Jan.). *Cymbopogon proximus* (Hochst. ex A. Rich.) Stapf (4, Mongonu, Kauwa, Kingowa, Gusko, Galarige, Kukawa, N'Gornu, Fantaganari). *C. giganteus* (Hochst.) Chiov. (1, Shuari to Kalkala, Kauwa, Gusko, Baga Seyoram, between Mongonu and N'Gornu). *Hyparrhenia dissoluta* (Steud.) C. E. Hubbard (123, Kauwa, Oct., Jillum, Oct., Mongonu, Jan.). *Vossia cuspidata* (Roxb.) Griff. (103, 82, Kalkala, May).

LXV—NOTES ON AFRICAN GRASSES: XXII.*

Tropical African Grasses. C. E. HUBBARD.

Helictotrichon Thomasii C. E. Hubbard in Kew Bull. 1936, 500, diagn. tantum, et in Hill, Fl. Trop. Afr. 10, 107 (1937), descr. angl.

Gramen perenne (?). *Culmi* geniculato-adscendentes, usque ad 1 m. longi, graciles, simplices, 3-nodes, paniculam et nodos versus asperuli, ceterum glabri laevesque. *Foliorum vaginæ* internodiis breviores, angustae, glabrae, nervis retrorse scaberulae; ligulae truncatae, laceratae, circiter 1 mm. longae; laminae anguste lineares, tenuiter acutae, usque ad 18 cm. longae et 3 mm. latae, planae, demum reflexae, scaberulae, sparsissime pilosae vel glabrae. *Panicula* linearis, interrupta, 10–15 cm. longa, circiter 6 mm. lata; rhachis gracillima, scaberula; rami erecti, solitarii vel bini, simplices, 1–3-spiculati, filiformes, dense scaberuli, inferiores usque ad 3 cm. longi; pedicelli dense et minute hispiduli, laterales 1–2 mm. longi, terminales elongati. *Spiculae* anguste oblongae, 10–13 mm. longae, pallide virides, appressae. *Glumae* acutae, hyalinae; inferior anguste lanceolata, 2.5–3 mm. longa, 1-nervis, laevis; superior oblonga, 4–4.5 mm. longa, 3-nervis, carina scaberula. *Anthoecii* 3–4: rhachillae internodia circiter 2 mm. longa, pilis usque ad 1.5 mm. longis pilosa; callus obtusus, brevis, barbatus. *Lemmata* exserta, a latere visa oblongo-lanceolata et acuta, 6.5–7 mm. longa (inferiora), coriacea, marginibus angustis et apice hyalinis, 7-nervia, supra medium tenuiter scaberula, apice breviter biloba, lobis mucronatis; arista triente superiore lemmatis orta, geniculata, usque ad 1 cm. longa, columna laxa torta circiter 4 mm. longa. *Paleae* lineares, 5–6 mm. longae, carinis superne scabridis. *Antherae* 2 mm. longae. *Ovarium* hispidulum.

SUDAN: Mongalla Province; Imatong Mtns., Mt. Kineti, in forest in ravine, 2700 m., Thomas 1862.

* Continued from K.B. 1937, 63.

Koeleria cristata (L.) Pers. var. **shiraënsis** C. E. Hubbard in Kew Bull. 1936, 500, diagn. tantum, et in Hill, Fl. Trop. Afr. **10**, 97 (1937), descr. angl.

Culmi e rhizomate brevi orti, erecti, usque ad 45 cm. alti, basin versus 2-3-nodes, validiusculi. *Foliorum vaginæ* usque ad 28 cm. longae, glabrae; laminae angustissime lineares, usque ad 30 cm. longae, explanatae circiter 2 mm. latae, conduplicatae, marginibus involutis, glabrae. *Panicula* linearis-oblonga vel anguste lanceolata, densa, inferne interrupta, 7.5-15 cm. longa, 1-2 cm. lata. *Spiculae* 6-7.5 mm. longae, 2-3-florae. *Glumae* carinis superne scaberulae vel ciliolatae; inferior linearis, acuminata, 5-7 mm. longa, 1-nervis; superior oblanceolato-oblonga vel anguste elliptico-oblonga, acute acuminata, 6-7.5 mm. longa, 3-nervis. *Lemmata* elliptico-oblonga, acuta, 5-7 mm. longa, lateribus laevibus, carinis superne scabridis vel ciliolatis. *Antherae* 2 mm. longae.

TANGANYIKA TERRITORY: Shira Mts., West of Mt. Kilimanjaro, 3000 m., Haarer 1122 A.

Agrostis Tylori C. E. Hubbard in Kew Bull. 1937, 63, diagn. tantum, et in Hill, Fl. Trop. Afr. **10**, 177 (1937), descr. angl.

Gramen perenne, 15-30 cm. altum, nonnunquam caespitosum. *Culmi* erecti, vel e basi brevi repente adscendentes, graciles, simplices, basi excepta enodes, glabri, laeves, internodia summo (pedunculo) demum exserto. *Folia* glabra; vaginæ imbricatae, tenuiter striatae, laeves; ligulae ovato-oblongae vel oblongae, obtusae, 2-4 mm. longae, membranaceae; laminae anguste lineares, apice obtusae vel subacutae, usque ad 12.5 cm. longae, planae vel siccitate involutae, usque ad 2 mm. latae, rigidiusculae vel flaccidae, erectae, apicem versus scaberulae. *Panicula* erecta, ovata vel ovato-oblonga, laxissima, 2.5-12.5 cm. longa, 1-2-5 cm. lata; rhachis gracilis, glabra, laevis; rami plerumque bini, laxè trichotomo-divisi, tenuiter filiformes, demum horizontaliter patentes, glabri, laeves, inferiores usque ad 5 cm. longi; pedicelli laeves, 3-10 mm. longi. *Spiculae* elliptico-lanceolatae vel elliptico-oblongae, 2.5-3 mm. longae, virides et purpureo-tinctae; rhachilla supra anthoecium brevissime producta, glabra, nonnunquam usque ad 0.4 mm. longa et anthoecium reductum ♀ gerens. *Glumae* subaequales vel superior inferiore paullo brevior, acutae vel obtusae, dorso et basin versus firmè membranaceae, 3-nerves, nervis minute glandulosae, ceterum laeves; inferior a latere visa lanceolata; superior a latere visa lanceolato-oblonga. *Lemmata* late elliptica (explanata), emarginata vel truncato-emarginata, usque ad 2.5 mm. longa, membranacea, supra medium minute asperula, ceterum glabra et laevia, 5-nervia, nervis lateralibus excurrentibus et in mucrones tenues breves productis; arista infra medium lemmatis orta, tenuissima, leviter brevissime barbatus. *Palea* oblonga, 1 mm. longa, hyalina, obscure 2-nervis vel enervis. *Antherae* 0.6-1 mm. longae. *Caryopsis* oblonga, 1.5 mm. longa.

UGANDA: Kigezi District; Virunga Mts., Mt. Muhavura, 3750 m., Taylor 2133 (typus, Herb. Mus. Brit.); Mt. Mgahinga, on crater rim below giant heaths, 3420 m., Taylor 1954.

Leptagrostis C. E. Hubbard in Kew Bull. 1937, 63, diagn. tantum.

Spiculae lanceolatae vel demum anguste oblongae, acuminatae, in paniculis angustis contractis breviter pedicellatae; rhachilla supra glumas disarticulans, supra anthoecium in setam tenuem brevem glabram vel leviter pubescentem producta. *Anthoecium* 1, ♀, glumae superiori aequilongum vel paullo longius. *Glumae* persistentes, lanceolatae, tenuiter acutae, acuminatae, superne carinatae, tenuiter membranaceae, inaequales; inferior superiore conspicue brevior, 1-nervis; superior 3-nervis. *Lemma* a latere visum anguste oblongum, dorso rotundatum, late lanceolatum (explanatum), acute acuminatum, apice integrum vel demum minutissime bidentatum, tenuiter membranaceum, 3-5-nervis, nervis lateralibus obscuris, nervo medio excurrente et in aristam rectam brevem producta; callus obtusus, pilis longis tenuissimis dimidiam partem lemmatis barbatus. *Palea* angusta, 2-nervis, lemmati fere aequilonga, membranacea. *Lodiculae* 2, oblongae, hyalinae. *Stamina* 3. *Ovarium* glabrum; styli distincti, breves; stigmata breviter plumosa, ex anthoeciis lateraliter exserta.—*Gramen* annum?, culmis gracilibus; foliorum laminae angustae, planae; ligulae ad seriem ciliorum redactae; paniculae graciles; anthoecium pilis flexuosis longis circumdatum.

Species 1, Abyssiniae incola.

Leptagrostis Schimperiana (Hochst.) C. E. Hubbard in Kew Bull. 1937, 63. *Calamagrostis Schimperiana* Hochst. in Flora, **38**, 202 (1855).

Culmi caespitosi, circiter 22 cm. alti, erecti, graciles, simplices, 2-nodes, glabri, laeves, internodiis superioribus demum exsertis. *Foliorum vaginæ* striatae, ore pilosae, marginibus nonnunquam sparse ciliatae, ceterum glabrae, laeves; laminae anguste lineares, in apicem setaceum attenuatae, 10-12.5 cm. longae, 2-6 mm. latae, supra laxè pilosae et nervis dense asperulae, subtus glabrae et laeves. *Panicula* densiuscula, 5-12.5 cm. longa; rhachis gracillima, glabra, laevis; rami bini, erecti, tenuiter filiformes, divisi vel basi simplices, laeves; pedicelli 0.5-1 mm. longi. *Spiculae* 3.5-4 mm. longae, pallide brunneae et purpureo-tinctae. *Glumae* carina apicem versus scaberulae; inferior 2.5-3 mm. longa; superior 3.5-4 mm. longa. *Lemma* 3.7-4 mm. longum, glabrum, laeve; arista usque ad 1 mm. longa; callus pilis albis usque ad 3.5 mm. longis praeditus. *Palea* apice ciliolata. *Antherae* 1.5 mm. longae.

ABYSSINIA: Samen, 1854, Schimper 1330 (Herb. Mus. Hist. Nat. Paris).

Danthonia Davyi C. E. Hubbard in Kew Bull. 1936, 501, diagn. tantum, et in Hill, Fl. Trop. Afr. **10**, 137 (1937), descr. angl.

Gramen perenne, dense caespitosum, circiter 90 cm. altum, innovationibus intravaginalibus. *Culmi* erecti, graciliusculi, simplices, enodes, glabri, laevissimi. *Foliorum* vaginae basales stramineae, coriaceae, extra glabrae et nitentes, intus appresse strigosae, superiores imbricatae, arcte appressae, glabrae, laeves; ligulae ad seriem densam ciliorum redactae; laminae angustissime lineares, setaceae, pungentes, usque ad 60 cm. longae, arcte convolutae, circiter 2 mm. latae (explanatae), rigidae, virides, subtus glabrae et laeves, supra nervis minutissime hirsutae. *Panicula* lanceolata, laxa, 22 cm. longa, 4 cm. lata; rhachis gracilis, circa nodos scaberula et pubescens, ceterum glabra; rami fasciculati, filiformes, laxi divisi, glabri, inferiores usque ad 10 cm. longi; ramuli et pedicelli scaberuli; pedicelli apicem versus pubescentes, laterales usque ad 4 mm. longi. *Spiculae* usque ad 17 mm. longae. *Glumae* anguste lanceolatae, tenuiter acutae, spiculae aequilongae, flavidae, scariosae, glabrae, laeves, 3-nerves, nervis lateralibus brevibus. *Anthocia* 3-4. *Lemmata* a latere visa lanceolata, 3-5 4 mm. longa (lobis exclusis), firme membranacea, obscure 9-nervia, circa medium et prope margines fasciculis circiter 3 pilorum alborum usque ad 3-5 mm. longorum praedita, ceterum glabra; lobi lanceolati, tenuiter acuti, nonnunquam mucronati, 4 mm. longi; arista geniculata, prope basin semel tantum torta, usque ad 11 mm. longa; callus obtusus, usque ad 1 mm. longus, pilis albis usque ad 2 mm. longis barbatus. *Paleae* lineari-lanceolatae, bifidae, 7 mm. longae, carinis minute ciliolatae. *Lodiculae* ciliolatae. *Antherae* 3 mm. longae.

NYASALAND: Mt. Mlanje, on steep grass slopes of the Lichenya Gorge, 1950 m., *Burtt Davy* 2068/29.

Pentaschistis imatongensis C. E. Hubbard in Kew Bull. 1936, 501, diagn. tantum, et in Hill, Fl. Trop. Afr. 10, 130 (1937), descr. angl.

Gramen perenne, dense caespitosum, 60-68 cm. altum. *Culmi* erecti, graciliusculi, simplices, prope basin 1-2-nodes, internodio summo (pedunculo) longe exserto glabro laevi eglanduloso. *Folia* inferiora pilis brevibus patulis molliter pilosa, superiora glabrescentia vel glabra; vaginae imbricatae, latiusculae, tenuiter striatae, inferiores pallidae et laxae; ligulae ad seriem ciliorum redactae; laminae lineares, in apicem obtusum gradatim attenuatae, usque ad 20 cm. longae, 2-5 mm. latae, planae, flaccidae, eglandulosae, marginibus scaberulae. *Panicula* erecta, contracta, densiuscula, 7.5-12.5 cm. longa, 1.2-1.8 cm. lata; rhachis laevis, eglandulosa; rami erecti, tenuiter filiformes, laeves, eglandulosi, basi nudati et simplices, supra basin divisi et dense spiculati; pedicelli 0.5-4 mm. longi. *Spiculae* pallidae, 6-6.5 mm. longae. *Glumae* a latere visae oblique lanceolatae, acuminatae, tenuiter acutae, scarioso-membranaceae, 3-nerves, nervis lateralibus brevissimis, glabrae, carina minute scaberulae. *Lemmata* a latere visa oblongo-lanceolata, 2-2.4 mm. longa (lobis exclusis), dorso pilis appressis sparse pubescentia, obscure nervia; lobi 0.3-0.4 mm. longi, obtusi, setam

tenuem 2-2.5 mm. longam gerentes; arista geniculata, 7-9 mm. longa, columna torta 2-2.5 mm. longa. *Paleae* lineari-oblongae, 3 mm. longae. *Antherae* 1 mm. longae. *Caryopsis* 2 mm. longa.

SUDAN: Mongalla Province; Imatong Mtns., Mt. Kineti, 3000 m., rocky summit, common, *Thomas* 1834.

Pentaschistis Mannii Stapf ex Maitland in Kew Bull. 1932, 425, nomen; ex Hutch. in Hutch. & Dalz. Fl. W. Trop. Afr. 2, 528 (1936), descr. angl.; ex C. E. Hubbard in Kew Bull. 1936, 501, diagn. tantum, et in Hill, Fl. Trop. Afr. 10, 134 (1937), descr. angl.

Gramen perenne, dense caespitosum, 8-30 cm. altum, innovationibus intravaginalibus numerosis. *Culmi* erecti, gracillimi, simplices, 1-2-nodes vel basi excepta enodes, glabri, paniculam versus glandibus minutis sessilibus praediti vel eglandulosi. *Foliorum* vaginae imbricatae, striatae, laeves, nervis nonnunquam glandulosae, ore plerumque barbatae, ceterum pubescentes, vel omnino glabrae, inferiores latae et laxae; ligulae ad seriem densam ciliorum redactae; laminae anguste lineares, subsetaceae, apice obtusae, usque ad 10 cm. longae, arcte involutae, usque ad 3 mm. latae (explanatae), rigidiusculae, glabrae vel pubescentes, marginibus scaberulis exceptis laeves. *Panicula* angusta, contracta et densa, 2.5-7.5 cm. longa, 0.4-1.8 cm. lata; rhachis et rami glandulosi vel eglandulosi; rami erecti, capillares, plerumque paucispiculati, inferiores bini, usque ad 2.5 cm. longi; pedicelli 1-5 mm. longi. *Spiculae* 6-7.5 mm. longae, pallide virides, purpurascens vel albidae. *Glumae* a latere visae lanceolatae et acuminatae, tenuiter scariosae, 1-nerves, glabrae, carina plerumque prominenter scaberulae vel minute scabrido-ciliolatae. *Lemmata* a latere visa lanceolato-oblonga vel anguste elliptico-oblonga, 2-2.5 mm. longa (lobis exclusis), inferne sparse et appresse pubescentia, obscure 7-nervia; lobi obtusi, usque ad 0.4 mm. longi, setam tenuem 2-4 mm. longam gerentes; arista geniculata, 6-9 mm. longa, columna torta 2-3 mm. longa. *Paleae* anguste oblongae, 2-2.5 mm. longae. *Antherae* 1 mm. longae. *Caryopsis* 1.5 mm. longa.

SOUTHERN NIGERIA: Cameroons Mtn., in grassland and on bare rocky ground, 2700-4050 m., *Mann* 1351 (typus), 2075; *Dalziel* 8353; *Maitland* 878, 1244, 1249, 1260; *Migeod* 186, 197; *Mildbraed* 10894, 10894a; *Johnston* 47; *Steele* 34; *Bornmüller* 25.

Pentaschistis meruensis C. E. Hubbard in Kew Bull. 1936, 501, diagn. tantum, et in Hill, Fl. Trop. Afr. 10, 127 (1937), descr. angl.

Gramen perenne, dense caespitosum, 15-60 cm. altum, innovationibus intravaginalibus. *Culmi* erecti, e rhizomate brevi orti, graciles, simplices, 1-nodes vel basi excepta enodes, internodio summo (pedunculo) exserto purpureo glabro paniculam versus glandibus ellipticis vel orbiculatis sessilibus praedito ceterum laevi. *Foliorum* vaginae imbricatae, inferiores latae, laxae, glanduloso-tuberculatae, pilis mollibus patentibus laxae vel dense pilosae vel villosae, superiores arcte appressae, dense pilosae vel pubescentes; ligulae ad seriem densam ciliorum redactae; laminae anguste

lineares, superne subsetaceae et flexuosae, 7.5-25 cm. longae, arcte involutae vel explanatae et basi usque ad 3 mm. latae, rigidiusculae, pubescentes vel molliter pilosae vel glabrescentes, marginibus glanduloso-tuberculatae. *Panicula* laxa et ovata, vel nonnihil contracta, 5-12.5 cm. longa, usque ad 6 cm. lata; rhachis et rami ut pedunculus glanduliferi; rhachis gracillima, superne capillaris; rami plerumque bini, demum patuli et nutantes, capillares, basi nudati, laxe trichotomo-divisi, inferiores usque ad 6 cm. longi; pedicelli valde inaequales, 2-20 mm. longi. *Spiculae* 6-8 (plerumque 7-8) mm. longae, basin versus purpureae, ceterum pallide flavidae vel albidae, vel omnino pallidae. *Glumae* a latere visae oblique et anguste lanceolatae, tenuiter acutae, acuminatae, 3-nerves, nervis lateralibus brevissimis, tenuiter scariosae, carina plus minusve scaberulae, juveniles prope margines plerumque leviter pubescentes. *Lemmata* a latere visa lanceolato-oblonga, 3-4 mm. longa (lobis exceptis), tenuiter pubescentia, 9-nervia; lobi acuti vel obtusi, 0.5-0.7 mm. longi, setam tenuem 4-7 mm. longam gerentes; arista geniculata, 8-14 mm. longa, columna torta 3-4 mm. longa; callus pilis 1 mm. longis barbatus. *Paleae* lineari-oblongae, usque ad 2 mm. longae. *Antherae* 2.5 mm. longae. *Caryopsis* circiter 2 mm. longa.

TANGANYIKA TERRITORY: Arusha District; Mt. Meru, dry open tussock-grass steppe, above the wooded region, 3090-3900 m., Troll 5707 (Herb. Berol.); dominant plant on sandy ash scree above *Erica* zone, 3600-3750 m., Burt 4062 (typus); rocky slopes, 3600 m., Uhlig 608; steep stony slopes, 3600 m., Uhlig 1067; at the summit, 4680 m., Uhlig 602.

Pentaschistis ruwenzoriensis C. E. Hubbard in Kew Bull. 1936, 500, diagn. tantum, et in Hill, Fl. Trop. Afr. 10, 127 (1937), descr. angl.

Gramen perenne, laxe caespitosum, 36-60 cm. altum. *Culmi* e rhizomate multinodi repente orti, erecti vel basi geniculati, graciliusculi, simplices, infra medium 1-2-nodes, glabri, laeves, paniculam versus glanduliferi. *Foliorum vaginae* laxae, pilis patulis laxae vel sparse pilosae, vel glabrescentes, inferiores pallidae, latiusculae, chartaceo-scariosae; ligulae ad seriem densam ciliorum redactae; laminae anguste lineares, in apicem tenuem obtusum gradatim attenuatae, usque ad 25 cm. longae, 2-3 mm. latae, planae, nonnihil flaccidae et flexuosae, laxe pilosae vel glabrescentes, supra crebre nervatae, marginibus basin versus glanduloso-tuberculatae. *Panicula* contracta, densiuscula, 6-10 cm. longa, 1.2-2.5 cm. lata; rhachis glandibus minutis ellipticis vel orbiculatis praedita; rami erecti, bini, basi nudati, capillares, ut rhachis glanduliferi; pedicelli 2-10 mm. longi. *Spiculae* 7-9 mm. longae, infra medium purpureae et virides, supra medium albidae. *Glumae* a latere visae oblique lanceolatae, acuminatae, tenuiter acutae, subhyalinae, glabrae, supra medium carina scaberulae, 3-nerves, nervis lateralibus brevissimis. *Lemmata* a latere visa oblongo-lanceolata, 2.6-3 mm.

longa (lobis exclusis), dorso et marginibus laxe pubescentia, 7-9-nervia; lobi 0.6 mm. longi, acuti, setam tenuem 3-5 mm. longam gerentes; arista geniculata, 11-17 mm. longa, columna torta 2.5-3.5 mm. longa, seta laxa torta. *Paleae* lineari-oblongae, 4 mm. longae. *Antherae* 2.5-3 mm. longae. *Caryopsis* 2 mm. longa.

UGANDA: Toro District; Mt. Ruwenzori, Namwamba Valley, on rocks in River Namwamba, 3090 m., Taylor 2903.

Danthoniopsis intermedia C. E. Hubbard in Kew Bull. 1936, 500, diagn. tantum, et in Hill, Fl. Trop. Afr. 10, 78 (1937), descr. angl.

Gramen perenne, dense caespitosum, usque ad 60 cm. altum. *Culmi* erecti, graciles, simplices, 2-nodes, internodio infimo sublanato vel glabro, ceterum glabri et laeves. *Foliorum vaginae* teretes, tenuiter striatae, internodiis breviores, dense et breviter pilosae; nodi dense villosuli; ligulae ad seriem densam ciliorum redactae; laminae lineares, in acumen tenue attenuatae, usque ad 15 cm. longae et 4-5 mm. latae, planae vel siccitate convolutae, molliter pilosae, marginibus scaberulis cartilagineis, uno margine crispo. *Panicula* linearis, densiuscula, 10-14 cm. longa, 1-2 cm. lata; rhachis gracilis, nodis pubescentibus vel villosulis exceptis glabra; rami erecti, solitarii, pubescentes, usque ad 2.5 cm. longi; pedicelli 0.5-3 mm. longi. *Spiculae* elliptico-lanceolatae, acuminatae, 9-10 mm. longae, pallidae, nervis viridibus. *Glumae* firme membranaceae; inferior elliptico-ovata vel elliptica, subacuta, 4-5 mm. longa, 3-nervis, apice pilis paucis minutis praedita, ceterum glabra; superior lanceolato-oblonga, rostrato-acuminata, apice obtusa, spiculam aequans, 5-nervis, glabra. *Anthoecium inferum* ♂: lemma lanceolato-oblongum, acuminatum, apice obtusum, 7.5-8 mm. longum, 7-nerve, glabrum; palea anguste oblonga, obtusa, 6 mm. longa, carinis apicem versus ciliolata. *Anthoecium superum* anguste oblongum; callus 0.6 mm. longus, rotundato-obtusus, pilis usque ad 2.5 mm. longis dense barbatus; lemma 4 mm. longum (lobis exclusis), bilobum, lobis acutis 1.5-1.8 mm. longis, 9-nerve, basi dense barbato, prope medium pilorum alborum fasciculis 8 in unam seriem transversam dispositis barbato; arista 10-12 mm. longa, columna scaberula 4 mm. longa; palea anguste oblonga, 4.5 mm. longa, carinis e basi ad medium alatis, alis ciliolatis apice auriculatis. *Antherae* 3 mm. longae.

NORTHERN RHODESIA: Broken Hill, Broken Hill Govt. School 12.

Rhynchelytrum reynaudioides C. E. Hubbard ex Mildbraed in Notizbl. Bot. Gart. Berlin, 13, 697 (1937), diagn. angl. *Melinis reynaudioides* Mez ex Mildbraed, Wiss. Ergebn. Deutsch. Zentr.-Afr. Exped. 1910-11, 2, Bot. 160 (1922), nomen.

Gramen perenne, circiter 25 cm. altum. *Culmi* graciles, teretes, multinodes, infra medium simplices vel parce ramosi, supra medium multiramosi, ramis approximatis, glabri, laeves. *Foliorum vaginae* internodiis longiores, arcte appressae vel demum laxae, tenuiter

striatae, glabrae vel ore pilis paucis gerentes, laeves; ligulae ad seriem ciliorum redactae; laminae lanceolato-lineares, in apicem subpungentem attenuatae, 1.5–9.5 cm. longae, usque ad 4 mm. latae, planae vel siccitate involutae, patentes, rigidae, glabrae, laeves. *Panicula* anguste oblonga, densa, 2–3 cm. longa, circiter 6 mm. lata (aristis exclusis); rhachis pubescens vel glabrescens; rami erecti, usque ad 1.5 cm. longi, filiformes, pubescentes, demum glabri; pedicelli 1–4 mm. longi, minute pubescentes. *Spiculae* oblongae, 2.5–2.7 mm. longae. *Gluma inferior* late ovata, obtusa, 0.5 mm. longa, membranacea, enervis, breviter pilosa; gluma superior spicula paullo brevior, late oblonga, obtuse et brevissime biloba, dorso leviter curvata, firme membranacea, 5 nervis, nervo medio in aristam scaberulam 3.5–5.5 mm. longam excurrente, dorso laxe pilosa. *Anthoecium inferum* ♂: lemma spiculae aequilongum, gluma superiore paullo latius, late elliptico-oblongum, obtuse et brevissime bilobum vel emarginatum, firme membranaceum, tenuiter 7–9-nerve, infra apicem nervis anastomosantibus, nervo medio in aristam flexuosam scaberulam 6.5–7 mm. longam excurrente, pubescens; palea oblonga, 2 mm. longa, carinis scaberula. *Anthoecium superum* ♀: lemma elliptico-oblongum, obtuse et brevissime bilobum vel emarginatum, 2 mm. longum, tenuiter membranaceum, hyalinum, 5-nerve, nervo medio in aristam flexuosam scaberulam 3.3–5 mm. longam excurrente, apice ciliolatum, dorso pilis paucis gerens, ceterum glabrum, laeve; palea late oblonga, truncata (explanata), 1.3 mm. longa, hyalina, glabra; antherae 1.8 mm. longae.

ANNOBON IS.: on lava cliffs, Oct. 1911, *Mildbraed* 6762 (typus, Herb. Hamburg).

Setaria Mildbraedii Mez ex Mildbraed, Wiss. Ergebn. Deutsch. Zentr.-Afr. Exped. 1910–11, 2, Bot. 160 (1922), nomen; ex Mildbraed in Notizbl. Bot. Gart. Berlin, 13, 697 (1937), diagn. angl.; affinis *S. angustissimae* Stapf, sed culmis gracilioribus, inflorescentiis brevioribus angustioribus, spiculis minoribus differt.

Gramen perenne vel annuum (?), laxe caespitosum, circiter 30 cm. altum. *Culmi* geniculato-adscendentes, gracillimi, rigidiusculi, teretes vel basin versus leviter compressi, usque ad 6-nodes, ramosi, glabri, laeves. *Foliorum vaginae* internodiis longiores, laxae, tenuiter striatae, angustae, superne plus minusve compressae et carinatae, glabrae vel ore pilis brevibus paucis praeditae; ligulae ad seriem ciliorum brevium redactae; laminae anguste lineares, basin versus gradatim attenuatae, apice tenuiter setaceae, usque ad 20 cm. longae, 1–2.8 mm. latae, planae, flexuosae vel curvatae, flaccidiusculae, glabrae, subtus laeves, supra nervis asperulae. *Inflorescentia* gracilis, angustissima, laxiuscula, 1–6 cm. longa, 2–3 mm. lata; axis primarius gracillimus, glaber, tenuiter scaberulus; rami filiformes, erecti, solitarii, inferiores 4–8 mm. longi et 2–7 mm. distantes, paucispiculati; setae solitariae, tenuiter filiformes, 2.5–4 mm. longae, minute scaberrulae; pedicelli usque ad

0.5 mm. longi, apice discoidei. *Spiculae* a latere visae semi-elliptico-oblongae vel oblongae, a dorso visae anguste ellipticae, acutae, 1.5–1.7 mm. longae, pallide virides. *Gluma inferior* late ovata, acuta, circiter 1 mm. longa, 3–4-nervis, tenuiter membranacea; gluma superior late elliptica, subacuta, spiculae aequilonga, 5–sub7-nervis, tenuiter membranacea. *Anthoecium inferum* sterile: lemma glumae superiori simile sed obtusum; palea oblonga, bifida, 0.5 mm. longa, hyalina. *Anthoecium superum* a dorso visum elliptico-oblongum et subacutum, apiculatum, a latere visum semi-elliptico-oblongum, 1.3–1.5 mm. longum, pallidum, laeve: lemma et palea tenuiter coriacea; antherae 1 mm. longae.

ANNOBON IS.: lava cliffs on the north coast, tufts between rocks, *Mildbraed* 6716 (typus, Herb. Berol.).

South African Grasses.

C. E. HUBBARD AND H. G. SCHWEICKERDT.

Eragrostis hygrophila C. E. Hubbard et Schweickerd, sp. nov.; affinis *E. peregrinae* Wieg., sed spiculis paullo angustioribus plerumque longioribus 7–15-floris, lemmatibus obtusis vel subacutis paullo brevioribus differt.

Gramen annuum, laxe caespitosum, 6–40 cm. altum. *Culmi* erecti vel geniculato-adscendentes, graciles, simplices vel ramosi, 2–4-nodes, prope nodos plerumque minute glanduloso-punctati, glabri, laeves. *Foliorum vaginae* internodiis demum multo breviores, plus minusve laxae, tenuiter striatae, glabrae, laeves; ligulae ad seriem ciliorum brevissimorum redactae; laminae anguste lineares, in apicem subsetaceum attenuatae, usque ad 17 cm. longae, 1–3.5 mm. latae, planae vel siccitate convolutae, subtus glabrae, laeves, supra nervis dense asperulae. *Panicula* lineari-oblonga, oblonga, lanceolata vel ovata, contracta et densiuscula, vel plus minusve laxa, 3–15 cm. longa, 0.6–5 cm. lata; rhachis et rami nonnunquam parce glanduloso-punctati; rhachis glabra, laevis; rami solitarii vel bini, e basi plerumque spiculiferi, divisi, ramulis brevibus ramis appressis, erecti vel patentes, tenuiter filiformes, glabri, laeves vel parce scaberuli, inferiores usque ad 5 cm. longi; pedicelli scaberuli, 0.5–3 mm. longi. *Spiculae* lineares, 3–7 mm. longae, circiter 1 mm. latae, 7–15-florae, olivaceo-virides vel purpureo-variegatae; rhachilla persistens, flexuosa, internodiis 0.5–0.6 mm. longis. *Glumae* tenuiter membranaceae; inferior lanceolato-oblonga (explanata), obtusa, 0.4–0.7 mm. longa, enervis; superior oblongo-elliptica (explanata), obtusa, 0.9–1 mm. longa, 1-nervis, carina minute scaberula. *Lemmata* imbricata, a latere visa lanceolato-oblonga vel anguste oblonga, obtusa vel subacuta, elliptico-ovata (explanata), 1.3–1.5 mm. longa, membranacea, nervis lateralibus parce et minute scaberula, carina supra medium minute scaberula, demum decidua. *Paleae* a latere visae curvatae, a dorso visae oblongae, truncatae, 1–1.3 mm. longae, tenuiter membranaceae, carinis minute scaberrulae, persistentes vel demum deciduae. *Antherae* circiter 0.2 mm. longae. *Caryopsis* ambitu oblonga, 0.6–0.8 mm. longa.

SOUTH WEST AFRICA. Great Namaqualand: Gawachab, near Seeheim, Febr. 1909, *Pearson* 4080; Ganus, near Kalkfontein, Febr. 1909, *Pearson* 4487.

SOUTH AFRICA. Cape Province: Prieska Distr.: Kranzfontein, March 1934, *Wilman in McGregor Mus.* 3061; Prieska, Jan.-April 1936, *Bryant in McGregor Mus.* 4195; Barkly West Distr.: Danielskuil, Jan. 1934, *Wilman in McGregor Mus.* 3069; Newlands, May 1934, *Paton in McGregor Mus.* 3137; Likatlong, March 1934, *Wilman*; Barkly West, March 1934, *Brewer in McGregor Mus.* 3068. Kimberley Distr.: Windsorton, March 1936, *Acocks* 92; Macfarlane, Febr. 1934, *Wilman*; Kimberley, Febr. 1937, *Acocks* (1875) in *McGregor Mus.* 4189 (typus); Kimberley, along Boshof road, Febr. 1937, *Wilman in McGregor Mus.* 4083; Jan. 1925, *Wilman in McGregor Mus.* 2469; Mauretzfontein, Jan. 1934, *Wilman in McGregor Mus.* 3259; Karrepan, Dec. 1933, *Wilman in McGregor Mus.* 3213; Blaauwkrantz, March 1937, *Acocks* 1896; Doornlaagte, Febr. 1937, *Wilman in McGregor Mus.* 4082; Herbert Distr.: Honeynestkloof, March 1920, *Wilman in McGregor Mus.* 557; Graspan, April 1937, *Esterhuysen in McGregor Mus.* 4192; Ottawa, April 1937, *Esterhuysen in McGregor Mus.* 4193; Hay Distr.: Lanyon Vale, March 1937, *Acocks* (1947) in *McGregor Mus.* 4194; Britstown Distr.: Britstown, Giesen's Kraal, April 1917, *Wilman in McGregor Mus.* 2668; Black Ridge, March 1934, *Wilman in McGregor Mus.* 3261.

Locally common and often abundant in wet places, or where water had remained for some time after the rains.

Eragrostis Wilmaniae C. E. Hubbard et Schweickhardt, sp. nov.; affinis *E. macrochlamydi* Pilger, sed paniculis minoribus, glumis brevioribus, foliis et glumis eglandulosis differt.

Gramen annuum, laxe vel dense caespitosum. *Culmi* 6-25 cm. longi, vel erecti vel geniculato-adscendentes vel prostrati, gracillimi, simplices vel plerumque ramosi, 2-4-nodes, glabri, laeves. *Foliorum vaginæ* internodiis demum multo breviores, plerumque laxae, carinatae, tenuiter striatae, ore brevissime pilosae, ceterum glabrae, laeves; ligulae ad seriem densam ciliorum redactae; laminae angustissime lineares, in apicem subsetaceum gradatim attenuatae, 2-10 cm. longae, 1-2 mm. latae, planae vel siccitate convolutae, glabrae, supra nervis asperulae, subtus laeves. *Panicula* ambitu vel linearis vel anguste oblonga vel ovata, densa vel plus minusve interrupta, 1-3 (raro 5) cm. longa, 0.5-1.4 cm. lata; rhachis rigida, glabra, fere laevis; rami solitarii, erecti vel leviter patentes, dense spiculati; pedicelli brevissimi. *Spiculae* latissime ovato-ellipticae vel orbiculato-ellipticae, valde compressae, 3-4 mm. longae, 2.5-3 mm. latae, 6-9-florae, albido-virides, vel purpureo-vel plumbeo-tinctae; rhachilla supra glumas et inter anthoccia disarticulans. *Glumae* subaequales, 2-4 mm. longae, lanceolatae (explanatae), acutae vel acute acuminatae, membranaceae, carina plus minusve minute scaberulae; inferior plerumque 1-nervis; superior 3-nervis.

Lemmata imbricata, a latere visa oblique ovata, acuta, 2.3-3 mm. longa (inferiora), carinata, minutissime granulata, membranacea, glabra, carina apicem versus minute scaberula. *Paleae* lanceolatae vel lanceolato-oblongae, obtusae vel truncatae, 1.7-2 mm. longae, carinis inferne anguste alatae, alis minute ciliolatis. *Antherae* 0.3 mm. longae. *Caryopsis* ambitu oblonga, 0.8-1 mm. longa, subtrigona.

SOUTH AFRICA. Cape Province: Barkly West District: Boetsap, Febr. 1934, *Swan in McGregor Mus.* 2989; Newlands, on limestone, March 1934, *Brewer in McGregor Mus.* 3036; Newlands, May 1934, *Paton in McGregor Mus.* 3139. Herbert District: Honeynestkloof, damp places, March 1920, *Wilman in McGregor Mus.* 558 (typus). Hay District: Groot Doorn, Banksfontein, sandy soil, March 1921, *Wilman in McGregor Mus.* 1411.

Aristida capensis Thunb. var. **Dieterleniana** H. G. Schweickhardt, var. nov.: a typo glumis subaequalibus extra pubescentibus differt.

SOUTH AFRICA. Basutoland: Quthing Distr., Industrial School, Leloaleng, 22.1.1916, brownish flower, *Dieterlen* 1205 (Nat. Herb. Pretoria, Kew and Paris). ORANGE FREE STATE: Ladybrand Distr., Westminster, March 1934, *Celliers* 11 (typus; Nat. Herb. Pretoria and Kew).

The above variety superficially resembles *Aristida sericans* Hack. It may be readily distinguished, however, by the pronounced articulation of the lemma.

Mauritius Grasses.

C. E. HUBBARD.

Arthraxon mauritianus Stapf, ms., sp. nov.; affinis *A. micanti* (Nees) Hochst., sed spiculis sessilibus angustioribus, gluma inferiore scabrida, pedicellis et rhacheos internodiis superne longius ciliatis differt.

Gramen annuum. *Culmi* e basi repente ramosa geniculato-adscendentes, e nodis inferioribus radicales, usque ad 40 cm. longi, graciles vel gracillimi, laxe ramosi, multinodes, internodiis inferioribus 1-3 cm. longis, inflorescentiam versus pubescentes, ceterum glabri, laeves. *Foliorum vaginæ* nodis breviter barbatae, tenuiter striatae, ciliatae, superne pilis e tuberculis ortis laxe pilosae, vel glabrescentes et tuberculatae, vel laeves; ligulae brevissimae, truncatae, membranaceae; laminae lanceolatae vel anguste ovatae, basi cordatae, apice tenuiter acuminatae, 1-4 cm. longae, 5-10 mm. latae, planae, patentes, utrinque sparse vel laxe pubescentes, marginibus pilis rigidis e tuberculis ortis laxe ciliatae, vel glabrescentes. *Racemi* 3-10, graciles, 1.5-3.5 cm. longi; rhacheos internodia gracillima, 2.5-3 mm. longa, pilis 2-3 mm. longis ciliata; pedicelli internodiis similes, sed 2 mm. longi. *Spiculae* sessiles a latere visae oblique lineari-lanceolatae, acutae, 4-5 mm. longae, pallidae vel purpurascens; callus pilis circiter 1 mm. longis barbatus; gluma inferior lanceolato-oblonga (explanata), acuminata,

dorso convexa, scabrida, 6-7-nervis; gluma superior anguste elliptico-oblonga (explanata), acute acuminata, carinata, carina supra medium scabrido-ciliolata, 3-nervis; lemma inferum 2.5 mm. longum, glabrum; lemma superum 2-3 mm. longum, minute bi obum; arista geniculata, 9-14 mm. longa; antherae 2, 0.5-0.7 mm. longae. *Spiculae pedicellatae* 2 mm. longae, ad glumam inferiorem redactae, vel plerumque nullae.

MAURITIUS: Mt. Pouce, near the summit and at Chateau d'Eau, April 1857, *Ayres* 47 (typus); Mt. Long, *Bouton* 1; Baie du Cap, in rock-crevices, *Vaughan* 1851; without precise locality, *Ayres*, *Boivin*, *Bouton* s.n., G.65.

Arthraxon lanceolatus (Roxb.) Hochst., to which several of the above specimens were referred by Baker (Fl. Maurit. & Seych. 444: 1877), is a perennial triandrous species from India.

Brachiaria serpens (Kunth) C. E. Hubbard, comb. nov. *Panicum repens* Nees, Agrost. Bras. 236 (1829), non L. *P. serpens* Kunth, Rév. Gram. 1, 38 (1829). *P. parvifolium* Lam. var. *serpens* Baker, Fl. Maurit. & Seych. 438 (1877).

Distrib. Mauritius and Réunion.

Vetiveria arguta (Steud.) C. E. Hubbard, comb. nov. *Andropogon argutus* Steud. Syn. Pl. Glum. 1, 391 (1854). *A. squarrosus* L. f. var. *chrysopogonoides* Hack. in DC. Monogr. Phan. 6, 544 (1889).

Distrib. Mauritius and Rodriguez.

Dichanthium aristatum (Poir.) C. E. Hubbard, comb. nov. *D. nodosum* Willem. in Usteri, Ann. Bot. 18, 11 (1796), nomen illegit. *Andropogon aristatus* Poir. in Lam. Encycl. Meth. Bot. Suppl. 1, 585 (1810). *A. mollicomus* Kunth, Rév. Gram. 1, 365, t. 96 (1830). *Diplasanthum lanosum* Desv. Opusc. 67, t. 5, fig. 1 (1831). *Leptocercis mollicoma* (Kunth) Nees in Edinb. N. Phil. Journ. 18, 185 (1835). *Andropogon caricosus* L. subsp. *mollicomus* Hack. var. *mollicomus* (Kunth) Hack. in DC. Monogr. Phan. 6, 569 (1889). *A. nodosus* (Willem.) Nash in N. Amer. Fl. 17, 122 (1912).

Distrib. South East Africa, Mauritius, Rodriguez, Réunion, South India; introduced into Polynesia, Australia and the West Indies.

Eragrostis tenella (L.) Beauv. ex Roem. et Schult. var. *insularis* C. E. Hubbard, var. nov., a var. *tenella* (L.) Hook. f. paniculis linearibus contractis 5-15 cm. longis 6-10 mm. latis, rhachi glabra, ramis erectis differt.

MAURITIUS: canefields near Moka, *Vaughan* 1937 (typus); roadside near Quatre Bornes, *Vaughan* A.70; without precise locality, *Bouton* G.33.

Isachne mauritiana Kunth var. *Bojeri* C. E. Hubbard, var. nov., a typo foliorum vaginis glabris vel marginibus leviter ciliatis, ligulis nullis, laminis 8-14 cm. longis 4.5-9 mm. latis glabris laevibus, paniculis 9-12 cm. longis 7-12 cm. latis, ramis laevibus, pedicellis

2-8 mm. longis, spiculis obovoideis vel ellipsoideis 1.3-1.6 mm. longis, lemmatibus 1-1.3 mm. longis differt.

MAURITIUS: Mt. Pouce, *Ayres* 43; without precise locality, *Bojer* (typus), *Sieber* II.32.

LXVI—SOME OBSERVATIONS ON ENCEPHALARTOS KOSIENSIS HUTCH. B. M. L. OGILVIE (Natal Herbarium).

The original description of this species by Hutchinson in K.B. 1932, 52, and the subsequent enumeration by Hutchinson and Rattray in Hill, Flora Capensis, 5, pt. 2, 34 (1933) are somewhat incomplete owing to lack of material. As copious living material has since come to hand it was thought desirable to amend and amplify the original description of this species.

Plants of *E. kosiensis* Hutch. were collected some years ago at the type locality, Kosi Bay, Zululand, and grown in the grounds of the Natal Herbarium, the Durban Botanic Gardens and the Old Fort, Durban. Among these there is only one female plant which has borne a cone, and I am very grateful to Mr. E. R. Thorp, the Gardener in charge of the Botanic Gardens, for giving me material of this plant, and the cone for examination. I should also like to express here my gratitude to Dr. H. G. Schweickerdt of the Natal Herbarium who has so generously given me his advice and much assistance, and to Dr. A. P. D. McClean of the Natal Herbarium who very kindly photographed the plants growing in the Botanic Gardens.

Encephalartos kosiensis Hutch. emend. et ampl. B.M.L.Ogilvie.—Hutch. in K.B. 1932, 512; Hutch. et Rattray in Hill, Fl. Cap. 5, pt. 2, 34, fig. 5 (1933). *Encephalartos* sp. sec Aitken et Gale in Bot. Survey. S. Afr., Mem. 2, p. 18 (1921).

Planta caulescens; caulis simplex usque ad 45 cm. altus (fide Gerstner). *Folia* circiter 1 m. longa, rachis glabra, supra haud canaliculata; foliola glabra, circiter 25-juga, conferta et leviter imbricata, oblongo-elliptica, sessilia, basi latissima et inaequalia, supra fere cordata, infra fere directa, apice 3-5-lobata, lobis late triangularibus pungentibusque, marginibus recurvis, superioribus dentibus 3-4 lateralibus minoribus armatis, inferioribus dentibus 0-3, 9-16 cm. longa, 4-6 cm. lata, nervis parallelis distinctis circiter 50. *Strobili* ♂ 1-2, pedunculo pubescente 12 cm. longo praediti, aurantiaci, cylindrici, apicem et basem versus gradatim angustati, circiter 39 cm. alti, 9-10 cm. diam.; squamae glabrae, obovatae, apice irregulariter rhomboideae, leviter rugosae, 2.5-3 cm. latae, 1-1.5 cm. altae. *Strobili* ♀ 1-2 (fide Aitken et Gale), pedunculo glabro albo 9 cm. longo praediti, splendide aurantiaci, ovoidei, apice aliquantulum plani, 27 cm. alti, 19-20 cm. diam.; squamae glabrae, spiraliter 8-10-seriatae, apice irregulariter rhomboideae, leviter rugosae, 3.5-5.5 cm. latae, 2.5-3.5 cm. altae. *Semina* splendide aurantiaca, oblonga, plus minusve 3-angulata, 4.5 cm. longa, 1.5 cm. diam.

PLATE IV

ZULULAND: East of Ingwavuma, near Kosi Lake, in sand-dune bush, 1920, *Aitken and Gale* 63 (Nat. Herb. Pret.); without precise locality, 1935, *B. Nicholson* (Nat. Herb. Pret.); Kosi Bay, 1921, *Colonel Lugge* in Natal Herb. no. 16507.

CULTIVATED: Durban, cult. at Natal Herb., March 1935, *H. M. L. Forbes* 1243 (Natal Herb. Durban); Durban, cult. at Natal Herb., May 1939, *Schweickherdt and Ogilvie* in Natal Herb. nos. 29874, 29875, 29876; Durban, cult. in Bot. Gard., May 1939, *Schweickherdt and Ogilvie* in Natal Herb. nos. 29877, 29878, 30434.

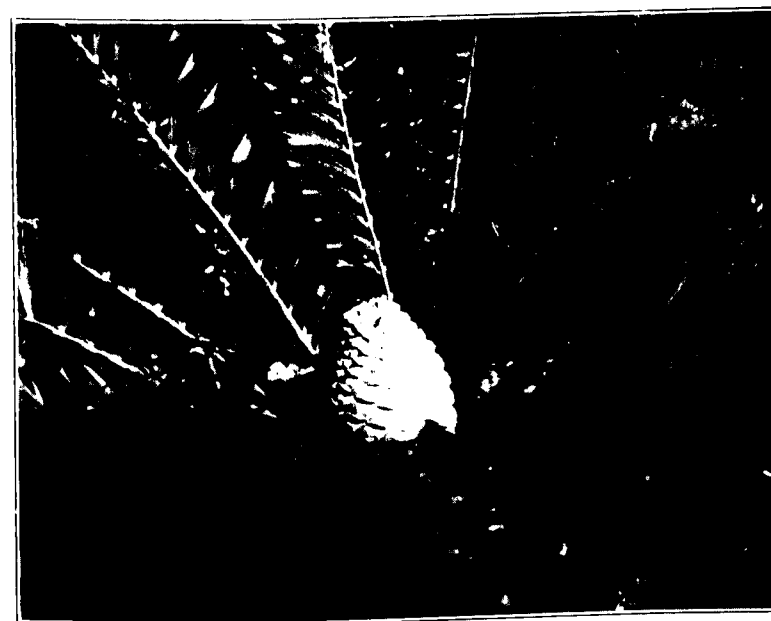
The plants are caulescent, the stem simple, up to 45 cm. high. I have only examined specimens with stems up to 22.5 cm., but I have it on the authority of Dr. J. Gerstner that at the type locality he has seen them up to 45 cm. He also gives it as his opinion that there is a slight difference between the stems of the male and female plants, those of the former being cylindric and well defined, while those of the latter tend to be almost globose.

Bracts at the base of the leaves ovate-lanceolate, up to 4 cm. long and 1.25 cm. wide at the base, glabrous on the inner surface, and lanate on the abaxial surface. Leaves up to 1 m. long, rhachis glabrous, not grooved on the upper surface, sometimes produced about 1.25 cm. beyond the terminal leaflets. Leaflets glabrous, about 25 pairs, not quite in one plane, the lower edge of the extremity of the leaflet being slightly curved upwards; oblong-elliptic, sessile, broad- and unequal-based, the upper side almost cordate, the lower almost at right angles to the rhachis; without a definite apex, but divided into 3-5 broadly triangular pungent-pointed lobes; margin firm, recurved, with 3-4 smaller lateral teeth on upper margin, and 0-3 on lower margin, the number on the lower margin being reduced towards the base of the leaf. Leaflets crowded, overlapping slightly, the longest at the middle of the rhachis where they are 16 cm. long and 6 cm. broad, decreasing towards the base of the leaf to 9 cm. long and 4 cm. wide. The lowest 2-4 pairs of leaflets are very much reduced. The upper surface is dark olive green, the lower much lighter, and in the larger leaflets shows 40-50 quite distinct parallel nerves.

There appears to be quite considerable variation in the number of teeth on the leaflets in different plants, but this can in no way be correlated with the sex of the plant. The apical pair of leaflets are usually unequal in size, from 5-7 cm. long and 2-2.5 cm. wide, the apex consisting of 2 triangular pungent-pointed lobes, and the upper margin bearing 1-2 teeth, the lower 1-toothed or entire. In some cases however, both margins are entire and the apex simple and pungent, while in others, where the rhachis is not produced beyond the leaflets, the terminal pair are very much reduced, entire, narrowly lanceolate and pungent-pointed, only about 4 cm. long and 0.6 cm. wide. In most plants the older leaves, those first produced, bear apical leaflets strongly toothed like those at the centre of the leaf; also in these leaves, and in the younger,



1. Male cones of *Eucephalartos kosiensis* Hutch. The collapsed cone in the centre was produced the previous season. The spotted appearance of the leaves is due to spraying with lead arsenate.



2. Female cone of *E. kosiensis* Hutch.

not fully developed ones, the cordate side of the leaflet bases is inclined to overlap the rachis.

Male cones 1-2 in plants seen, pedunculate, orange-brown, cylindric, tapering slightly at both ends, 39 cm. high and 9-10 cm. in diameter; peduncle 12 cm. long, pubescent at least towards the base. Scales glabrous, obovate, with a rhomboid slightly rugose top, 2.5-3 cm. across and 1-1.5 cm. high, the top rising slightly towards the lower surface to an irregularly rhomboid flat, smooth area about 1-1.5 cm. across and 0.75-1 cm. high.

Female cone pedunculate, solitary in the plant examined, but Aitken and Gale (Bot. Survey S. Afr., Mem. 2, p. 13) mention a plant of this species "bearing two fine brilliant red cones"; cone ovoid, rather flattened at the apex, bright tangerine, turning yellow on maturity, 27 cm. high and 19-20 cm. in diameter; peduncle cream, glabrous, about 7.5-10 cm. long. Scales glabrous, very rugose, almost echinate, on the upper and lower (unexposed) surfaces, arranged in 8-10 spirals, the largest at the base. The top is rhomboid, slightly rugose in the upper portion, from 3.5-5.5 cm. across, and 2.5-3.5 cm. high; towards the lower surface it rises to a small irregularly rhomboid slightly convex, smooth area, 1.5-2.5 cm. across and 1-1.25 cm. high. The seeds are tangerine-coloured, oblong, rounded at the top and tapering slightly towards the truncate micropylar end, roughly three-angled, 4.5 cm. long, 1.5 cm. in diameter.

A mass of root tubercles, apparently caused by bacterial infection, was found on one of the youngest plants examined.

I have not seen *E. kosiensis* growing in its natural habitat, but Aitken and Gale (l.c. p. 13) describe it as growing "just back of the sand-dune bush," and "within the bush itself." It seems therefore to occur much nearer the coast than any other South African species, though the East African *E. Hildebrandtii* is described in a letter from Sir John Kirk (Kew Bull. 1914, 388), as growing right on the rocky shore.

LXVII—NOTES ON CAREX: XI.* E. NELMES.

NEW SIAMESE SPECIES.

The preparation of the genus *Carex* for the "Florae Siamensis Enumeratio" has disclosed three species which are considered to be new. They are described below.

The first, *Carex craspedotricha*, is represented at Kew by better material from China, and this has accordingly been chosen as the type.

***Carex craspedotricha* Nelm.** sp. nov.; affinis *C. planatae* Franch. et Sav., sed inflorescentia longiore, spiculis pluribus, utriculis minoribus minus late alatis differt.

* Continued from K.B. 1939, 313.

Rhizoma caespitosum. *Culmi* usque 50–70 cm. alti, laeves, graciles, foliati, basi vaginis dissolutis brunneis cincti. *Folia* superiora interdum inflorescentiam superantia, 2–4 mm. lata, planiuscula, mollia. *Inflorescentia* 9–12 cm. longa. *Spicae* 12–16, gynaeceandae, ovoideo-ellipticae vel subglobosae, sessiles, plerumque 5–10 mm. longae, subapproximatae, infima remotiuscula. *Bractae* inferiores foliaceae, inflorescentiam superantes, superiores squamiformes, omnes evaginant. *Squamae* ovatae, acutae, albiae, carinatae, mucronulatae. *Utriculi* squamis longiores latioresque, circiter 3 mm. longi, elliptici vel ovato-elliptici, suberecti, tenuiter membranacei, glabri, compressi concavo-convexi, marginibus superne alati et scabro-ciliati, dorso 4–5-, ventre 2–3-nerviati, vix stipitati, in rostrum mediocre scabro-ciliatum bidentulum subsensim abeuntes. *Stigmata* 2.

CHINA. Kwangtung; Yingtak-hsien, Tutchers North River Expedition, April, 1914, Hongkong Herb. No. 10,643 (type, Kew).

SIAM. Mûang Fang, Doi Pahom Pok, c. 1600 m., in open ground, 2 April 1921, *Kerr* 5184 (Kew); Mûang Chên, Doi Ngao, c. 1300 m., in moist ground by stream, 12 May 1921, *Kerr* 5429 (Kew).

Carex lageniformis *Nelmes*, sp. nov.; affinis *C. graniferae* Dunn, sed utriculis minoribus rhomboidali-lageniformibus distincte multinervosis praecipue differt.

Rhizoma obliquum, crassum, caespitosum. *Culmus* lateralis, 3–6 cm. altus, gracilis, saepe curvulus, laevis, vaginis breviter laminiferis obsitus. *Folia* sterilia culmum longissime superantes, 4–7 mm. lata, plana, superne marginibus aspera. *Spicae* 3–5, fastigiatae, corymboso-capitatae, suprema mascula, parva, pauciflora, ceterae femineae, usque 1 cm. longae, suberectae, subdensiflorae, plerumque breviter incluse pedunculatae. *Bractae* inferiores subfoliaceae, inflorescentiam superantes, vaginantes, superiores abrupte minores. *Squamae femineae* oblongo-lanceolatae, pallidae, carinatae, apice acutae. *Utriculi* squamas duplo superantes, 5 mm. longi, membranacei, rhomboidali-lageniformes, subinflati, obtuse trigoni, multinerves, subpatentes, minute puberuli, breviter sed valde stipitati, in rostrum mediocre conicum ore albidum bidentulum sensim abeuntes. *Nux* subarcte inclusa, rhomboidalis, trigona, lateribus inferne et superne concavis, longe et valde stipitata, in rostrum breve cylindricum apice disciforme abrupte contracta. *Stigmata* 3.

SIAM. Chantabûn, Kao Soi Dão, c. 1400 m., in evergreen forest, 13 December 1924, *Kerr* 9647 (Kew).

Carex sychnostachya *Nelmes*, sp. nov.; affinis *C. Helfer* Boeck., sed paniculis secundariis minoribus paucioribus, utriculis brevioribus ellipticis praecipue differt.

Rhizoma lignosum, stoloniferum. *Culmi* circiter 40 cm. longi, validi, scabridi, parce foliati, basi foliis paucis et vaginis aphyllis

fuscis circumdati. *Folia* culmum subaequantia, 1–2 cm. lata, plerumque plana sed inferne conduplicata, coriacea, inferne marginibus et supra nervis prominentibus scabrida. *Inflorescentia* valde paniculata, interrupta; *paniculae secundariae* 4–5, singulae, ovato-pyramidales, densae, circiter 2 cm. longae, circiter 1–1.5 cm. latae, inferiores distantes, infima longe exserte pedunculata; pedunculi scabridi. *Bractae* inferiores subfoliaceae, inflorescentiam subaequantes, longe vaginantes, superiores vaginiformes. *Spicae* androgynaeceae (pars mascula parti femineae subaequilonga), paucae, 8–10 mm. longae, demum divaricatae. *Squamae femineae* oblongo-ovatae, albiae, carinatae, mucronatae. *Utriculi* squamas superantes, 4–4.5 mm. longi, demum divaricati, late elliptici, conspicue trigoni, hirtelli, plurinerves, in rostrum longum marginibus hispidulum oblique sectum bidentatum (dentibus strictis) sensim attenuati. *Stylus* basi incrassatus. *Stigmata* 3.

SIAM. Petchabûn, c. 200 m., on bank of dry stream in evergreen forest, 28 March 1922, *Kerr* 5703 (Kew).

A new name is here given to the species described by Boott as *C. tumida*, which is a later homonym:

Carex oedorrhapha *Nelmes*, nom. nov. *C. tumida* Boott, *Illustr.* 1, 66 (1858), non Beilschm. (1850).

LXVIII—NEW OR LITTLE-KNOWN PLANTS FROM SOUTHERN INDIA: XI.*

Myriactis glutinosa *Schlecht.* [Compositae].

This combination, published in Linnaea, 25, 207 (1852) has been overlooked in subsequent works, including C. B. Clarke, *Comp. Ind.* and F. Brit. India, presumably because the Index Kewensis had not been published when they were compiled. Schlechtendal described the species from plants grown from seed sent to him from the Nilgiri Hills by the Rev. B. Schmid. The description agrees well with *M. Wightii* DC. in Wight, *Contrib.* 10 published in 1834, so that the omission is of no consequence.

Barleria Morrisiana *E. Barnes* et *C. E. C. Fischer*, sp. nov. [Acanthaceae]; *B. pilosae* Wall. et *B. Lawii* T. And. accedens, ab illa sepalis exterioribus majoribus late ovatis, ab hac floribus solitariis, sepalis exterioribus late ovatis, ab utraque, statura multo minore, foliis anguste oblanceolatis usque ellipticis fere glabris differt.

A perennial undershrub up to 23 cm. high; roots numerous, wiry; stems numerous from a thickened stock, woody, slender, terete, dark-red, dark-brown or black when dry, sparingly adpressed-hispidulous. *Leaves* narrowly oblong to elliptic or oblanceolate, narrowed at both ends, acute or subacute, 3–6 cm. long, 0.8–2.2 cm. wide, midrib reddish, raised below, primary nerves 4–5 pairs,

* Continued from K.B. 1939, 251.

anastomosing near the entire, red margins with coarse reticulation between, sparsely appressed-hispid on the nerves and edges, dull-green above, pale silvery-green below, when dry dark-olivaceous above, pale below; petioles 1-3 mm. long. *Flowers* axillary, solitary; pedicels 4-8 mm. long, appressed-hispid; bracteoles a little above the middle of the pedicels, linear to linear-lanceolate, acuminate, sometimes rigid and pungent, 8-10 mm. long, hispid-ciliate. *Sepals* 4; outer pair broadly ovate, the anterior frequently shortly bifid with acute lobes, 1.9-2.4 cm. long and 1-1.4 cm. wide in flower, up to 3 cm. long and 2 cm. wide in fruit, glabrous or sparsely hispidulous on the 9 nerves outside, minutely spinulose-ciliate, reddish-brown or green or green flushed brown; inner pair linear-lanceolate, acuminate, 8-9 mm. long, hispidulous, greenish. *Corolla* tubular funnel-shaped; tube white, 2-2.5 cm. long, slightly constricted about $\frac{1}{3}$ above the base and then expanding to double the basal diameter at the mouth, sparsely hairy within at the constriction; lobes 5, spreading, obovate to rotund-obovate, usually emarginate, 1.2-1.5 cm. long, up to 1.4 cm. wide, pinkish-mauve, usually with a few hairs on the margins at the base. *Stamens* 5, all fertile, inserted at the constriction of the corolla tube; filaments slender, sparsely hairy at the base, one distinctly shorter than the remaining 4 of which 1 pair is slightly longer than the other 2; anthers linear-oblong, 3-3.5 mm. long, of the 5th stamen a little shorter, those of the 4 long stamens exserted; pollen grains orbicular, smooth. *Ovary* ovoid, 2 mm. long, glabrous; ovules 4; style longer than the stamens, white; stigma large, clavate-capitate, flattened or concave at the apex, mauve. *Capsule* ovate-ellipsoid, hollow throughout, 1.7 cm. long, nearly black. *Seeds* broadly ovate, or subcircular, flat, 6-7 mm. long, brown, densely covered with white silky, hygroscopic hairs up to 1 cm. long.

MYSORE STATE: Billigirirangan Hills near Panjur, 900-1100 m., frequent on dry stony hills, fls. April-May, frt. April-June and later, *E. Barnes* 2122, 2155 (type, in Kew Herb.) 2166 (fruit). Growing with *Meyenia Haclaynana* Nees. The specific name commemorates Mr. Randolph Morris, planter in the Billigirirangan Hills, who is a noted hunter of big game and a keen naturalist.

***Pancratium parvum* Dalz.** [Amaryllidaceae].

This species was described from a plant found in the Thana District of the Bombay Presidency. Subsequently it was obtained in a few other localities of that Presidency, and Cooke, when writing his Flora of that region, considered that it was probably endemic. It had, however, been collected in the Bababudan Hills and so was included in the "Flora of the Presidency of Madras." Professor Barnes has now found it in the Billigirirangan Hills. The previous descriptions state that the filaments are hardly longer than the teeth of the cup (staminal) but no measurements are given and the following taken from Prof. Barnes' excellent specimens may be useful.

Bulb 3-4 cm. diam. Outer segments of *perianth* up to 3.5 cm. long and 7 mm. wide, apiculate with a tubercle a little below the apex; inner segments 2.8-2.9 cm. long, tunicate or rounded and slightly cucullate at the apex with a minute apiculum and no tubercle. Teeth of *corona* 2.7 mm. long, 2 mm. wide; *filaments* 1 mm. long; *anthers* 9 mm. long.

MYSORE STATE: Billigirirangan Hills, common, fls. in latter half of April, *E. Barnes* 2123 and 2171 (in spirit).

***Amorphophallus mysorensis* E. Barnes et C. E. C. Fischer** sp. nov. [Araceae]; *A. silvatico* (Roxb.) Kunth. affinis, sed planta major, segmento mediano foliorum dichotomo, petiolis olivaceis et nigromaculatis, foliolis linearibus vel lineari-lanceolatis, spatha majore purpurea, organis neutris 1-3-seriatis globosis, appendice brevior purpurea differt.

Tuber depressed-globose, up to 10 cm. diam., white. *Cataphyll* solitary, lorate, cuspidate, about $\frac{1}{3}$ as long as the petiole, pink when young, becoming brown and scarious. *Leaf* solitary; petiole up to 44 cm. long, terete, beautifully mottled dark-olive-green and blackish on a light-green ground, whitish or pinkish at the base; blade broadly oblate in outline, up to 43 cm. wide and half as long, trisect, all three branches dichotomously branching, the 2 lateral broader than the median, pinnatisect into opposite or alternate linear to linear-lanceolate, acute segments decurrent on the rhachis, 2.5-10 cm. long, the apical the longest, 5-12 mm. wide, a few basal ones reduced to oblong, obtuse, auricles, lateral nerves 4-5 pairs, uniting in a sub-marginal one, impressed above, raised below, glabrous on both faces, glaucous-green above, paler below. *Peduncle* slender, terete, up to 41 cm. long, mottled olive and pale-green, smooth. *Spathe* rotund-ovate, deeply convolute, acute, 7-13 cm. long, dull bleached-purple or dull greenish without with numerous, fine, raised, parallel veins, purple and glossy within, darker at the centre. *Spadix* slender, thickening later, up to 19 cm. long; stipe up to 8 mm. long; ♀ inflorescence terete, up to 2.5 cm. long; neuters covering about 1 cm., ♂ flowers extending up to 6.5 cm. long; appendix up to 8 cm. long. ♀ flowers crowded; ovaries spherical, up to 2.5 mm. diam., yellowish-green, 2-celled, ovule 1 in each cell, attached to the middle of the dissepiment; style very short, stigma almost spherical or more or less 2-lobed, a little smaller than the ovary, white becoming buff, sticky and somewhat tubercled. *Neuters* crowded in 1-3 rows, spherical, up to 7 mm. long, brownish-red and glossy, becoming buff-coloured and spongy. ♂ flowers very numerous, crowded, subglobose, laterally compressed, yellow flushed with red, 4-celled, opening by 2 apical pores. *Appendix* subulate, dark-purplish or chocolate, corrugated at the base, smooth and subglossy above, becoming warty and wrinkled with age. *Berries* ovoid, apex indented, up to 1.2 cm. long, scarlet. *Seeds* 1-2, ovoid or subglobose, 7-8 mm. long, whitish at the base,

the blunt conical tip green, testa dark-grey covered with a thin silvery outer skin that breaks up into scales when dry.

MYSORE: Billigirirangan Hills, Western slopes, 3rd mile on Punjur Ghat in stony ground under shade of bamboos, 1260 m., fls. April, *E. Barnes* 2133 (Type in Kew Herb.); 2159 (leaf-blade); June, 2159A (petiole, peduncle and fruiting spadix); June, 2167 (inflorescence in spirits). Notes by Prof. Barnes:

The inflorescence appears before the leaf and the ♀ flowers mature earlier than the ♂ on the same spadix. As leaves of several sizes are found, it appears that a tuber produces a leaf each year for several years before an inflorescence is produced, and thereafter the tuber does not produce a leaf for some time, probably not the same season. Some leaves of immature plants had fewer and broader lobes than is characteristic of the full-sized ones.

LXIX—A NEW SPECIES OF *YOUNGIA* AND ITS BEARING ON THE DISTRIBUTION AND PHYLOGENY OF CERTAIN SPECIES. E. B. BABCOCK (University of California.)

In their monograph on *Youngia*, Babcock and Stebbins (Carnegie Institution of Washington, Publ. No. 484, p. 59) state that the geographic distribution of *Y. cinereipappa*, *Y. gracilis* and *Y. fuscipappa* supports the idea (suggested by differences in size of plant and caudical leaves) that *cinereipappa* is more primitive than the other two species, since its area in southwest China, Indo-China, and Assam is central with reference to the range of the genus, whereas the other two are at the outskirts of the range—*gracilis* in the Sikkim Himalayas and *fuscipappa* in Ceylon. It is also noted (op. cit. 62) that a typical fragment of *cinereipappa* was reported to have been collected in the highlands of Ceylon; also (p. 63) that, if its existence in Ceylon should be verified, this will strengthen the hypothesis that this species is either the ancestor of the other two or represents a common progenital stock. Although no further evidence is at hand concerning the existence of *Y. cinereipappa* in Ceylon, yet some additional evidence, having a bearing on this problem, has been found in the existence of a new Indian species in the Nilgiris area of southern Mysore.

***Youngia nilgiriensis* Babcock, sp. nov.**; affinis *Y. gracili* Hook. f., a qua caudicis foliis majoribus et lyratis, involucri bracteis exterioribus longioribus, corolla longiore, ligularum dentibus longioribus, antherarum tubo appendicibusque brevioribus et praesertim achaeniis longioribus brunneis basin versus haud attenuatis, pappo copiosiore differt.

Herba perennis, 3–4.7 dm. alta. *Caudex* brevis, ligneus. *Folia caudicalia* 10–16 cm. longa, 1.5–3 cm. lata, oblanceolata, acuta, lyrata, pinnatifida, in petiolum longum sensim angustata, supra puberula, infra glabra, segmento terminali triangulari truncato sinuato, segmentis lateralibus rotundis vel triangularibus. *Folia*

caulina inferiora similia vel acuminata, superiora sessilia, lanceolata, acuminato-caudata. *Caulis* tenuis, sinuatus, teres, glaber vel nodis tomentulosus, ramis brevibus vel longis capitula 2–4 gerentibus. *Pedunculi* 1–5 cm. longi, glabri. *Capitula* parvula, circiter 13-flora. *Involucra* 8–9 mm. longa, nigro-viridia, glabra, squamis exterioribus 5–7 inaequalibus 2–3.5 mm. longis, squamis interioribus 8 per vices apice tuberculatis maturitate basi carinatis et spongioso-incrassatis. *Receptaculum* arcolatum, nudum. *Flosculi* flavi. *Corolla* 9–10 mm. longa, ligula 2 mm. lata, dentibus 1–1.5 mm. longis, tubo 2 mm. longo breviter pubescente. *Antherae* 2 mm. longae, appendiculis 0.25 mm. longis acuminatis, filamentis 1 mm. longioribus. *Styli rami* virides, 1 mm. longi. *Achaenia* fusca, 5 mm. longa, subcompressa, apice pallida et valde attenuata, basi vix attenuata, costis 12–14 inaequalibus spiculatis. *Pappus* cyaneo-griseus, 5 mm. longus, 2–3-seriatus, subcrassus, persistens.

INDIA: Madras, southern Mysore, Nilgiris area, Sispara, 2060 m., fl. Nov., J. S. Gamble 13341 (typus in Herb. Kew.).

Although this plant exhibits much general resemblance to *Y. gracilis* Hook. f., yet it differs in many details, most notably in the larger, lyrate, caudical leaves, the longer outer involucre bracts, the longer corolla and ligule-teeth, the shorter anther-tube and appendages, and especially in the longer, brown achenes which are not attenuate to the base, and in the more copious pappus.

Y. nilgiriensis is intermediate between *Y. gracilis* and *Y. cinereipappa* in size of plant and leaves; but it is distinct from both these species, as well as from *Y. fuscipappa*, in the character of leaf dissection and especially in the larger corollas and achenes, as well as the 2–3-seriate pappus. These features of the flowers and fruits, together with the lyrate caudical leaves, characterize *Y. nilgiriensis* as somewhat more primitive than the other three species in this subsection of the genus. Its occurrence in an isolated highland suggests that it may be an endemic relict; and, in view of its diagnostic characters, that it, rather than *cinereipappa*, may more nearly represent the ancestral type from which this group arose. Further collections in the Nilgiri highlands would be of interest. It is also very desirable that the Cardamom-Palni Hills region, which is farther south and reaches a still higher elevation, should be explored for *Youngia*. In fact this is the only other highland of comparable elevation south of the Himalayas. The attention of Indian botanists to this interesting group of species is invited.

LXX—NEW PLANTS FROM BHUTAN AND TIBET. C. E. C. FISCHER.

Mr. B. J. Gould, I.C.S., Government Agent in Sikkim, took the opportunity afforded by his official tours in Sikkim, Bhutan and Tibet to make collections of plants, totalling up to date about

2400 numbers, which have been presented to the Kew Herbarium. Among these are the following new species and one new variety.

Saxifraga Gouldii C. E. C. Fischer, sp. nov. [Saxifragaceae]; ab *S. brachypoda* Don et *S. fimbriata* Wall. gemmis nullis, floribus majoribus, petalis glanduloso-ciliatis separatis; ab *S. megalantha* Marq. in Journ. Linn. Soc. Bot. **48**, 179 (1929) foliis angustioribus basi subcordatis, pedunculis longioribus 2-3- raro 1-floriferis, petalis brevioribus haud unguiculatis differt.

A herb (caespitose? the root system is lacking); stems up to 26 cm. long, slender, glabrous except for the gland hairy apical 2-3 cm., the basal 2-5 cm. almost naked but for the remnants of fallen leaves, the rest leafy. Leaves alternate, close, broadly ensiform, acute, pungent, base subcordate, 6-15 mm. long, 2-3 mm. wide, those of the mid-stem longer than the rest, margins spinulose, the spinules of several of the upper leaves gland tipped, nerves 3, obscure, the 2 lateral nearly parallel to the mid rib and joining it just below the tip, upper surface, bright green, lower pale green with a silvery sheen (at least when dry). Peduncles and pedicels purplish gland-hairy, the former 6-12 mm. long, the latter 3-5 mm. long; bracts and bracteoles like the leaves but smaller. Flowers usually 2, sometimes 3, rarely 1. Sepals 5, ovate, obtuse, 5 mm. long, covered outside with purplish short, gland tipped hairs and closely ciliate with similar ones, glabrous within. Petals 4, yellow, obovate, tapering to the base, 8 mm. long 6-7 mm. wide near the subtruncate apex, 1 mm. wide at the base, the apical margins decorated with a single row of small, sessile or shortly stipitate black glands which are continued for a varying distance along the sides, but not below the middle. Stamens 10, 4-4.5 mm. long; filaments narrowly ensiform; anthers oblong, 1-1.2 mm. long. Ovary ovoid, trigonous, 3 mm. long; styles 1-3 mm. long. Fruit and seeds not seen.

BHUTAN: Chira, 5100 m. fls. Aug. Gould 1310 (type in Kew Herb.).

TIBET: Gantsa to Phari, 4300-5200 m. fls. Aug. Gould, 1467; Dothera, 3700 m., fls. May, Rohmoo Lepcha 177, as to 2 of the plants on the sheet, the rest being *S. fimbriata* Wall. (These are the two plants referred to by Marquand (l.c.) under his description of *S. megalantha*.)

In *Pflanzenreich*, iv, **117** (Saxifrag.) 136, *S. brachypoda* Don is described as having the margins of the petals glandulose ciliate, but Don in the original description in Trans. Linn. Soc. **13**, 378 makes no mention of such glands, nor can I find any in the Wallich sheets in the Kew Herbarium, Nos. 442 and 443 (*S. fimbriata*), the numbers quoted in *Pflanzenreich*. Don states that the stems are "pilis undique tecti," but in the Wallich specimens referred to above they are glabrous though at first sight the basal spinules of the leaves appear to rise from the stem. Don, however, quotes the Wallich specimens in the Lambert Herbarium and these seem to have disappeared.

Ceropegia Dorjei C. E. C. Fischer, sp. nov. [Asclepiadaceae]; *C. intermediae* Wight similis, sed foliis ovatis basi rotundatis supra hispidulis, petiolis hispidulis, corollis validius inflatis collis brevioribus differt.

A slender twiner; stem terete, brown, glabrous or nearly so. Leaves elliptic- to broadly-ovate, acute, base rounded, 2-4 cm. long, 1.2-2.8 cm. wide, sparingly pubescent below when young, later glabrous except for scattered short bristly hairs on the midrib, with minute distant bristles above, lateral nerves 3-4 pairs, rather indistinct, inarching near the minutely ciliate margins, ultimate reticulation very fine; petioles flat (when dry), 4-10 mm. long, hispidulous. Inflorescence an axillary, few-flowered umbel, sometimes reduced to a single flower; peduncle rather stout, 1-1.5 cm. long, with a line of pubescence on one side; pedicels up to 1.2 cm. long glabrous; bracts and bracteoles very short, linear, acute. Sepals narrowly ensiform acute, apiculate, 5-7 mm. long, eglandular. Corolla-tube barrel-shaped, 2-2.2 cm. long, 1.06 cm. diam., abruptly narrowed above into a short cylindrical part 3.3 mm. diam. at the mouth; segments linear-lanceolate, adhering by their apices, in bud forming a narrow, blunt cone. Corona crateriform, 3 mm. long, mouth shallowly 10-lobed with 5 ligulate processes 0.5 mm. long, cohering at the base to the anthers. Fruit not seen.

BHUTAN: Trongsa to Tsanka, 2600-2700 m., fls. June, Gould 639 (Type in Kew Herb.). The colours of the corolla are not given but the tube appears to be pale-yellow with the mouth and lobes dark. The species is named in honour of the Raja Dorje, who was one of the Bhutanese chiefs who gave assistance to Mr. Gould.

Ceropegia Ugeni C. E. C. Fischer, sp. nov. [Asclepiadaceae]; *C. Incidae* Wall. similis, sed foliis caudato-acuminatis, petiolis hispidis, pedunculis secus alterum latus linea pubescente instructis, bucca corollae truncata evoluta, lobis eciliatis distat.

A twining shrub; stem slender, terete, brown, sparsely puberulous especially at and near the nodes, internodes much longer than the leaves. Leaves broadly elliptic, caudate-acuminate, base cuneate, 7-11.5 cm. long, 4-5.5 cm. wide, sparsely pubescent below when young, later glabrous except for a few short hairs on the midrib at the base below, distantly dotted above with very short, stout bristles, margins minutely ciliate, lateral nerves 5-6 pairs, nearly straight, inarching near the margins, ultimate reticulations minute; petioles 1.2-1.7 cm. long, hispid. Peduncles axillary, 6-10 mm. long, pubescent on one side, solitary, bearing an umbel of 8 to 12 or more flowers, or sometimes produced into a subumbellate cyme, sometimes a more slender peduncle bearing one abortive flower is found alongside the fertile one; pedicels up to 2 cm. long, glabrous; bracts and bracteoles like the sepals, 2-3 mm. long. Sepals free or nearly so, linear to narrowly ensiform, sharply acute, recurved, 6-7 mm. long, glabrous, bearing minute triangular glands at the base within. Corolla narrow, elongate urn-shaped; tube up to

2.5 cm. long, 6 mm. diam. at the widest part, narrowed to 3.5 mm. above and thence expanding to 5½ mm. at the truncate mouth, everted in the open flower, lobes linear, 8-9 mm. long, adhering by the tips in the open flower, forming a beak in bud. *Corona* annular bearing 5 linear, obtuse horns 3 mm. long. *Fruit* not seen.

BHUTAN: Ri-Tang to Tsarza-La, 3000-3300 m., fls. July, *Gould* 761 (Type in Kew Herb.). The colours of the corolla have not been stated; the tube appears to be pale with the numerous veins darker and the mouth and segments darker still. The material is scanty; the measurements may have a larger range. The specific name commemorates Ugen, son and heir of the Maharaja of Bhutan.

Briggsia Penlopi C. E. C. Fischer, sp. nov. [Gesneriaceae]; *B. muscicolae* (Diels) Craib affinis, foliis minoribus marginibus crenatis, petiolis longis, scapis floribusque brevioribus, sepalis eglandulosis differt.

A scapigerous herb. Leaves elliptic or elliptic-oblong, obtuse, narrowed to an obtuse base, 5.5-7.5 cm. long, 2-3 cm. wide, margins coarsely crenate, both sides densely covered with appressed pale hairs, often brownish on the nerves below, dark above, paler below, lateral nerves 6-7 pairs, nearly straight, their branches running into the marginal sinuses, secondary nerves invisible; petioles compressed, 2-5 cm. long, covered with short white hairs intermixed with long, multicellular, spreading brown ones. *Scapes* slender, 9-13 cm. long, patently brown-hairy, few flowered; bracts narrowly lanceolate, up to 5 mm. long, white and brown hairy; pedicels up to 7 mm. long, clothed with spreading, multicellular, brown hairs or sometimes white in the lower part. *Calyx* of 5 linear, subacute, almost free segments 6-8 mm. long, sparsely clothed with multicellular brown hairs. *Corolla* tubular-funnel-shaped, posteriorly slightly gibbous above the middle, 2-2.3 cm. long, sparsely hairy without, 2-lipped, anterior lip 5 mm. long, with 3 subequal oblong lobes, white-hairy within; posterior lip slightly shorter, 2-lobed. *Stamens* 4 inserted about the middle of the corolla tube, included; filaments glabrous, posterior pair nearly straight 5-7 mm. long, anterior strongly curved, 9 mm. long. *Disk* annular, 1 mm. long. *Ovary* linear-oblong, compressed, 8 mm. long, glabrous except for a few gland-tipped hairs at the apex; style rather stout, 4 mm. long, stigma narrowly clavate. *Capsule* not seen.

BHUTAN: Pele-La to Ri-Tang, 400-300 m., fls. June; *Gould* 718 (type in Kew Herb.). The corolla appears to be yellow. Named after the Paro Penlop, Ruler of Paro under the Maharaja.

LXXI—*Solanum hispidum* Pers.: ITS DISTRIBUTION AND SYNONYMY. C. T. WHITE.

For some years past I have been puzzled over the correct identification of a tall, robust and handsome *Solanum* that is naturalised but not especially abundant about Brisbane (Queensland). It was probably introduced as a garden shrub, but I have

not noticed it in any Australian garden of recent years. The plant was evidently in cultivation at the Brisbane Botanic Gardens in 1882, as there is an herbarium specimen at Kew from Cape Town (South Africa) collected by P. MacOwan and accompanied by the following note: "I have not been able to identify this. It was raised from a stray seed picked out from among a collection from Queensland Botanic Gardens or Adelaide (uncertain which) in 1882. The plant is now a 10 ft. tree and flowers and seeds profusely in the Cape Town Municipal Garden." About Brisbane it is mainly found on creek banks in open forest or cleared light rain-forest, but is sometimes seen on vacant allotments around the town.

It had been determined as *Solanum torvum* Sw. (*sensu lato*), but is quite different from the ordinary form of that species which is a very abundant weed in Queensland and is mostly known as "devil's fig," sometimes as "Dirran curse," though in a more limited sense the latter name belongs to a native species, *S. hamulosum* C. T. White. The *Solanum* concerned was collected by Mr. C. E. Hubbard during his 12 months stay in Queensland, and was distributed as *Solanum torvum* Sw., under No. 3156 (Ferny Grove nr. Brisbane, in sparse rain-forest near stream. Erect shrub, up to 10 ft. high, reddish brown hairs on branches, young leaves and midrib, leaves green, corolla white, flowers and fruits, 28/6/1930). When sending me further specimens of the plant recently, one of my assistants, Mr. L. S. Smith, suggested it might be *Solanum Warscewiczii* Hort., a species that at one time, judging from the illustrations cited in the Index Londinensis, was fairly common in European gardens. All the illustrations cited show the habit of the plant very well, though none shows flowers and fruits or details of the same. In the Kew Herbarium there is a specimen from a plant cultivated in the Temperate House, though the species has now disappeared from the living collections at Kew. This specimen exactly matches the Queensland material. The various specimens, however, suggested so much the appearance of the "*torvum*" group from tropical America, that a search was made among the Central American specimens in the Herbarium; and the plant was found to be *Solanum hispidum* Pers., a common Mexican species.

In addition to the American and Australian specimens at Kew is one from India and another from Algeria (both cultivated); and Alston in the Handbook to the Flora of Ceylon, 6 (Suppt.), 207 (1931) records the species as an escape around Hakgala. Ruiz and Pavon in their original account of the species (as *Solanum stellatum*), gave the native country as Peru, but there are no Peruvian specimens at Kew, and Standley in his "Trees and Shrubs of Mexico" (Contrib. U.S. Nat. Herb. 23, 1300: 1924) queries its occurrence in that country and gives it as a native of Mexico and Guatemala. In 1907 De Wildeman described and figured a *Solanum* from the Belgian Congo as a new species, *S. Pynaertii*. I have not seen a specimen, but his description and illustration tally so exactly with

S. hispidum Pers. that I have no hesitation in referring it to this species, which is evidently naturalized in the Congo.

A characteristic feature of *S. hispidum* Pers. is the peculiar rust-coloured indumentum composed of long-stalked stellate hairs, which are admirably illustrated in De Wildeman's figure and in a cruder way by Ruiz and Pavon (both cited below).

The following is the synonymy :

Solanum hispidum Pers. Syn. Pl. **1**, 228 (1805) ; Duval in DC. Prodr. **13**, pt. 1, 275 (1852) ; Hemsl. in Biol. Centr. Amer., Bot. **2**, 409 (1882) ; Standley in Contrib. U.S. Nat. Herb. **23**, 1300 (1924).

S. stellatum Ruiz et Pavon, Fl. Peruv. **2**, 40, t. 176, fig. b. (1799) ; non Jacq. (1789).

S. chrysotrichum Schlecht. in Linnaea, **19**, 304 (1847), sec. Standley, l.c.

S. Warszewiczii Hort. Weich. ex Lambertye in Revue Horticole, 1865, 429, fig. 50.

S. Pynaertii De Wildeman, Mission Émile Laurent, 437 (1907).

LXXII—MISCELLANEOUS NOTES.

Honours List. Since our note on the New Year's Honours was published in Kew Bulletin, 1939, 31, the following Honours have been conferred, and we have much pleasure in recording them here: Knight Bachelor EDWIN JOHN BUTLER, Esq., C.M.G., C.I.E., D.Sc., M.B., F.R.S., Secretary to the Committee of the Privy Council for Agricultural Research and Secretary to the Agricultural Research Council. C.B.E. CHARLES EDWARD LEGAT, Esq., Secretary, Empire Forestry Association; JOHN PHILLIPS MEAD, Esq., Director of Forestry, Straits Settlements; EDWARD JAMES SALISBURY, D.Sc., F.R.S., Quain Professor of Botany, University of London.

Promotions in the Colonial Agricultural Service. MR. D. L. BLUNT, M.A., has been appointed Director of Agriculture, Kenya. Mr. Blunt was formerly an agricultural officer in that colony (1926-33), but in 1933 was transferred to Cyprus as Director of Agriculture and after four years moved to Nyasaland in the same capacity.

MR. H. P. WATERS, B.A., has been appointed Director of Agriculture, Gold Coast, in the vacancy caused by the retirement of Mr. G. C. AUCHINLECK. Mr. Waters has spent most of his service on the West Coast. He was appointed Superintendent of Agriculture, Nigeria, in 1921, and served in that colony until 1928 when he was transferred to the Gold Coast as Deputy Director. He was appointed Director of Agriculture, Kenya, in 1933, and so returns to the West Coast after an absence of six years.

Dr. I. B. Pole-Evans.—We regret to learn that Dr. POLE-EVANS, C.M.G., M.A., D.Sc., F.L.S., Chief of the Division of Plant Industry, Department of Agriculture and Forestry, Union of South Africa, has recently retired under the age limit. Dr. Pole-Evans was educated at the University College of South Wales and Monmouthshire, and Cambridge University, where he was a member of Selwyn College and carried on research work on Fungi under the late Professor H. Marshall Ward. He was appointed Mycologist to the Transvaal Government in 1905 and was promoted to be Chief of the Division of Plant Pathology and Mycology in the Department of Agriculture, Union of South Africa, in 1911, and in 1927 he became Chief of the Division of Botany, Plant Pathology, Horticulture and Entomology. In 1929 his post was styled Chief of the Division of Plant Industry. In 1918 he was appointed Director of the Botanical Survey of South Africa.

Dr. Pole-Evans has travelled widely in the Union of South Africa, and his work on the pasture grasses has been of great value in connexion with erosion and over-grazing problems in the Union. He has also rendered very valuable service in matters relating to the South African fruit trade in connexion with fungous diseases and cold storage problems. In 1919 he was President of the South African Association for the Advancement of Science.

Dr. Pole-Evans has our best wishes for many years of continued botanical activity during his retirement.

We learn that the Divisions of Plant Industry and Agricultural Education and Extension have been replaced by five new divisions. These are as follows:—Animal and Crop Production; Soil and Veld Conservation; Horticulture; Entomology; Botany and Plant Pathology.

Dr. E. P. PHILLIPS, M.A., D.Sc., has been appointed Chief of the new Division of Botany and Plant Pathology, and we extend him our best wishes in his new post.

MAURICE ARMAND BAILEY.—We regret to record the death of Mr. M. A. Bailey, M.A., Director of the National Institute of Agricultural Botany, which occurred at Cambridge on 16th October, 1939. Educated at Dulwich and Cambridge, where he took the Natural Science Tripos and the Diploma in Agriculture, he afterwards held a Research Studentship at the John Innes Institution from 1911 to 1915. The war intervened and he joined the R.F.A., resigning his commission in 1919 with the rank of Brigade-Major and the award of the M.C.

It is chiefly for his work on cotton, and particularly Egyptian cotton, that Bailey will be remembered. From 1919 to 1938, when he retired, he served with the Egyptian Ministry of Agriculture in Cairo and with the Empire Cotton Growing Corporation in the Sudan. For the last seven years of his foreign service he was Director of Agricultural Research to the Sudan Government.

His service will be remembered for the work he did in combating such cotton maladies as leaf curl by breeding resistant strains, and his organization of research under the peculiar conditions that surround cotton growing in the Gezira.

On his retirement last year, he accepted the post at Cambridge, and even in the short time he was there his personality had instilled renewed life and enthusiasm into the work of the Institute.

His death at the early age of 49 is a real loss to agricultural science.

HENRY HALCRO JOHNSTON. We regret to record the death, at Kirkwall, on 18th October, 1939, of Colonel H. H. Johnston, C.B., C.B.E., D.Sc., M.D., D.L., at the age of 83 years.

Col. Johnston is best known to British botanists through his researches on the flora of the Orkneys. On this subject he published many papers in the *Annals of Scottish Natural History* and in the *Transactions of the Botanical Society of Edinburgh*. These papers chiefly recorded species, varieties, etc., new to the flora of the Orkney Islands. Many of them were apomicts or paramorphs of species belonging to such polymorphic genera as *Rosa*, *Faravacum*, and *Hieracium*.

Col. Johnston was a meticulously careful recorder. His specimens were usually adequately collected and well prepared and full notes were provided with them. He was insistent that referees, to whom he frequently submitted specimens, should give their determinations according to his own instructions. Kew is indebted to him for many valuable specimens from Orkney. There are also in the Kew Herbarium collections presented by him from Afghanistan, Egypt, Sierra Leone, Nubia, and Mauritius.

Col. Johnston joined the Army Medical Service in 1881 and was promoted to the rank of Colonel in 1911, retiring from the Service in 1913. During this time he served in the Suakin Expedition and in South Africa, Singapore, Gibraltar and elsewhere, and later in the British Isles.

His valuable Orkney and Shetland collections were bequeathed by him to the Orkney Natural History Society's Museum at Stromness, and his main Mauritius, Indian and S. African collection to the Herbarium of the Royal Botanic Gardens, Edinburgh.

Villa Taranto.—We have received the following notice regarding Captain McEacharn's well-known Garden on Lake Maggiore:

"In order that the gardens and valuable collection of plants at Villa Taranto shall be preserved for all times, the owner, Captain Neil McEacharn, has offered them, through Signor Mussolini, to the Italian Nation. Il Duce has gratefully accepted the offer and plans are to be drawn up whereby the gardens will form the nucleus for a school and instructional centre where students can be trained in the arts of Horticulture. For the present, there will not be any

important changes in the administration of the gardens, as the gift has been made with the provision that the present owner shall continue to live at the villa for so long as he so desires. Eventually, the villa and gardens will be known as the 'Istituto Botanico di Villa Taranto'."

Mr. H. R. Cocker, who is at present in charge of the Garden, will continue his duties, though with a reduced staff. Mr. Cocker, who left Kew in 1933, has been working in Italy for six years, first with Colonel Beddington at Ospedaletti and later at Villa Taranto. Under his charge Captain McEacharn's Garden has developed rapidly and is now one of the finest in Italy.

An Amazonian Highway.*—To come to the end of a book with much regret that there were not many more pages to be read is a real tribute to its interest. This has been the experience of the reader of Mr. Christopher Sandeman's delightful account of his journey from Lima to Huanucao and then down the Huallaga river from its source, at 14,000 feet in the Peruvian Andes, to Yurimaguas, 500 feet above sea level in the Tropical Amazonian Forests, and thence on foot, muleback and by car, via the old trail, through Moyabamba, Chachapoyas, Cajamarca to Trujillo and back along the Pacific coast to Lima.

The book is in the form of a daily diary and is full of interest from both the geographical and botanical points of view. Mr. Sandeman is a keen gardener with an extensive knowledge of plants which he describes in a way which makes a botanist long to have been with him.

Despite the difficulties of travel on the river by canoe and raft and the arduous journeys up and down the precipitous cuestas on the trail to Cajamarca, Mr. Sandeman not only made notes on the many plants of interest he found in flower, but also made large collections, his bag including a new genus of *Melastomataceae*, which has been named *Sandemania* by Dr. Gleason†, and several new species, which, as well as many of the other plants he collected, have been identified at Kew. The book though in diary form is a very pleasantly written continuous narrative; difficulties and hardships must have been many, but Mr. Sandeman does not let them obtrude in any undue proportion, so that the reader can follow his route and enjoy with him the grandeur of the Huallaga, the thrills of its rapids and deep gorges and the tropical luxuriance of the vegetation on its banks, as well as sympathise with him and his companion in matters of sleeping accommodation and food.

Owing to the depression following the fall in the price of rubber, much of the region traversed has fallen on evil days and poverty and squalor were all too evident.

* "A Forgotten River," by Christopher Sandeman. London, Oxford University Press, 1939. Pp. xii + 299, maps and numerous illustrations. Price 12s. 6d. net.

† See K.B. 1939, 480.

Mr. Sandeman writes with a pleasant vein of humour, which evidently carried him serenely through many difficulties and hardships, and he discourses pleasantly and learnedly on the fish fiend piranhas, ants, and butterflies making "an ever changing kaleidoscope of colour in the moving sunlight." Fish poisoning with barbasco (*Lonchocarpus Nicou*) is also described, and he is not unnaturally puzzled as to how primitive Indians discovered the method of converting the poisonous roots of *Manihot utilissima* into a nourishing and sustaining food.

Mr. Sandeman and his companion, Mr. Michael O'Halloran, were fortunate in finding the Huallaga in a fairly good mood, though undoubtedly they were in some danger more than once owing to heavy rains and the rushing rapids—still, they probably ran greater risks in the car between Trujillo and Lima, where the road faded away into the desert and they travelled in the dark and lost their way, with a possible drop over the cliffs into the Pacific at any moment, than they did on the river or on the Cajamarca trail!

"The horror of that moment I shall never, *never* forget," declared the White King. "You *will*," replied the White Queen, "you will, though, unless you make a memorandum of it." Luckily for his readers Mr. Sandeman, though he makes light of the horrors—perils by day and by night in some of the Tambos!—has recorded fully the many moments of enchantment and extraordinary interest which he gives us the pleasure of sharing with him.

The Flora of Devon.*—A county of such great botanical interest as Devon deserves a worthy account of its flora. Jones and Kingston's pioneer work "Flora Devonensis" (1829) was followed by T. F. Ravenshaw's List in 1860 (with Supplement in 1872). Since then no work dealing with the whole county has appeared, though studies of restricted areas, notably Archer Briggs' excellent "Flora of Plymouth," have gradually added to our knowledge of the flora.

The Devonshire Association is to be congratulated on sponsoring the present work, which will undoubtedly be welcomed on all sides as an authoritative and comprehensive account of the flora of the county.

The plan followed is that adopted by most of the larger county Floras. In addition to the enumeration of the species, there is an Introduction with sections on climate, geology, ecological studies,

* "Flora of Devon: Phanerogams, Vascular Cryptogams, Charophyta." Promoted by the Devonshire Association. Edited by Rev. W. Keble Martin, M.A., F.L.S., and Gordon T. Fraser, B.A. With the assistance of Rev. Thomas Stephenson, B.A., D.D., and Francis M. Day, M.A., F.R.Met.Soc. Printed and published by T. Buncle & Co. Ltd., Arbroath, 1939. London Agents: Wheldon & Wesley, Ltd., 2 & 3, Earnshaw St., W.C.2. Pp. xv + 787, Pl. 8, Maps 2. Price 25s.

etc., and, at the end of the book, there are short biographical notices of botanists who have been connected with the county.

The section entitled "Southern Species in Devon" is disappointingly brief (half a page) and no mention is made of the work of Stapf or Matthews. A rather fuller analysis of the geographical affinities of the flora would have been welcome. Among the ecological studies, that on Braunton Burrows by Dr. Elliston Wright is the most valuable. It is to be hoped that the notes on the ecology of Dartmoor by G. T. Harris will stimulate the undertaking of an intensive study of this area.

In the enumeration, under each species, the localities are very fully set out, under two vice-counties, eight districts, and twenty-three sub-districts. In addition, the first record for the county, notes on taxonomy and ecological distribution, and occurrence in neighbouring counties are given. Perhaps the most valuable feature of the work is the great pains taken by the editors to use the correct classification and nomenclature of the species enumerated. The help of experts in the various groups and in nomenclature has been enlisted, with the result that the book should do much to spread a knowledge of the correct naming of British plants.

There are eight photographic plates, including pictures of several Devon rarities in their natural habitats, and two maps showing rainfall distribution and district boundaries. The book is well bound and printed and the Editors and their helpers deserve the thanks and congratulations of British botanists for this worthy addition to the County Floras of the country.

Hesperides.*—The word *Hesperides* has been used in at least two very different ways; in Greek mythology for the nymphs who guarded, with the aid of a fierce serpent, the golden apples given by Ge (Earth) to Hera (Juno), in delightful gardens at the western extremity of the world, supposed to be in the region of Mount Atlas. Thus Milton in *Paradise Regained*:

"Ladies of the Hesperides, that seem'd
Fairer than feign'd of old,"

whilst Shakespeare (*Pericles*) offended the learned by using the word in the singular:

"Before thee stands this fair Hesperides,
With golden fruit, but dangerous to be touch'd."

And it has been used in botany by Endlicher for a group of plants which included the Citrus family *Rutaceae*.

This attractive book by S. Tolkowsky, who writes his preface from Tel-Aviv, in Palestine, is concerned neither with the fair ladies nor the group of plant families, but with the various kinds of "golden apples" or Citrus fruits now to be found cultivated in most

* "Hesperides, a History of the Culture and Use of Citrus Fruits," by S. Tolkowsky. London, John Bale, Sons and Curwen, Ltd., 83-91, Great Tichfield Street, W.1, 1938. Pp. 371, with 113 plates, 10 figures in the text, and 5 statistical tables. Price 21s.

warm parts of the world. It is a fascinating book and deals comprehensively with an interesting and difficult subject.

From the first chapter on "The home of the genus *Citrus*," we learn that the first mention of *Citrus* fruits occurs in the *Shu-king*, popularly known as the "Book of History," a collection of old documents believed to have been edited by Confucius about 500 B.C. These documents dealt with the period from the twenty-fourth to the eighth century B.C., and amongst them there are botanical lists in which mention is made of *kü* (oranges), and *yu* (shaddocks), both of which were grown in the districts of China known at present as the provinces of Chekiang, Anhui, and Kiang-si. *Kü* is today the most common name for oranges in China. Reading this most interesting chapter and the author's concluding remarks (p. 323), it seems that the original home of the orange and citron is China, and of the lemon is either China or India, whilst the lime, the shaddock, and the grape-fruit probably came from the Malay Archipelago.

The citron (*Citrus medica*) was the first to reach the Mediterranean world, about the third century B.C., and its culture spread rapidly, chiefly owing to its employment in Jewish ritual. The orange and lemon were introduced into the same region by the Romans, and the Portuguese navigators imported improved varieties of sweet oranges. The Spaniards under Columbus planted the first oranges, lemons, citrons, and shaddocks on American soil.

It is interesting to read that *Citrus* fruits were at first used in Southern Europe almost exclusively in ritual and in medicine, and during the late Middle Ages they acquired considerable importance as seasoning for meat or fish. Being scarce and costly, they were used only in the households of the rich, and to the masses of the people they were not available until the latter half of the nineteenth century, when transport became more rapid. The application of cold storage brought supplies from the southern hemisphere into the market, enabling countries in the northern hemisphere to receive supplies of *Citrus* fruits all the year round.

The book is profusely illustrated, particularly with photographic copies of classical pictures in which citrus fruits or trees are included, the number of which is quite surprising, and a very large bibliography of books and articles in many languages concludes this intensely interesting volume.

J. HUTCHINSON.

Science in the Garden.*—Sir Frederick Keeble has served a useful purpose in bringing together in book form the many articles he has contributed to the "Gardeners' Chronicle." These, as the table of contents shows, cover a wide field, opening with some useful talks on the fertility of the earth and the right ways of ensuring

* "Science Lends a Hand in the Garden," by Sir Frederick Keeble, C.B.E., F.R.S., Sc.D., F.R.S.L. Putnam, London, 1939. Pp. x+307. Price 10s. 6d.

its maintenance; virus, fungal and insect diseases; the effects of light and temperature on plant growth, with discourses on ultra-violet light, length of day and vernalisation experiments. On the latter subject he says nothing, unfortunately, as to whether the Russian work has been checked or confirmed in this country. Under temperature Sir Frederick refers to the eruption of Krakatoa and suggests that the plant covering was not wholly destroyed, but he can hardly have read Dr. Docters van Leeuwen's recently published and convincing account showing that the new plant covering of the island must have come from adjacent lands. With regard to the Antirrhinum rust, may it not be that the old hardy forms, which grow on walls, are resistant because they have a better constitution than the newer varieties with their beautiful and aesthetic colours? For they, like the modern sweet peas and other "art-shade" garden plants, have been developed into remarkable colour varieties frequently at the expense of their vigour and resistance to disease! Sections on soil sterilization and composts, forcing, and seed germination, follow naturally in his chapter "Improving on Nature," though all may not agree that the gardener, aided by scientific research, has always done so.

An interesting series of articles in the chapter "Winter and Hard Weather" is followed by sections on plant diseases and their remedies, after which comes a series of short essays on some of the recent advances in plant breeding and genetics, largely based on work carried out at the John Innes Horticultural Institution at Merton.

In the chapter "The Plant Commonwealth" many remarkable facts about the interactions of plants on one another are discussed, including the incompatibility between stock and scion and the reaction of plants to wounds. The article on the Jerusalem Artichoke in this chapter seems somewhat out of place, and one regrets there is no reference to Sir David Prain's learned explanation of the origin of the name Jerusalem, which he proved fairly conclusively has nothing to do either with the capital of Palestine or with the Italian Girasole. Articles on growth-substances, the rooting of cuttings and the effect of drugs on plants, etc., are grouped together in a chapter entitled "Oranges and Lemons," which is taken from a reference to their antiscorbutic properties in the opening article. The volume concludes with the chapter "Sermons in Stones and Good in Everything," which includes quite a number of articles hardly suggested by the title, though nevertheless of much interest.

Sir Frederick as usual writes in an easy and pleasant style and touches on a very wide range of subjects, many of which are stimulating to the amateur gardener, though many could not be properly practised on the all too brief accounts that are given.

The World of Plant Life.*—This book has been written with the specific purpose of making the layman familiar with a few of the interesting plants, both native and introduced, which are found in the United States. The author is assistant professor of botany at Colgate University, and according to his preface "any attempt to get on speaking terms with plants, whether we stay at home or travel, usually ends disastrously," because, he continues, there are too many books about them. But these contain so much detail and are written in such scientific language that the "layman with an incipient interest often shies away from these possible sources of information."

In the present bulky volume of 722 pages, therefore, the author has used a minimum of scientific terminology in order to give his readers as he says an introduction to an alive, fascinating world which is often ignored in laboratory study. And on the whole he has succeeded very well indeed, for there are illustrations to assist the reader on nearly every page, either small outline black and white drawings or full page photographs, the latter being very good. It should be noted, however, that the *baobab* and *kapok* trees do not belong to *Tiliaceae* as shown in the figures on p. 381.

The families dealt with are roughly classified into chapters, the sequence being that of Engler, though the Monocotyledons take second place. To assist the student to understand this classification, no doubt, the binding of the volume is lined both at the beginning and end with a phylogenetic "tree," at the top of which the Dicotyledons and Monocotyledons branch off separately. Most taxonomists, however, would find a better place for the "pinks," which are shown as terminating a branch bearing the willows, walnuts, oaks and mulberries. And few would now agree that the aroids, grasses and orchids should occupy a more lowly position than the lilies. These are minor points, however, due to the system followed, and are not likely to mislead the student very seriously.

Some of the information regarding the extent of certain families and genera seems to be very much out of date. For example *Ericaceae* is credited with 1400 species, and the genus *Rhododendron* with 100 species. Considering that there are 469 species of *Erica* alone described in the *Flora Capensis*, and many more besides, and between 600 and 700 fairly good species of *Rhododendron*, this estimate falls very far short of actual facts.

There are two appendices, (1) a check list of species mentioned in the book, and (2) a reference reading list of the books recommended for each chapter. It would perhaps have been an improvement if these references had been inserted with the chapters, instead of being placed together at the end of the book where they are apt to be overlooked.

J. HUTCHINSON.

* By C. J. Hylander, Ph.D. The Macmillan Company, New York, 1939. Pp. 722, with numerous black and white drawings and photographs. Price 32s. 6d.

Shrubs of California.—Professor McMinn's manual* includes descriptions of "about 800 species and 200 varieties of shrubs, woody vines, subshrubs, woody cushion plants and halfshrubs" native in California. The collecting of material for the work has taken place over a period of twenty years, and more than 300 species have been transplanted to the trial gardens at Mills College, where they have been under observation for structural variations.

The sequence of families, with slight modification, is that used in Engler's 'Syllabus.' As regards the genera, it is somewhat surprising at this date to find *Mahonia* treated as a section of *Berberis*: the author mentions compound leaves and absence of spines as characters used to separate *Mahonia* from *Berberis*, but fails to note the 'intercalary' inflorescence so characteristic of the former genus.

The species-concept adopted is rather wide, forty plants described by other botanists as species being reduced to varieties, as against two varieties raised to specific rank. This method of treatment makes it possible to indicate degrees of inferred phylogenetic relationship.

The author has endeavoured to follow the International Rules of Botanical Nomenclature, and has employed double citations where they are required. Common names are supplied for each species, some of them, however, being mere translations of the scientific names. A protest seems needed against the practice, so common on the other side of the Atlantic, of citing Asa Gray and Sereno Watson as "Gray" and "Wats." respectively. Asa Gray was antedated by the well known botanists S. F. Gray (1766-1828) and J. E. Gray (1800-75), and Sereno Watson was preceded by H. C. Watson (1804-81).

There are five appendices, a glossary of botanical terms (pp. 623-630), an index to the meanings of the names (i.e., epithets) of species and varieties (pp. 631-637), a list of nomenclatorial changes made in the book (pp. 639-641), a bibliography (pp. 643-647) and a section on the use of California shrubs in the garden design (pp. 649-674). The index to the meanings of the specific and varietal names falls below the general standard of the book: *acradenius* does not mean "resembling *Acradenia*" but having glands at the apex (of the bracts in *Haplopappus acradenius*); reference to any standard Latin dictionary would have prevented the mistranslation of *consanguineus* (closely related) as "blood-colored"; the adjective *hypoleucus*, employed as a descriptive epithet in botany, does not mean "somewhat white" but white beneath (cf. the leaves of *Monardella hypoleuca*).

The manual embodies the results of many years of research, and the taxonomic views expressed in it accordingly merit careful

* "An Illustrated Manual of Californian Shrubs." By Howard E. McMinn. J. W. Stacey, San Francisco, 1939. Pp. xi+689, 775 text and full-page figures. Price \$5.

consideration. The numerous reproductions of pen-and-ink drawings are satisfactory and will be very helpful, especially in difficult genera such as *Ceanothus* and *Malvastrum*. On the other hand, some of the reproductions of photographs are not all that could be desired. The text is well printed. Both author and publisher are to be congratulated on the publication of this useful and attractive volume.

T. A. SPRAGUE.

Botanical Magazine. Part 2 of vol. 162 was published on 20th October and contains the following plant portraits: *Campanula affinis* Roemer & Schultes (t. 9568), a native of the mountains of Catalonia, Valencia and Aragon, Spain; *Betula Medwediewii* Regel (t. 9569), from Mount Somlia and the neighbouring ranges of Transcaucasia; *Pedicularis megalantha* D. Don var. *Hoffmeisteri* (Klotsch) Sealy (t. 9570), with yellow flowers, a native of the Himalayas; *Eriogonum nudum* Douglas ex Benth. var. *auriculatum* (Benth.) J. P. Tracey ex Jepson (t. 9571), from central California; *Erigeron foliosus* Nutt. var. *confinis* (Howell) Jepson (t. 9572), found in California and Oregon; *Iberis Welwitschii* Boissier (t. 9573), from southern Portugal; *Genista jannensis* Viviani (t. 9574) distributed from Italy to the north-western Balkan Peninsula; *Prunus campanulata* Maxim. (t. 9575), from Formosa, Liu Kiu Islands and S. China; *Merendera sobolifera* Fischer & Meyer (t. 9576), occurring in Bulgaria and Asia Minor eastwards to Afghanistan and S. Turkestan; *Rhododendron agsatum* Balf. f. & W. W. Smith (t. 9577), native of Yunnan, and *Oncidium unguiculatum* Lindley (t. 9578), from Mexico.

A correction to plate 9545, *Jasminum polyanthum* (vol. 161, part 3) is given as follows:— for “A deciduous climber up to 3 metres high” read “A rampant evergreen climber reaching a height of 7 metres or more under favourable conditions.”

Seed and Potting Composts.* In years gone by it was a common complaint amongst practical gardeners that much of the valuable information derived from experiments carried out at the John Innes Horticultural Institution did not receive the publicity it deserved. This book, prepared with due thought after a long period of experiments, will serve to overcome this prejudice as it continues the policy adopted in more recent years of bringing to the whole of the horticultural profession the important facts obtained in research.

The older type of gardener may well consider that the methods he has adopted for so many years cannot be improved, but after reading this brief and concise work, he will be anxious to commence experimenting on his own behalf.

* By W. J. C. Lawrence and J. Newell. Published by George Allen & Unwin, Ltd., London, 1939. Pp. 128. Illustrated. Price 3s. 6d. net.

There is no doubt that some genera will react more favourably than others to the composts advocated, and in one or two cases it would appear that there is no noticeable improvement in plants grown in the sterilised composts over those used as controls. To be positive that this is not due to other outside factors, one would require to adopt the very high standard of hygiene practised at Merton but, unfortunately, many establishments do not lend themselves to such spotless methods of cultivation.

It may be possible that some further distinction requires to be made between those composts used for plants which will be discarded at the end of one growing season and those which are of a more permanent nature. The importance of the seed compost experiments must not be overlooked, as on the assumption that a good start in life is half the battle, then the stronger the resultant seedling the more likely are the plants to grow successfully.

Though a wide range of plants has been subjected to experiment, there is still ample scope for others in the varying branches of horticulture to take up where the authors leave off and ascertain the response made to these methods by their own plants.

The subject is one of the most important of garden operations and yet has never before received the attention and study given now by Mr. Lawrence and Mr. Newell. To them are due the thanks of all gardeners interested in greenhouse management for the very capable way in which they have carried out their work and, better still, have placed the results within the reach of every person. Easily assimilated, it will prove a boon to all it reaches.

W. M. CAMPBELL.

Report of the National Botanic Gardens, Kirstenbosch.—

This report for the year 1938 is pleasant reading in comparison with some of the earlier reports, since it gives welcome evidence of the growing appreciation of Kirstenbosch by the general public, and, more especially, by Government and by the Cape Town City Council. Not only did the Government make a special grant of £500, over and above the normal Government grant for 1938, but the grant in aid has been raised by a further £500, making a total of £4000 for the financial year 1939/40.

The Botanical Society as usual handed over its surplus which reached the record figure of £1067 7s. 8d.

Considerable progress has been made in the amenities of the Gardens in the way of new entrance gates, hedges and water supply.

An interesting Bell Tower commemorating the work which Sir Lionel Phillips did for so many years for the Gardens has been erected replacing one of the gate piers. The tower and the bell, formerly the ship's bell of H.M.S. “Dominion”, were given by Lady Phillips. Various other alterations and improvements to buildings are also recorded.

A change of great importance to the Gardens as regards buildings is the assumption by Government, through the Public Works Department, of the care of the buildings, both as to maintenance and erection.

For the first twenty years of the Gardens' existence new works had to be financed by special grants or by private donations. Now, thanks to the new provision, serious arrears in building have been overtaken and general improvements have been made. It should now be possible for Kirstenbosch, far more fully than before, to develop the collection, cultivation and study of the flora of South Africa.

The Grasslands of the Falkland Islands.* This report is based on observations made by the author during a recent agrostological survey of the colony. It includes an account of the natural and artificial grasslands, together with tables showing the approximate acreage and botanical composition of the different pasture types. The climax vegetation of the Falklands is grassland in one form or another, the islands being treeless except for a few plantings made around the main settlements. In the immediate vicinity of the latter, the pastures are composed mainly of introduced species of European origin. The natural grazings, however, although similar in general appearance to the hill-lands of Wales, are dominated by non-European species. The most abundant native plant is *Cortaderia pilosa*, a grass of inferior nutritive value, which is the chief element in most plant communities.

As grassland is the mainstay of agriculture on the islands, its maintenance and possible improvement are matters of considerable importance. Chemical analyses have shown that the native grasses are in general of poor nutritive value when compared with British pasture plants. It is considered therefore that improvement in the herbage can be best brought about by the replacement of the present species by suitable introduced plants. Amongst other recommendations are suggestions for more modern management, such as the fencing and subdivision of paddocks, rotational grazing, and manuring. The periodic burning of old grass is discussed and it is pointed out that its indiscriminate use on dry ridges has caused the prevalence of an almost worthless plant *Pernettya pumila*.

The text is accompanied by 18 photographs illustrating various types of scenery and vegetation, and by 2 maps, one showing the distribution of the chief pasture types and the other with contours plotting the routes traversed by the author in and around the islands. It is hoped that Mr. Davies' recommendations will receive serious consideration, based as they are on his expert knowledge of the treatment of the grassland problems confronting pastoralists in many parts of the world.

* By William Davies, M.Sc. Government Printer, Stanley, Falkland Islands, and Crown Agents for the Colonies, 4, Millbank, London, S.W.1. 1939. Pp. x+86. Price 5s.

Cultivation of Non-succulent South African Plants.*—

This little booklet is a very useful guide to those whose gardening has to be carried out in conditions so greatly varied as those experienced in the Union of South Africa. The information given about plants, their habits and appearance is quite sound, as are the practical suggestions made for general cultivation. One would prefer to find the work less sub-divided, as the sudden change from descriptions of "Climbing Plants" to "Propagation by Cuttings" and then to "Pruning," as instanced on page 39, does not facilitate reference when no index is afforded.

Many plants not common in our own gardens will interest the English reader and this will, no doubt, lead to more successful cultivation in this country.

Mr. Mathews is to be congratulated on providing horticulturists with this good, practical work.

W. M. CAMPBELL.

Hardy Chrysanthemums.†—This book should prove of great interest and value to all lovers of the Chrysanthemum, particularly to those who are interested in the newer and more hardy types which in recent years, with the introduction of the popular Korean varieties, are grown extensively by private and commercial growers.

In Chapter I, which is devoted to the ancient history of the Chrysanthemum, its introduction to Europe and the development of the various new types which were raised in Europe and America, the author points out the tremendous advance made in the last quarter of a century in the raising of new types and varieties.

The various species, types and varieties are summarised and illustrated. The list of recommended varieties, which includes many of the Korean hybrids, is good, and brief notes on the habit and hardiness of each variety are given.

Cultural requirements of hardy Chrysanthemums as given in America are described in detail under various headings, including feeding, spraying and winter protection. Diseases and pests, of which the Chrysanthemum has its full share, are described, and control or preventive measures recommended in a very practical way.

In the chapter on propagation by cuttings and seeds, the author refers to the interest and fascination of raising Chrysanthemums from seeds. Information on plant breeding and hybridizing in Chrysanthemums is given in the following chapter, which should prove most helpful to the beginner.

For those interested in the raising of new Korean Chrysanthemums, the final chapters should prove valuable, for much

* By J. W. Mathews, A.H.R.H.S. Issued under the auspices of the Botanical Society of South Africa. Published by the Speciality Press of South Africa, Ltd., Cape Town, no date [1938]. Pp. 77.

† By Alex Cumming, Jr. The McGraw-Hill Publishing Company, Ltd., London. 1939. Pp. 168. Illustrated. Price 10s. 6d.

information is given regarding the origin of the Korean *Chrysanthemum* and the raising of hybrid varieties.

S. A. PEARCE.

Fruit Crops.*—This book should prove a valuable addition to those already published on fruit culture, particularly to growers in this country and the colonies who require information on the methods practised in America. The authors have endeavoured to meet the needs of both the student and the grower, a point often neglected in recent books.

Information that should prove useful to the young man who intends to follow fruit growing as a career is given in the first chapter, where important points such as specialized fruit growing, capital requirements and the necessary practical qualifications are outlined.

Improvements made in varieties of fruits, the selection of bud mutations, and methods of fruit breeding are dealt with in Chapter 2. Details of the Plant Patent Law, introduced in the United States in 1930, are also given. It is interesting to note that the protection given to the raiser of a new variety is the same as that given to the inventor of a new mechanical device. This plant patent gives the raiser of a new variety the exclusive right to reproduce and sell it in the U.S.A. for a period of 17 years.

In chapters 3 and 4 the various methods of propagation are dealt with, such as cuttings, layering, budding and grafting of pome fruits, stratification, and sowing of seeds. The principles and practice of grafting are dealt with in a very practical way.

Methods of grafting, including double-grafting, are well described and illustrated, but it is surprising that the authors have neglected to mention the more recent method of "frame grafting" which is so useful as a rapid way of rejuvenating old trees. This method has, I believe, been successfully practised in America and New Zealand.

In later chapters the following aspects of the subject are dealt with: soil management, irrigation and drainage, pollination and thinning, pruning, and diseases and pests. Chapters 13 to 17 describe in detail the various individual fruit crops, and the final chapter is devoted to marketing.

The book is well illustrated and the references at the end of each chapter will greatly help the student who wishes to gain further information.

S. A. PEARCE.

Intermediate Botany.†—The first edition of this textbook was reviewed in K.B. 1936, 243, and attention was drawn to the broad cultural standpoint from which the author approached his

* "Fruit Crops: Principles and Practices of Orchard and Small Fruit Culture." By T. J. Talbert and A. E. Murneek. Baillière, Tindall and Cox, London, 1939. Pp. 345, figs. 112. Price 19s.

† By L. J. F. Brimble, B.Sc., F.L.S. Second Edition. Macmillan and Co. Ltd., London, 1939. Pp. viii + 562. Figs. 352. Price 8s. 6d.

subject. The opportunity of a second edition has been taken to improve the work in several ways and to add new illustrations, the excellence of which is a feature of the book.

Gardening in East Africa.*—The first edition of this book, which was published in 1934 (see K.B. 1935, 64), was sold out after two years and the editor has taken the opportunity of a second edition to add some new chapters, to rewrite a number of others and to include ten new coloured plates by Mr. and Mrs. Bally and Mrs. Graham. The new chapters include "Garden Planning," "Orchids," and "Gardening in Tanganyika Territory," and the plates, apart from the frontispiece depicting *Spathodea nilotica* by Mrs. Bally, consist of a number of subjects grouped on each plate. These improvements will be welcomed by all readers of the first edition and it is hoped that, in its new form, the book will be even more widely used.

Keys to the Phyla of Organisms.*—The object of Dr. Barkley's publication is explained in the Introduction: "The keys contained in this volume are the outgrowth of the author's effort to meet the special needs of his class in plant morphology." For this purpose it will undoubtedly prove stimulating. The author groups living organisms into four Kingdoms: *Monera*, including the colloidal first phases of life (*Archaeophyta*) and the *Schizophyta*; *Prostista*, comprising the *Thallophyta*, *Protozoa* and *Parazoa* (Sponges); *Phyta*, composed of the *Bryophyta*, *Pteridophyta* and *Spermatophyta*; and *Zooeca* (*Animalia*), corresponding to the Animal Kingdom without the *Protozoa* and *Parazoa*. It is somewhat surprising to find the Sponges included in the same Kingdom as the *Thallophyta*.

The scope of the work does not admit of explanations of the classification adopted, but there is a list of 46 references which the author feels will be most useful to the student. The orders of Dicotyledons and Monocotyledons accepted seem to correspond exactly with those of Hutchinson's "Families of Flowering Plants." Their arrangement, however, differs considerably, a block of mostly perigynous or epigynous, apetalous and polypetalous orders being intercalated between the *Bicarpellatae* and the *Inferae*. Whether this reflects phylogenetic speculation or is due merely to the exigencies of the key is not apparent.

* By Members of the Kenya Horticultural Society and of the Kenya, Uganda and Tanganyika Civil Services. Edited by A. J. Jex-Blake, M.A., M.D. (Oxon.), F.R.C.P. (London). With a Foreword by Sir Arthur W. Hill, K.C.M.G., M.A., Sc.D., F.R.S., Director of the Royal Botanic Gardens, Kew. Second Edition. Longmans, Green and Co. 1939. Pp. xiv + 388. Price 12s. 6d.

* Keys to the Phyla of Organisms, including keys to the Orders of the Plant Kingdom. By Fred. A. Barkley, Montana State University. Associated Students Store, Missoula, Montana, 1939. Pp. 39. Price 75 cents, post free.

The preparation of a synoptical key to the orders must have presented great difficulties, more especially since many of them appear to be more or less artificial groups obtained by analytical methods (vide Journ. Bot. 1925, 63, 9). The work will perhaps be more useful as an indication of the prevailing tendencies of the orders recognized than as a key to them. The *Olacales* are included under the heading "Stamens alternate with petals," although all the *Opiliaceae* and about half of the genera of *Olacaceae* (*sensu stricto*) have the stamens opposite the petals. Most of the genera of *Olacales* accordingly run down in the key to the *Rhamnales*: this might have been avoided by inserting the *Olacales* in two places in the key, but to do so would have impaired the synoptical character of the work. The *Lythrales* are included under a heading "mostly epigynous," with the result that the family *Lythraceae* runs down nowhere in the key, except for those that have a single whorl of stamens opposite the petals (e.g. *Rhynchoalix lawsonioides*, *Diplusodon* spp.), which run down to the *Rhamnales*. It is probable that undue emphasis has been placed in the past on this single character (a whorl of stamens opposite the petals), and that the order *Rhamnales* should be restricted to the family *Rhamnaceae*. The *Vitaceae*, included in *Rhamnales* in Engler-Diels, "Syllabus," ed. 11, 273 (1936), differ from *Rhamnaceae* and approach *Simaroubaceae*, *Burseraceae* and *Meliaceae* (belonging to Hutchinson's *Rutales* and *Meliales*) in their frequently compound leaves and constantly phaenopetalous flower-buds, as well as in the anatomy of the petiole. An even stronger case exists for the exclusion of the *Heteropyxidaceae*, which—on the basis of maximum correlation of characters—seem to be correctly placed by Diels (l.c. 300) beside *Lythraceae*, along with *Crypteroniaceae* and *Sonneratiaceae*. The reasons for assigning *Elaeagnaceae* to *Rhamnales* are not obvious.

A glossary of terms is appended to assist the student in the use of the keys. *Ovary* and *ovule* are defined, the former (in botany) as an enlarged portion of the *pistil* or *gynoeceum* containing ovules, but *pistil* and *gynoeceum* themselves are not explained. One would have thought that they stood in at least equal need of definition. *Monosporangiate* is defined as "with one sporangium or with a single type of sporangium." Though the former meaning is etymologically correct, the use of *monosporangiate* in the latter sense is sanctioned by custom, but it is clearly undesirable to employ the term *bisporangiate* as equivalent to bearing two types of sporangium when the word *amphisporangiate*, proposed by Arber and Parkin, is available. The word *ovulary*, included in the glossary as an equivalent of *ovary*, seems superfluous: the author uses the former term on pp. 3, 4, but the latter elsewhere in the key (pp. 19-25) for precisely the same member. The term *ovary* is now so thoroughly established in botany that it is not likely to be replaced by the etymologically preferable word *ovulary*. T. A. SPRAGUE.

BULLETIN OF MISCELLANEOUS INFORMATION Appendix 1939 ROYAL BOTANIC GARDENS, KEW

General

STAFF.—Mr. C. V. B. MARQUAND, M.A., F.L.S., resigned his position as Botanist in the Herbarium on May 31st, 1939 (K.B. 1939, 313). Mr. A. A. BULLOCK, B.Sc., Assistant Botanist, was appointed to succeed him (K.B. 1939, 313).

Mr. C. A. GARDNER, Liaison Officer for the Commonwealth of Australia since March, 1937, left Kew on January 28th, 1939, to return to his post as Government Botanist, Perth, W. Australia. Mr. C. T. WHITE, Government Botanist, Brisbane, succeeded him at Kew on March 7th, 1939, but relinquished his post in October owing to the outbreak of war (K.B. 1939, 162).

Mr. D. G. COLLETT, Botanist for South Africa since September, 1938, returned to Pretoria in November owing to the outbreak of war.

ERRATA

In K.B. 1939, No. 4, p. 180, l.22, and p. 181, ll.20, 29 and 38, "Erythrophloeum" should read "Erythrophleum."

In K.B. 1939, No. 5, p. 241, "Tropical African Plants: XVII," should read "Tropical African Plants: XVIII," and the footnote should read "Continued from K.B. 1937, 432."

In K.B. 1939, No. 6, p. 278, l.5 from bottom, insert "Ridl." before "FMP. 1, 76."

In the same number, p. 279, l.12 from top, "true" should read "tree." On the same page, l.29 from top, "imbrication" should read "aestivation."

In the same number, p. 281, l.14 from bottom, delete "(typus, Herb. Kew)."

In the same number, p. 308, l.1, "*Carex luteo-brunnea* (Kükenth) Nelmès," should read "*Carex luteo-brunnea Nelmès*."

Owing to an error in pagination, page 441 and subsequent pages are numbered 100 too high.

held at Tripoli from March 13th to 17th, 1939, under the Presidency of Professor Le Plae, Hon. General Director of Agriculture to the Colonies' Ministry, Belgium. Sir JOHN RUSSELL was the Chief Delegate, and delegates were present from Italy, France, Belgium, Holland, Poland, Germany, Bulgaria and other countries.

The Congress was opened and closed by H. E. Marshal Balbo, Governor General of Libya. At the opening meeting, papers were presented by Prof. Armando Mangini on "European Colonization and Native Agriculture in Tropical and Sub-Tropical Countries," by Count Edmond de Warren on "The Agricultural Production of the Warm Countries" and by Prof. Le Plae on "The Professional Preparation of Native Agriculturists through Compulsory Instruction." The Congress then broke up into five sections. The first dealt with the possibilities of agriculture in tropical and sub-tropical countries, Sir John Russell being one of the Presidents of this section. In the second section papers were read on agricultural problems relating to ecology, meteorology, erosion, irrigation and dry culture; while the third dealt with various economic problems such as credit, labour, co-operation and marketing.

The fourth section was in two parts, one devoted to vegetable products of which the Director was one of the Presidents. Numerous papers dealing with cotton, sugar-cane, rubber, olives, citrus, vines, etc., in N. Africa, were presented and also papers dealing with forestry. In the other subsection the papers concerned animal products.

The fifth section was devoted to insect and fungus pests of cultivated crops.

Visits were paid to the Agricultural and Zootechnical Experiment Station near Tripoli where fine new laboratories have just been completed; the grounds contain a very representative collection of citrus species and varieties, and of vines, almonds, and other trees of economic value.

Visits were paid to the new villages of Crispi, Michele Bianchi and Oliveti, which have been recently built. Crispi, only some four months old, is situated in a seemingly desert plain and consists of some 330 farms with a civic centre where the church, town hall with cinema, hospital, school and co-operative store are arranged around a central square.

The farms allotted to each colonist are from 37 to 120 acres in extent according to the locality, part being irrigated for the growing of wheat, lucerne, cotton, etc., the rest being dry-farmed with olive and almond trees and vines.

Bianchi and Oliveti are nearly three years old, and the results due to irrigation and good cultivation were remarkable, since at the start they were founded on sites as sandy and barren as Crispi.

At these two villages the olive and almond trees were flourishing and beginning to bear, and the irrigated crops were in very good condition.

No doubt in Roman times much of this N. African "desert" country was fertile, else such magnificent cities as Leptis Magna and Sabratha would not have been founded.

The new colonist is provided with his house, sheds and farm on trust, together with the equipment and livestock. After a short time on a fixed salary he is placed on a crop-sharing basis for about five years, and in the sixth year he becomes full owner of the farm and assumes direct management. At the end of nine years, when he has paid one-third of his debt, the colonist becomes full owner of his farm. The whole debt is expected to be paid off before the end of the 35th year.

This Eighth Congress was admirably organised by Dr. Gioacchino Dallari, Colonial Adviser of the Fascist Confederation of Land Workers, and his Staff. The majority of Delegates were conveyed from Genoa, Naples or Messina in the s.s. "Roma," a fine cruiser of 30,000 tons, which served as their headquarters during the Congress.

Mr. N. Y. SANDWITH accompanied Mr. N. Douglas Simpson on a collecting expedition by car across Libya and spent 4½ weeks in Italian territory during March and April. They motored across hundreds of miles of coastal desert by way of the splendid Strada Litoranea and then explored the mountain plateaux of Cyrenaica, as far as Derna. Cyrenaica, with its limestone gorges and macchie, resembles a piece of Greece or Crete set in North Africa, and the flora is of remarkable interest. The representation of plants from this region in the Kew Herbarium was previously very poor. Many species and varieties, including some peculiar endemics recently described by Prof. Pampanini, have now been added to the Herbarium. A large number of new records, and possibly some new species, are also represented in the collection and it is hoped to publish a paper of results when it has been fully worked out. On returning to Tripolitania a visit was paid to the Garian plateau which lies to the south of Tripoli. 853 numbers of plants, with duplicates, were collected for the Herbarium.

Miss I. M. DAVIDSON, Library Assistant, attended the 62nd Annual Conference of the Library Association held in Liverpool in June, as a delegate from Kew.

Dr. J. HUTCHINSON paid a visit in June to the National Museum of Wales at Cardiff.

Dr. F. N. HOWES attended the annual meeting of the Museums Association at Cheltenham in July.

Dr. R. MELVILLE attended the summer meeting of the Royal English Forestry Society at Bournemouth in July, visiting the woodlands of Hursley Park, near Winchester, and a number of Forestry Commission plantations in the New Forest, and on Wareham Heath.

THE DIRECTOR attended a meeting of the Advisory Committee on Forest Research of the Forestry Commission at Otterburn from July 7th-10th.

The ASSISTANT DIRECTOR and Dr. W. B. TURRILL attended the Seventh International Congress of Genetics at Edinburgh, from August 23rd-30th.

Dr. J. HUTCHINSON and Dr. R. MELVILLE attended the British Association meeting at Dundee in September which was interrupted by the outbreak of war.

Official visits were paid by members of the CURATOR'S STAFF to the following establishments:—The nurseries of Messrs. Hillier and Sons, W. J. Marchant, Messrs. Maxwell and Beale, Messrs. R. Veitch and Son, and Col. Grey, Hocker Edge, and the Gardens of Lord Swaythling (Townhill Park), Mr. E. A. Bowles (Myddleton House), Lord Ilchester (Abbotsbury), Mr. W. I. Whitaker (Pylewell Park), and Mr. L. de Rothschild (Exbury).

PUBLICATIONS.—Ten numbers of the "Kew Bulletin" were published during the year, and the Review of the work during 1938 was issued as an Appendix. The "List of Seeds" was published as a separate pamphlet; owing to war conditions a shortened list was issued, reproduced by the cyclostyle process.

THE WAR.—It has been decided by the Minister of Agriculture and Fisheries that the normal work of the Establishment shall at present be continued as far as possible. A number of economies have been made, both in the running of the Gardens and in the issue of publications.

During the first three weeks after the declaration of war the Gardens were closed to the public whilst necessary air raid precaution measures for the staff were being carried out. Since September 23rd they have been open as usual, but Cambridge Cottage Garden and Museum 4 have been closed temporarily, and also the Isleworth Gate. Visitors enter the Gardens at their own risk as no air raid shelters have been provided for the general public.

Seventeen members of the staff have either enlisted or have been called upon for service with the Navy, Army, Air Force, or Civil Defence Forces, as follows:—Botanists (3), Sub-Assistants (1), Student Gardeners (5), Stokers (2), Garden Labourers (1), Constables (4), Boys (1).

A demonstration allotment plot has been laid out on the lawn in front of the Palace and a number of demonstrations are being given to the public by members of the staff. Lectures on allotment management have also been given in the Borough by members of the Curator's Staff and Student Gardeners, under the auspices of the Borough of Richmond War-time Allotments Propaganda Committee.

Arrangements have been made to safeguard the most valuable of the scientific collections both in the Herbarium and in the Museums. The type-specimens in the Herbarium, which number approximately 200,000, are being placed in protective covers preparatory to storage in the basement of the Herbarium, which has been specially strengthened for the purpose.

An Air Raid Precautions organisation has been set up and a number of shelters for the Staff have been built. Members of the Staff are acting as Wardens, and have formed fire and first-aid squads covering the grounds and principal buildings. The fire squad in the Herbarium has been organised so that there have been members on continuous day and night duty since the outbreak of war, while the main first-aid post, situated behind the Herbarium, is continuously staffed during working hours.

Economic Work in Tropical Agriculture

Oiticica (*Licania rigida* Benth.).—This is a native of the dryer regions of Brazil and has considerable commercial possibilities as a source of quick drying oils of the same type as tung oil. Some years ago a few plants were raised from seed at the Imperial College of Tropical Agriculture, but the climate of Trinidad did not prove altogether suitable and accordingly during the year rooted cuttings were received at Kew and from there despatched to Amani and to the Department of Agriculture, Jamaica. It is hoped that these introductions will prove the nuclei for further expansion when conditions in the future become more favourable.

Kubui (*Solanum sessiliflorum* Dun.). This is a large kind of tree tomato suitable for tropical conditions, used for fruit, jams and jellies. Seed collected in the hinterland of British Guiana by the Economic Botanist in March was sent to Kew and a number of plants raised. A few have been despatched for trial to Trinidad, Jamaica and Amani.

Cacao.—One of the most important of our present activities is the introduction of high grade "forestero" types of cacao from the West Indies into the West African colonies. The chief problems are, firstly, the danger of introducing diseases, such as witches broom, from the West Indies into West Africa, where at present they do not occur; and secondly, the short viability of cacao seed. A number of rooted clones of the special Trinidad types have been successfully transferred to Kew, and at the same time, young plants from Nigerian seed have been raised at Kew. The latter have been used as root stocks, and a number of Trinidad clones budded on these plants have been raised and are now awaiting transfer to Nigeria. The plants are under supervision from officers of the Imperial Mycological Institute, and Kew, therefore, acts as a quarantine station.

As the above process is somewhat cumbersome, it was decided to conduct experiments with cuttings direct from the original plants received from Trinidad. At the time of writing it seems probable that success will crown these efforts, using very young green slips for the purpose.

Bananas.—Seeds of many wild species were obtained during the year from Burma, Nyassaland, Southern Rhodesia, New Guinea,

Assam and Tanganyika. A portion of the seed is retained and planted at Kew and the rest is despatched to Trinidad and Jamaica. This precaution has been found necessary to guard against loss of viability or damage during transit.

Cassava.—Arrangements were made for the collection of a number of *Manihot* species in Brazil for ultimate despatch to Amani, where the work of breeding types resistant to virus diseases is being undertaken. These have not yet arrived, but a dark-leaved type of cassava from British Guiana was sent to Amani.

Five varieties from Malaya were sent to British Honduras after a period of quarantine in Kew.

Passiflora.—In response to a request from Amani, where work on the passion-flower virus is in progress, various authorities in Central America were approached for seed of wild species. As a result, seed of four species from Colombia, three from Venezuela, and one from British Guiana, were sent to Amani, together with four from La Mortala. These were supplemented by the despatch of cuttings of fourteen other species from the collections at Kew.

Papaya.—Somewhat similar work is being undertaken with regard to raising disease-resistant varieties of papaya, and seed of nine species, collected by Mr. A. H. G. Alston of the British Museum in Venezuela and Colombia, were sent to Amani, Ceylon, Jamaica, Trinidad, Fiji and Queensland.

Derris.—Rooted cuttings of special clones of *D. elliptica*, Changi No. 3 and Sarawak creeping, raised from plants originally received from the Department of Agriculture in Malaya, have been sent during the year to Dominica, Jamaica and the U.S.A. Department of Agriculture.

Napier Grass.—Three special clones of *Pennisetum clandestinum* Hochst. ex Chiov. were received from the Department of Agriculture, Kenya, but one clone failed. The other two were propagated and cuttings despatched to the U.S.A. Bureau (for transfer to Hawaii), Jamaica and Trinidad.

In addition to the plants mentioned above, the following is a list of the more important economic plants dealt with at Kew during the year :

MATERIAL RECEIVED AND DISTRIBUTED.

Barley.—Seeds received from Mr. B. J. Gould, collected on the Sikkim-Tibet border at Kala, 14,600 feet, and Samada, 14,100 feet, sent to the Plant Breeding Institute, Cambridge, and to the Department of Agriculture, Basutoland.

Ephedra Gerardiana.—Seeds from the Forest Research Institute, Dehra Dun, India, sent to Departments of Agriculture in Cyprus, Kenya and Palestine ; the Agricultural and Forestry Officer, St. Helena ; Horticultural Department, Sudan ; and Professor L. D. Hiner, South Dakota State College, U.S.A.

Ephedra intermedia.—Seeds from Forest Division, Punjab, India, distributed to the same institutions as *E. Gerardiana*.

Ephedra sinica.—Seeds from the South Dakota State College, U.S.A., sent to the Departments of Agriculture in Cyprus, Kenya and Palestine ; Forest Products Research Institute, Dehra Dun, India ; Agricultural Officer, St. Helena, and the Division of Plant Industry, Pretoria, South Africa.

Gossypium Stocksii.—Seeds from Department of Agriculture, Sind, India, sent to the Cotton Research Station, Trinidad, and M. Guy Roberty, French West Africa.

Musa Buchananii.—Seeds from Dr. G. A. C. Herklots sent to Trinidad.

Musa Livingstoniana var. *Chisusu*.—Seeds from Dr. G. A. C. Herklots sent to Trinidad.

Musa Peekelii.—Seeds from Department of Agriculture, New Guinea, collected in New Ireland, sent to Trinidad.

Musa sp.—Seeds from Chief Scientific Officer, Indian Tea Association, Tocklai, Assam, sent to Trinidad.

Musa sp. “Thikmeve-Nget-Pyaw” and “Yethilan-Nget-Pyaw.”—Seeds from the Silviculturist, Maymyo, Burma, sent to the Department of Science and Agriculture, Jamaica, and Trinidad.

Peas.—Seed from Mr. B. J. Gould, collected on the Sikkim-Tibet border at Samada, 14,100 feet, sent to the Department of Agriculture, Kenya, and to the Plant Breeding Institute, Cambridge.

Potatoes, Wild varieties.—Tubers collected by Mr. J. Hanbury-Tracey in Venezuela, sent to Dr. R. N. Salaman, Cambridge.

Sweet Potatoes.—Tubers from the Bureau of Plant Industry, Washington, U.S.A., sent to Amani.

Tobacco.—Seed of five varieties received from the Department of Agriculture, Nyasaland, sent to the Imperial College of Tropical Agriculture, Trinidad, for transmission to the Agricultural Officer, Tortola, British Virgin Is.

Wheat.—Seed from Mr. B. J. Gould, collected on the Sikkim-Tibet border at Saugang, 13,400 feet, sent to the Departments of Agriculture, Basutoland and Kenya, and to the Plant Breeding Institute, Cambridge.

MATERIAL RECEIVED.

Derris elliptica.—Seeds from Singapore Botanic Garden.

Musa sp.—Seed from Dr. G. A. C. Herklots, collected in Ngorongoro.

Musa sp.—Seed from Triangle Sugar Estates, Fort Victoria, Southern Rhodesia.

Musa spp. A. and B.—Seed from Assam.

Ugli Fruit.—Cuttings from Department of Agriculture, Jamaica, and from F. G. Sharp & Co., Jamaica. (Both failed to strike.)

MATERIAL DISTRIBUTED.

Bambusa spp.—Plants, Dr. G. A. C. Herklots, Hong Kong.
Cassava sp.—Cuttings, Agricultural Officer, British Honduras.
Derris elliptica.—Cuttings, the Director, de Pascos Publicos Montevideo, Uruguay.
Iris florentina.—Plants, Agricultural and Forestry Officer, St. Helena.
Manihot esculenta and *M. heptaphylla*. Cuttings, East African Agricultural Experiment Station, Amami.
Musa sp.—Suckers, Imperial College of Tropical Agriculture, Trinidad.
Rhamnus Purshiana.—Cuttings, Imperial Chemical Industries, Ltd.
Rheum officinale and *R. palmatum*.—Roots, Department of Agriculture, Kenya.

The Gardens

GENERAL.—From most points of view the year was very satisfactory for the welfare of the plants, as adequate rainfall, evenly distributed, did much to counteract the very dry seasons recently experienced. This is shown by the fact that the water consumption was less by over 10,000,000 gallons than the quantity used in 1938, the figures respectively being 1938 36,941,000 galls., 1939—26,890,000 galls. Spring weather was exceptionally good on the whole, resulting in particularly long displays of wallflowers and tulips, though the duration of the flowers of the Magnolias and other early flowering trees and shrubs was not quite so long. Severe weather was again experienced at Christmas, and on December 21st the hardest spell of arctic weather known in the country for over 40 years commenced. Snow fell and, owing to frost each day, was not dispersed until late in the New Year.

VISITORS.—The number of visitors in 1939 was 1,173,652; weekdays (other than Students' Days) 607,523; Sundays 497,322; Students' Days 68,807—a decrease of 47,828 on the figure for 1938. The greatest monthly attendance was in May, with 352,446; the lowest in September, with 6176 (the Gardens were only open on the 1st and 23rd to 30th inclusive). The highest daily attendance was 84,725 on Whit Monday, and the lowest 5 on December 8th, a very wet day.

ARBORETUM.—Many of our older trees responded well to the increased rainfall during the year. Unfortunately, losses amongst the old beech trees still continue, and nine or ten of these were removed. One or two particularly fine trees have been saved from destruction by the insertion of tie rods and many cavities have been filled in to arrest further decay.

Among the conifers, the most regrettable loss was that of a specimen of *Pinus Lambertiana*, the sugar pine, which was planted

in 1870/71 and had attained a height of 72 feet and girth of 5 feet 10 inches.

During the growing season, one or two of the Catalpas commenced to wilt and die back rather quickly, spoiling the symmetry of the trees and necessitating their removal.

Two fine poplars have been shorn of their beauty. One close to the Sherman Hoyt House, some 70 feet high, had about 50 feet of its upper portion blown off in a heavy gale in the autumn, and a very fine one at the end of the Sion Vista by the river side had to have its top 40 feet removed.

Early in the year the specimens of *Paulownia tomentosa* (= *P. imperialis*) flowered particularly well; also, during the latter part of November and December, the trees of *Prunus subhirtella* var. *autumnalis* were exceptionally beautiful.

Several of the young tulip trees, planted last year to form an avenue along the Broad Walk, unfortunately died and, as the remainder were not very good specimens, they have all been replaced by new trees of suitable size.

The east end of Kew Green, close to the Main Gate, which is part of the Royal Botanic Gardens, has been planted with groups and specimens of flowering trees, such as cherries in variety and species of *Crataegus* and *Malus*.

Seeds of *Elliottia racemosa* were received from Mr. W. Knight, Biltmore, U.S.A., and it is hoped that this rare shrub will once again be an object of interest and beauty in the Gardens.

TEMPERATE HOUSE.—The renewal of the lower roof of the central section of the Temperate House was completed during the summer, Canadian red cedar wood again being used for the purpose.

During the autumn the work of replanting the Rhododendron collection in the Himalayan House, as well as those in the Rhododendron Annex, was continued.

The collection of *Fuchsia* species, together with new and old hybrids of garden origin, made a fine display of flowers for about five months until late autumn.

In the warm section a rare conifer, *Agathis vitiensis*, produced a number of silver-grey cones, whilst several plants of the hybrid Bougainvilleas, Mrs. Butt and Orange King, made a brilliant display over a very long period. Many fine climbers considered to be tropical plants thrived and flowered profusely in this section. Some of the best of these were *Passiflora Hahnii*, *P. racemosa*, *P. amabilis*, and *P. quadrangularis*; *Thunbergia grandiflora* var. *alba* also grew rapidly and flowered freely.

Howea Belmoreana bore heavy crops of seed on long pendulous spikes, flowers of both sexes being borne on the same inflorescence. *Hibiscus Waimeae*, a small Hawaiian tree, has now reached a height of 28 feet and produced a multitude of fragrant white flowers during the summer months.

In the central portion the fine collection of Acacias, in pots and planted out in beds, was a prominent feature in the spring, escaping damage by fogs. A batch of five-year-old seedlings of *Lapageria rosea*, raised at Kew, flowered well throughout the autumn and early winter, showing much variation in the size of the flowers and the length of the tube. The rare shrub *Vallea stipularis* produced many clusters of rich rosy-red flowers in mid-summer; planted out in the border, it has formed a shrub some 10-12 feet in height. A rare Chilean climbing member of the *Compositae*, *Proustia pyrifolia*, trained on the roof of the house, produced many sprays of blush-coloured flowers which lasted for several months and remained attached to the plant until the middle of winter. Among the rarer species of *Rhododendron* to flower during the year were *R. Taggianum*, *R. Parryae* and *R. xanthocodon*.

TROPICAL DEPARTMENT.—Palm House. The work of making good the soil in the permanent beds was continued and a number of new palms and other plants were planted. York stone slabs forming the path have been rebbed in places, and a new truck with pneumatic tyres has been provided.

Ferries.—Pit No. 6A was repainted inside and out, and a new side bench constructed in reinforced concrete. Permanent beds in No. 2 Ferries were renewed with fresh soil and many new plants placed in position.

Tropical Pits.—There has been an increase in the number of economic plants dealt with during the year, stock of Cacao varieties, *Derris elliptica*, *Musa* spp., *Manihot utilissima* varieties, *Lonchocarpus Nicou*, *Pennisetum clandestinum* and *Passiflora* spp., being propagated (see also economic section, p. 689).

During the year *Baikiaca insignis* and *Streptocarpus Baudertii* flowered freely, whilst amongst the orchids the following were particularly effective:—*Chilochista phyllorhiza*, *Angulocaste Georgius Rex*, *Cirrhopetalum* "Louis Sander," *Dendrobium tetragonum*, *Lycaste Skinneri* var. *alba*.

HERBACEOUS DEPARTMENT.—The staff have been fully occupied with continued improvements and alterations. In the Iris Garden exhausted beds have been resoiled and many of the varieties which had become obsolete were replanted with more modern varieties kindly presented by various members of the Iris Society.

The limestone scree at the north end of the Rock Garden was rebuilt, the area being enlarged and undersurface watering provided. As sandstone is used in that part of the garden, the existing limestone was replaced by Sussex sandstone, thus affording better accommodation and more suitable cultural conditions.

At the opposite end of the Rock Garden, facing south-east, the whole of the stone has been lifted and relaid, and the exhausted soil has been renewed. The opportunity has been taken to carry out a more effective grouping of the plants in the section.

Several silver birch trees have been planted in the Wild Garden in order to provide more shade for the ferns and to improve their growing conditions.

A number of new frames built of Canadian red cedar wood have been erected at one end of the propagating yard, to accommodate the increased Alpine collection. Plants of special interest which have flowered during 1939 included *Sedum Gattefossii*, a charming yellow annual, collected by Mr. J. Gattefossé in the Atlas Mountains of Morocco; *Arctica nana* and *Glaucidium palmatum*, both uncommon plants from Japan; *Dracocephalum Stewartianum*, a native of W. China; *Cyananthus Sherriffii*, raised from seed collected by Capt. Sherriff and Mr. Ludlow on their expedition in S. E. Tibet during 1936; *Helicodicerus muscivorus* (*Araceae*), an uncommon plant from S. Europe, *Cypripedium reginae*, collected in N. America and presented by Mr. F. J. North; *Streptocarpus pusilla*, an interesting plant from S. Africa, presented by Mrs. Garrett-Botfield, and *Notholirion macrophyllum* from bulbs collected in Kashmir by Mrs. Leonard Lees.

DECORATIVE DEPARTMENT.—The best feature of the spring bedding was the display of Darwin tulips and other subjects on the Palm House front, where the beds had been resoiled the previous autumn. Owing to lack of frost and heavy rain these continued in excellent condition for a much longer period than usual.

Many of the summer bedding plants, particularly the Dahlias, flowered exceptionally well, these no doubt having benefited by the showery weather during June and July.

In the conservatory the display was good throughout the year, such subjects as Primulas, Cyclamen, Cinerarias, Calceolarias, Streptocarpus and the winter flowering Begonias being noteworthy. The various types of Chrysanthemum included varieties of the large-flowered Japanese, Decorative, Single, Korean and Cascade, many of these being new in commerce during the last one or two seasons.

Liliums also did well, amongst the most attractive and outstanding being *L. nobilissimum*, *L. myriophyllum* var. *superbum*, *L. ochraceum*, and *L. speciosum* and its varieties. As in past years the bulbs of *L. longiflorum* var. *eximium* presented by the Departments of Agriculture, St. Helena, and Bermuda, gave a fine display of flower. One of the most successful of the winter flowering plants was *Coleus thyrsoides* which was greatly assisted by the absence of severe fog during its flowering period.

STUDENT GARDENERS.—Despite the outbreak of war, which must necessarily affect the movements of students, sixteen men secured appointments on completion of their training, only one less than in 1938.

Six men secured posts in Parks Departments; one was engaged by The Land Settlement Association as Assistant Horticultural Instructor; one went to the National Physical Laboratory,

Teddington; one to St. Benedict's School, Reading; one to St. Thomas More School, Southport; one to the Botanic Gardens, Glasgow; one was engaged by Messrs. Hillier and Son, Winchester, and one commenced in business in Kew as a Landscape Gardener.

Appointments secured overseas were not so numerous as in 1938. One student obtained a position in the Botanic Gardens, Grahamstown, South Africa; one, on exchange in New York Botanical Gardens, was successful in securing an appointment in the Botanical Gardens at Montreal, and another, on exchange at Government House Gardens, Cape Town, was engaged for permanent service in that department.

Three Overseas students, one from Belgium, one from New Zealand and one from Palestine, completed their full course of training during the year and returned to their respective countries.

Nine men from nurseries and private gardens; six from Parks Departments; one from The John Innes Horticultural Institution and one from the Botanic Gardens, Wellington, New Zealand, were selected for full course training; two of these subsequently joined H.M. Forces. It was decided not to fill further vacancies during the remainder of the year.

Exchanges of students were arranged with the Botanic Gardens at Berlin, Munich and New York, also with the Ontario Agricultural College, Guelph, and the Niagara Parks Commission, but with the exception of the two latter, the exchanges had to terminate owing to the commencement of hostilities.

Two students from Holland and one from Germany were admitted for voluntary training during the year.

RAINFALL RECORD.—Rainfall recorded at the Royal Botanic Gardens, Kew, during 1939:—

Inches.			Inches.		
January	...	4.13	July	...	2.24
February	...	.83	August	...	3.29
March	...	1.55	September	...	.85
April	...	2.28	October	...	4.87
May	...	1.32	November	...	4.59
June	...	1.66	December	...	.89

Total 28.50 inches.

The total for 1938 was 20.00 inches.

ORNAMENTAL WATERFOWL.—The collection has been enriched during the past year by the following generous presentations:—1 pair Black Swans, 1 female Muscovy, and 1 Andean Gander from M. J. Delacour, Clères, France; 1 Versicolor Teal duck from Mr. F. R. S. Balfour, Dawyck; 3 Indian Tree ducks and 2 drakes from Mr. P. Castang, Hampstead; 1 Barrow's Golden-eye duck from Dr. J. M. Derscheid, Sterrebeck, Belgium.

In addition, the following were received:—2 Magellan geese in exchange for 2 Magellan ganders, from Messrs. R. N. Stevens,

Walcot Hall; and 1 pair Common Shelduck, 1 Common Teal drake, 2 Mandarin drakes, 1 pair Maned Geese, and 1 pair Red Shovellers, from Messrs. McLean & Wormald, Dereham.

MATERIAL CONTRIBUTED TO AND DISTRIBUTED FROM THE GARDENS, 1939.—During the year, 782 separate consignments of plants, bulbs, seeds, etc., were received and 418 consignments despatched. The annual distribution of seeds amounted to 187 separate consignments, comprising 5042 packets of seeds of herbaceous plants and 3765 of trees and shrubs. The aggregate shows a decrease of 2091 packets as compared with 1938.

Wardian cases of plants were sent to East African Agricultural Research Station, Amani; Department of Science and Agriculture, Jamaica; Botanic Gardens, Penang, Straits Settlements (2); Department of Agriculture, Western Australia.

ECONOMIC PLANTS.—A list of the more important economic plants received and distributed during the year will be found under the section on Economic Work in Tropical Agriculture, p. 690.

ORNAMENTAL AND OTHER PLANTS.—The following is a list of material of the more important ornamental and other plants received during the year:—

Public Institutions:—

Cambridge Botanic Garden.—A collection of alpine and herbaceous seeds.

Edinburgh Botanic Garden.—A large collection of seeds collected by Messrs Ludlow and Sherriff in S. E. Tibet, 1938/39.

John Innes Horticultural Institution.—Collection of *Streptocarpus* spp. and hybrids.

Kirstenbosch National Botanic Garden.—Collection of seeds.

Lloyd Botanic Garden, Darjeeling.—Collection of seeds.

Pretoria, Division of Plant Industry.—Plants of *Pelargonium Bowkeri*.

Peradeniya Botanic Garden.—Wardian case of plants and a collection of orchids.

Sudan Government Gardens.—Wardian case of plants.

Private Donors:—

Mr. E. K. Balls.—Collection of seeds, bulbs and plants from the Andes of Bolivia, Colombia, etc.

Mr. H. Bruins-Lich.—Collection of South African seeds.

Mr. E. W. Davy.—Plants of *Dahlia Maxonii*.

Mr. P. H. Davies.—Collection of seeds from the Persian plateau.

Dr. R. E. G. Gray.—Collection of *Erica* seedlings.

Mr. A. Grove.—Plants of *Anemonopsis macrophylla*.

Mr. T. Hay, Hyde Park.—A collection of candelabra *Primulas* and *Meconopsis* spp.

Mrs. Kennedy.—A collection of seeds from Cyprus.

Mr. C. H. Lankester.—Collection of orchids and succulent plants from Costa Rica.

Mrs. Leonard Lees.—Bulbs of *Notholirion macrophyllum*, collected in Kashmir.

Mr. H. Q. Levy.—Collection of Jamaican orchids.

Mr. F. Millard.—A collection of choice alpine.

Lord Moyne.—Plant of *Dendrobium veratrifolium*.

Mr. J. W. Page.—Several fine specimen plants of orchids.

Mr. Amos Perry.—Plants of *Arisaema serratum* var. *japonicum* and *A. sikkokianum*.

Mr. C. Sandeman.—Collection of seeds from Peru.

Major F. C. Stern.—Bulbs of *Iris Winogradowii*.

Dr. C. T. de M. Villet.—Collection of South African succulent plants.

National Pinetum, Bedgebury

The most interesting facts to record are the peculiar weather conditions that have prevailed during the year. January was a very wet month and it was followed by several months of very cold weather with a rainfall below the average. At the end of September the rainfall for the year had been much lower than usual. There was, however, a lot of rain during the last three months of the year and the total fall for the year was 38.38 inches. Of this amount 21.35 inches fell in three months. October had the heaviest rainfall with 7.59 inches, and was followed by January with 6.96 inches and November with 6.80 inches.

The screen and ground thermometers used for Meteorological Office records are situated in one of the driest and highest positions in the Pinetum, but two of the other thermometers are placed in much damper places at some 70 feet lower elevation. In these positions the water table is within 9 or 12 inches of the surface after a wet period, and much lower temperatures are recorded than on the higher ground. On the morning of 30th December in a low place near Marshall's Lake 35 degrees of frost were recorded. On the same morning the ground temperature near the screen was 8°F. and the minimum temperature in the screen was 16°F. On the following morning the temperature in the same low place fell to 4°F., the ground temperature near the screen to 12°F., and the minimum temperature in the screen to 24°F. On the morning of December 30th, 17 degrees of frost were recorded on an exposed thermometer 3 feet above the ground at 430 feet elevation in Mr. Dallimore's garden at Bidborough. The Pinetum at Bedgebury varies from 200 to 270 feet above sea level. In May ground frost near the screen at Bedgebury was recorded on 13 mornings, and on 20 mornings in low places. On the morning of 21st May the ground temperature near the screen fell to 26 and the reading on low ground was 19. The highest shade temperature recorded was 81 degrees on successive days, June 6th and 7th. The greatest cold recorded at Bedgebury since we have been recording temperatures, previous to 30th December last, was on 10th December, 1933, when the thermometer on the same low ground fell to 5°F.

Despite the rather unusual weather conditions the growing season was a remarkably good one, and although there were so many cold nights in May, fewer plants than usual were injured by late frosts. This was due to the late spring and the backward condition of growth. The heavy rains of October and November caused some trees to continue growing until very late in the year and there are signs of a little injury to late shoots from the severe frost of late December.

The principal work, apart from upkeep, during the year has been the removal of nurse trees, mostly Scots pine and *Rhododendron ponticum*, with some natural Sitka spruce and Douglas fir, but some time has also been spent laying drain pipes and filling up open drains where they crossed avenues, and smoothing out avenues to facilitate mowing and the access of visitors.

Green aphids on spruce and pine sawfly on pines have required attention during the year, but they were kept in hand without difficulty, and the greatest problem has again been the control of honey fungus. As many tree butts as possible are removed as occasion arises, but the disease continues to take toll of the young trees. Even when a large butt is removed from an affected area it is not possible to trace out all the decayed roots.

Several violent wind storms have occurred, but only one tree has been lost. That was a young tree of *Pinus Pinaster* that had been blown down on previous occasions.

Before the outbreak of war a good many people visited the Pinetum during the week ends, and it was not unusual to have from 60 to 100 visitors on a fine Sunday. The seats erected about the Pinetum have been greatly appreciated.

The Museums

Inquiries for information regarding economic plants and curios have been as numerous as usual, some of them connected with conditions brought about by the war. Since the outbreak of war the Keeper has assisted with the protection of type specimens in the Herbarium, and has completed the determination and description of his collections made in Africa from 1928-30. Duplicate labels have been prepared and despatched to South Africa where sets were left for the Bolus Herbarium and the National Herbarium at Pretoria. As a precautionary measure the large marquetry pictures on loan in No. 3 Museum were returned to the owners, and the larger bottles of spirit-specimens have been taken from No. 1 Museum and stored in a safer place. Recutting and repolishing of the timber specimens in Museum No. 3 has been commenced, and should result in a great improvement in their appearance.

During the last year or two the question of suitable woods for charcoal for use in gunpowder manufacture has been raised, and the possibility has been explored of growing sufficient quantity of the native *Rhamnus*, *R. Frangula* L., and the closely allied American

species *R. Purshiana* DC., the latter being also the source of cascara.

Another plant about which enquiries have been received is the red squill, *Urginea Scilla* Steinh., an important ratticide, the bulbs of which vary considerably in toxicity.

A large firm of patent food manufacturers has been supplied with information regarding the vitamin value of native or easily obtained plants. Other correspondents have received help with regard to the cultivation of herbs and medicinal plants of which there is likely to be a shortage during the war.

A large number of beans, mainly from trade sources, have been received for identification during the year, particularly in connexion with alternative kinds for livestock, poultry and pigeons, etc. Seeds occurring as an impurity in cocoa beans proved to be those of *Dioclea reflexa* Hook.f., a common tropical climber.

Interest has also been taken in the so-called "giant star grass," *Cynodon plectostachyum* (K. Schum.) Pilger of tropical Africa, which is of very rapid growth, and is a valuable forage plant and soil binder.

Interest in the possibilities of *Ephedra* cultivation continues and the growth of plants raised in East Africa from seed of *Ephedra sinica* Stapf sent from Kew appears to be promising so far. Steps have been taken to procure additional seed of this species. Seed of two Indian species known to yield ephedrine (*E. intermedia* Schrenk & C. A. Mey and *E. Gerardiana* Wall. ex Stapf) has also been despatched to East Africa and to other areas for trial.

The work of checking and adding to the Arboretum Herbarium continued. The identifications of all the *Carya* spp. in the living collection were revised and material was collected to assist in the revision of the cultivated species of *Cotoneaster*. In addition to the routine work of naming plants, a number of requests for identification and advice on control of forest pests were received.

A number of seeds and other plant-organs suspected of poisoning stock were received and advice given on their toxic properties. The advent of the war caused increased interest in unusual fruits and the possibility of their use for making preserves. A sample of fruit-stones used by a gamekeeper for attracting pheasants proved to be *Prunus Laurocerasus* L., cherry laurel. The fruits of this species and the allied *P. lusitanica* L., Portugal laurel, have long been known as a favourite food of these birds.

Among foreign visiting workers, interested especially in tropical economic plants products, were Messrs. F. M. Baud and J. Kort from Holland, and Mr. J. E. A. den Doop, Agricultural Advisor, Anglo Dutch Plantations of Java Ltd., Bandoeng, Java, who spent some time examining *Agave* and allied fibres, both from Museum and living material.

CONTRIBUTIONS TO THE MUSEUMS, 1939:—Mr. V. C. G. Cecil, The Peruvian Corporation Ltd., London, E.C.3: material of *Lonchocarpus utilis* A. C. Sm.

Mr. W. S. Dahl, Mortlake, Surrey: balsa wood and balsa wood sawdust (*Ochroma Lagopus* Sw.) from Ecuador.

Mr. J. S. L. Gilmour, Royal Botanic Gardens, Kew: preserved "bakuri" fruit (*Platonia insignis* Mart.), and sample of Indian bamboo-pulp paper.

Mr. L. Wilson Greene, Maryland, U.S.A.: samples of sugar cane wax from Natal, Barbados, Louisiana and the Philippines.

National Institute of Medical Research, Hampstead: bark of *Chondrodendron candicans* (Rich. ex DC.) Sandwith, from British Guiana.

Mrs. A. Norris, Acton: French walking stick made from compressed leaves round a steel rod.

Mr. O. F. Parker, Ealing: box made of various New Zealand woods.

Mrs. P. L. Priestley, Penrhynedeudraeth, N. Wales: seeds of the Chile pine (*Araucaria araucana* C. Koch).

Mr. H. C. Sampson, Chesham, Bucks.: castor oil seeds (*Ricinus communis* L.), from Dahomey.

Miss B. Smith, Westerham, Kent: three ornamental doilies made partly from ferns.

Mr. H. Hamel Smith, Upper Caterham, Surrey: section of wood of *Araucaria* ("chaco").

Mrs. W. B. Stokes, Beckenhara, Kent: photographs of the Canadian Timber Exhibit at Wembley Exhibition, 1924.

Lt.-Col. Ellis de Vesian, London: cabbage walking-stick from Jersey.

Jodrell Laboratory

The following are some of the more unusual items among the considerable number of specimens received for identification. A large consignment of tarred ropes; rape seed for the detection of charlock (*Sinapis arvensis* L.) as an adulterant; elm wood from Old Waterloo Bridge; material from between the teeth of a Giant Panda.

Steady progress has been made with the compilation of the new book on the systematic anatomy of the Dicotyledons which was mentioned in last year's report. The collaboration with Dr. L. Chalk of the Imperial Forestry Institute has been maintained, and Dr. M. M. Chattaway of the same institution continued to work on the subject until the outbreak of war.

An account of the experiments on the use of synthetic plant growth substances for facilitating the rooting of cuttings, which were carried out in the gardens with the co-operation of Mr. W. G. Templeman of the Imperial Chemical Industries Research Station at Jealott's Hill, was published (K.B. 1939, 441-456). A few additional experiments with these substances have also been made. The Plant Hormone Committee met at the laboratory in April and decided to sponsor the publication of a propagation index to enable

ready reference to be made to those species and varieties of plants which have been successfully rooted with the aid of "hormones," together with particulars of the conditions under which successful results have been obtained. The index is being prepared by the joint action of several members of the committee, and arrangements are being made for it to be published by the Imperial Bureau of Horticulture and Plantation Crops at East Malling.

The Assistant Keeper attended a number of meetings of the pharmacognosy sub-committee of the committee which is revising the British Pharmaceutical Codex.

Visitors who worked at the laboratory included: Dr. L. Porthem (The Action of heteroauxin on *Phaseolus vulgaris*); Mr. D. G. Collet (Anatomy of *Senecio*); Messrs. F. M. Baud and J. Kort (Propagation of Cuttings by Synthetic Growth Substances); Mr. J. E. A. den Doop (Fibres and Fibre Plants); Mr. W. G. Templeman (Anatomy of cereal straws). Mr. J. Pryde continued his chemical work on S. African woods, but then left for S. Africa to collect more material. Miss W. M. Curtis completed her work on *Taraxacum*, for which she was awarded the M.Sc. degree of London University.

DRAWING AND PHOTOGRAPHY.—The quantity of type specimens photographed this year has been slightly less than usual, due to the outbreak of war. A number of living plants have been photographed or drawn for Kew records; these included some interesting photographs of banana seedlings and cacao plants, and a comprehensive series showing the movements of flower-buds of *Angraecum eburneum* in the course of a month.

More than the usual number of maps and illustrations have been prepared for the Kew Bulletin and other publications, and lantern slides have been made for various purposes to augment the official collection.

Over fifty new photographs of the Gardens have been taken, and 21 are being made into postcards for sale at the publications kiosk.

The Herbarium

EUROPE, ORIENT, AND N. AFRICA.

About 6600 numbers have been received during the year. The principal contributors were as follows:—*British Isles*.—Botanical Society and Exchange Club of the British Isles; Mr. J. P. M. Brenan; Mr. C. E. Britton; Mr. J. D. Grose; Mr. P. M. Hall; Prof. Heslop Harrison; Col. H. H. Johnston; Mr. J. E. Lousley; Saffron Walden Museum, Essex; Mrs. Cecil I. Sandwith; Mr. E. C. Wallace. *Continental Europe*.—Natural History Museum, Stockholm; Mr. J. H. Kern (Holland); Mr. J. E. Lousley (Czechoslovakia); Cracow Bot. Gard. (Poland). *Balkan Peninsula*.—Mr. P. Davis (Crete, Greece); Rev. & Mrs. H. P. Thompson (Greece); University of Sofia (Bulgaria); Mr. O. Grebenchikoff (Greece, purchased); Dr. K. H. Rechinger (Macedonia, etc., purchased); Dr. F. Houska

(Yugoslavia, purchased); Mr. V. Lindtner (Yugoslavia, purchased). *Orient*.—Mr. J. W. O. Platt (Chios); Hebrew University, Jerusalem (Palestine); Vester & Co. (Syria, purchased); Mrs. Kennedy (Cyprus); Mr. C. H. Wyatt (Cyprus); Lady Loch (Cyprus); Dept. Agric. Cyprus (Cyprus); Mr. A. C. Trott (Arabia). *North Africa*.—Mr. P. Davis (Morocco); Botanical Museum, Helsinki (Morocco); Mr. N. D. Simpson (Tunisia); Mr. A. W. Trethewy (Tangier); Natural History Museum, Stockholm (Morocco).

Members of the staff have also contributed specimens of British and Scandinavian plants and N. African specimens collected in Libya and Tunisia.

Sir A. D. Hall presented a set of *Tulipa* specimens, cultivated at Merton.

Material has been added regularly to the Genetical and Ecological Herbaria, especially from the Potterne Biological Station and the Herbarium Experimental Ground.

ASIA.

INDO-MALAYA.—*India*: About 800 sheets were mounted and laid in during the year. Collections have been received from the following sources and have been mostly dealt with: Mr. B. J. Gould (Tibet, Bhutan and Sikkim); Mr. R. N. Parker (Punjab); Forest Botanist, Dehra Dun (mainly from Kulu and Lahul); Forest Botanist, Burma (Burma); Lady Joan Legge (United Provinces); Professor E. Barnes (S. India); Professor Kobli (North India). Smaller collections were sent by Mr. H. W. Tilman (Assam); Mrs. Carson-Roberts (Burma); Mr. P. V. Mayuranathan (S. India); Academy of Sciences, Leningrad ("Pamirs," collector Dr. Fedtschenko). *Indo-China*: Mr. H. B. Garrett and Dr. A. F. G. Kerr (Siam); Natural History Museum of Paris (Indo-China).

MALAY PENINSULA AND ARCHIPELAGO.—About 3270 specimens were incorporated in the Herbarium during the year. In the first half of the year the identification was undertaken of a number of specimens from the Forestry Department, North Borneo, including *Lauraceae*, *Leguminosae* (*Sindora*, etc.), *Rhizophoraceae* (*Bruguiera*, etc.), *Anacardiaceae*, *Apocynaceae* (*Dyera*), and *Irvingiaceae* (*Irvingia*). Specimens of *Podocarpus*, *Dacrydium*, etc., were kindly named by Mr. M. Y. Orr of Edinburgh, and some *Sapotaceae* by Dr. H. J. Lam of Leiden.

The *Lauraceae* and *Myristicaceae* collected by the Oxford University Expedition to Sarawak in 1932 were also named in the early part of the year, and the results published.

The more important collections received from this area were from the Forestry Department, British North Borneo; Botanic Gardens, Singapore; Dr. F. A. Rodway (Java).

CHINA, JAPAN, AND N. ASIA.—The Sino-Japanese conflict has greatly restricted botanical activities in the Far East, and only one collection of specimens was received during the past year. This

consisted of 645 sheets of Szechwan plants communicated by Dr. W. T. Fang of the Szechwan University.

Owing to the resignation at the end of May of Mr. C. V. B. Marquand (who for many years had been in charge of the Chinese collections) little routine work was carried out.

AFRICA.

Normal work on the African flora has necessarily been curtailed but a number of collections have been named and determinations supplied. Over 6000 specimens have been mounted and about the same number have been incorporated. Several thousand specimens have also been sorted into duplicate sets for distribution.

A number of collections from various sources have been received for identification, the most important of which are mentioned below.

West Tropical Africa: Mrs. G. W. Harley (Liberia); Dr. F. R. Irvine (Gold Coast); Forest Dept., Nigeria; The Dept. of Agriculture, Sierra Leone (coll. F. C. Deighton). *Cameroons and Congo*: Botanic Gardens, Brussels; Institute des Parcs du Congo Belge. *North East Tropical Africa*: Veterinary Dept., British Somaliland (coll. A. S. McKinnon); Agricultural Research Institute, Sudan (coll. Messrs. F. W. Andrews and J. G. Myers); Sudan Dept. of Agric. & Forests (Mr. J. Robbie). *East Tropical Africa*: East African Agricultural Research Institute, Amani, and Mr. A. P. G. Michelmores (Tanganyika); Coryndon Museum (Kenya); Department of Agriculture and The Forest Department, Uganda. *South Tropical Africa*: Mr. R. A. F. Brennan (Northern Rhodesia); Botanical Institute of the University, Coimbra (Angola); Colonial Garden, Lisbon and Senhor Gomes e Sousa (Portuguese East Africa). *South Africa*: Bolus Herbarium; Natal Herbarium; National Herbarium, Pretoria.

AMERICA.

The most important accessions presented during the year were the collections of Mr. John Hanbury-Tracy in Venezuela and Colombia; of Mr. E. K. Balls on the Andes from Colombia to Bolivia; of Prof. T. W. J. Taylor in the Galapagos Archipelago; and a consignment received from the Forest Department of British Guiana which includes many specimens collected on the Pacaraima Range. A very large duplicate set of specimens collected by Dr. A. C. Smith on the Terry-Holden Expedition to British Guiana was received in exchange from the New York Botanical Garden. Mr. G. B. Hinton continues to send valuable consignments of plants from Central Mexico.

The following are the larger of the many useful collections received, besides those mentioned above:—The University of California, Berkeley, the California Academy of Sciences, San Francisco, and Messrs. H. D. Ripley and R. C. Barneby (California); Gray Herbarium (Plantae Exsiccatae Grayanae, cent. 9); Dr. F. J. Herman (Washington); Montana State University (Montana); National Museum, Ottawa, and Department of Agriculture, Ottawa

(Canada, Greenland and Labrador); University of Toronto (Canada); and from Dr. A. Ducke a collection of *Licania* and *Diospyros* specimens from Brazil.

In addition a number of important collections from Canada, Baja California, Sonora and Chiapas Districts of Mexico, British Honduras, Costa Rica and Brazil were purchased.

AUSTRALIA, NEW GUINEA, NEW ZEALAND AND OCEANIA.

Collections were received from Mr. E. Ashby (South Australia); Dr. F. A. Rodway (New South Wales); the North Queensland Naturalists Club, the University of Queensland, Brisbane, and the Brisbane Botanic Gardens (Queensland); Mr. R. A. Black (Victoria); Capt. J. D. McComish (Lord Howe I. and Norfolk I.); New Guinea Department of Agriculture, Rabaul (New Guinea); Dr. H. H. Allan and Mr. G. W. Simpson (New Zealand).

Research was continued on figs from New Guinea and various parts of Oceania.

ORCHIDS.

Numerous collections were dealt with from all parts of the world and an especially interesting series of duplicates was presented by the Botanical Museum of Harvard University.

Research was concentrated on the orchids of Tropical and South Africa, especially the genera *Habenaria* and *Polystachya*.

GRAMINEAE.

Despite war-time duties it has been possible, not only to make good progress with the determination of current collections received for identification from all parts of the world, but also to deal with some of the arrears which had accumulated. Over 2000 specimens have been named, including excellent material of rare or imperfectly known species from Mauritius, British Somaliland, Anglo-Egyptian Sudan, Tanganyika Territory, Northern Rhodesia, Angola, and Mexico. During the year, 2913 specimens were laid-in in the Herbarium and others not yet incorporated were sorted, as in previous years, into genera to make them available for study. Mr. W. Hartley of Canberra again gave valuable assistance in a number of ways, and for several months was engaged on a monograph of the genus *Eriachne*. Miss N. T. Burbidge of the University of Western Australia, spent some time revising the Australian species of *Enneapogon* and studying Western Australian grasses generally.

The more important collections of grasses received are listed below, but it should be noted that most general collections also contain a varying proportion of grasses.

Europe.—British Isles (members of Kew Staff, over 1000 numbers); France (Dr. M. Bouly de Lesdain). *Asia*.—India (a set of excellent specimens of *Saccharum* spp. and *Saccharum-Sorghum* hybrids from the Imperial Sugarcane Station, Coimbatore). *Africa*.—Gold Coast (Forestry Department); British Somaliland

(Veterinary and Agricultural Department; a collection containing a number of additions to the flora); Uganda (Department of Agriculture); Nyasaland (Veterinary Department); Tanganyika Territory (Mr. H. A. Lindeman); South Africa (Natal Herbarium, and McGregor Museum); Mauritius (Dr. R. E. Vaughan, and Department of Agriculture). *Australasia*.—Victoria (Mr. R. A. Black); New South Wales (Sydney Botanic Gardens); New Zealand (Professor Arnold Wall, including specimens of *Festuca* spp. which were cited in publications by Dr. W. O. Howarth and the late M. A. Saint-Yves). *America*.—North America (United States Department of Agriculture); West Indies (Mr. H. E. Box, specimens cited in Hitchcock's Manual of the Grasses of the West Indies); Argentine (Dr. A. Burkart and Professor L. R. Parodi).

PTERIDOPHYTES.

The most important collections received during the year included the following: specimens collected by Dr. A. Peter in Tanganyika Territory, including several type numbers, from the Botanic Gardens and Museum, Berlin, and a set of W. Indian ferns collected and presented by Mr. H. E. Box.

During the year 800 sheets were incorporated, while many more have been sorted and arranged into genera.

FUNGI.

Accessions of named fungi have included Sydow, *Mycotheca germanica*, fasc. 61–64, and *Fungi Exotici Exsiccati*, fasc. 20–21; *Reliquiae Farlowianae*, cent. 9, from Farlow Herbarium (received in exchange); roughly 100 specimens received in exchange from the Rijksmuseum, Stockholm, and 100 specimens of Basidiomycetes from the herbaria of Bourdot, Romell, and Donk, presented by Mr. A. A. Pearson, also type specimens presented by Dr. R. Sprague of Oregon State College and by the Imperial Agricultural Research Institute, New Delhi. Specimens for naming have been received from the National Herbarium, Pretoria, South Africa; Mr. R. W. Rayner, Trinidad, and Dr. E. Christophersen, Tristan da Cunha, in addition to numerous miscellaneous British fungi.

Considerable time has been devoted to the nomenclature of fungi, in connexion with the Nomenclature Committee of the British Mycological Society, which was appointed to provide material for consideration at the International Congress at Stockholm, now unfortunately postponed.

ALGAE AND LICHENS.

Specimens received include 280 Marine Algae from the University of California, some British Marine Algae presented by Mr. W. C. Worsdell, and fascicles 8–11 of "*Lichenes Fenniae Exsiccati*" presented by the Botanical Museum of the University, Helsinki. Several important collections of Algae and Lichens which had

accumulated have been laid in to the Herbarium. Specimens received for naming and correspondence with regard to material in the Herbarium have covered a wide geographical range.

EXPERIMENTAL RESEARCH.

The Genetical and Transplant experiments at Potterne and research in the Herbarium Experimental Ground have been continued throughout the year with important results which are being prepared for publication. It is hoped to complete as many of the series of experiments as possible in the coming season.

SUMMARY.

The routine work, apart from naming, accomplished during 1939 is summarised as follows:

Specimens mounted	...	...	...	...	47,494*
„ incorporated	...	...	...	...	30,509†
„ received on loan to Kew	...	...	...	...	3570
„ borrowed from Kew	...	...	...	...	6262
„ presented or purchased	...	...	...	...	29,100
Duplicates distributed	...	...	...	...	52,805
Type specimens extracted and placed in special covers, 70,000.					

POISON CHAMBER.

Owing to the outbreak of war, only 17 fumigations were carried out during the year. In addition to the treatment of incoming and borrowed specimens, several thousands of specimens which showed signs of the presence of beetles were removed from the herbarium and passed through the chamber.

DRAWINGS, PHOTOGRAPHS AND PORTRAITS.

During the past year the Collection of drawings and photographs has been enlarged by the following presentations and exchanges:—397 photographs of *Stapelieae* presented by Mr. Alain C. White; 172 photographs from the Division of Plant Industry, Pretoria, and 40 plates (711–750) of the "Flowering Plants of South Africa"; 38 water colour and pencil drawings prepared for the Botanical Magazine presented by the Royal Horticultural Society; 25 original pen and ink drawings and 25 copies of plates 3376–4000 of Hooker's *Icones Plantarum* presented by the Bentham Trustees; 159 photographs of British Plants with their negatives and index presented by Mrs. H. F. Devis; 125 original sketches of *Crocus* from Miss M. L. Maw; 22 photographs of *Pedicularis* from Sir David Prain; 17 photographs of types of *Erythrina* presented by the New York Botanical Garden; 192 drawings of Fungi from the Wellcome Research Laboratory. A complete set of 22 coloured plates (about 80 drawings) from Atchley's "Wild Flowers of Attica" was also received and

* Not including the Lower Cryptogams.

† Approximate number, and not including Lower Cryptogams.

27 photos were purchased from Dr. P. R. O. Balley. In addition a large number of drawings and photographs and some portraits of botanists were received from numerous other sources and have also been incorporated in the Collection. Photographs of type specimens have been laid into the Herbarium.

INDEX KEWENSIS.

During the year the compilation of Supplement X has gone on steadily. The majority of the periodicals in the Kew Library have been examined up to date and the new names abstracted from them. In addition a commencement has been made on the independent works. One of the compilers spent a short time at the Muséum d'Histoire Naturelle in Paris where she examined certain works which are not represented in the Kew Library, or in the Library of the Natural History Museum, South Kensington.

In addition to the many changes incorporated in Supplement IX, a further valuable innovation is being introduced into Supplement X in that figures of new plants are being specially recorded, such entries being prefixed by an asterisk. The references for the forthcoming Supplement are typed out on cards and have been arranged alphabetically so that they are available for consultation by the staff and by visiting botanists. The present number of entries included in the manuscript card catalogue is about 16,000.

NOMENCLATURE.

As in previous years many enquiries on nomenclatural points have been dealt with. The investigation of some of these has resulted in the publication of certain of the papers cited below.

The usual help of checking works for publication has been afforded to institutes and to individual botanists. A fair amount of work was done in connexion with the VIIth International Botanical Congress which was due to take place in Stockholm in 1940 but which has now been postponed. Considerable progress has been made with the list of correct names of economic plants.

PUBLICATIONS.—*Nicotiana Langsdorffii* (K.B. 1939, 26); Choice between epithets of the same date (l.c. 34); *Ocotea viridis* (l.c. 35); *Amaryllis* and *Hippeastrum* (l.c. 49); New combinations in the Gramineae (l.c. 101); The correct name for *Sesbania aculeata*. (l.c. 159); The correct name of the common Parsley (l.c. 168); The genus *Dalea*: new combinations and notes (l.c. 194); Notes on the nomenclature of certain Rutaceae-Aurantioideae (l.c. 290); Proposed additions and amendments to the International Rules of Botanical Nomenclature (l.c. 317); Analysis of binary combinations published under Anonymos by Walter, Fl. Carol. (1788) (l.c. 331); *Actinocheita* (l.c. 337); *Sedum Rosea* (Journ. Bot. 77, 126); Notes on British Carices (l.c. 152, 179, 259, 301); Ambiguous elm names (l.c. 244, 266); *Rorippa islandica* (Oeder) Borbás (l.c. 343); The nomenclature of hybrids (Chron. Bot. 5, 209).

VISITORS.

The total number of visitors in the Visitor's Book for the year 1939 was 3241, and included a number of well-known botanists from the Empire overseas and from foreign countries, in addition to members of various British Institutions, who regularly visit the Herbarium.

The following visitors kindly gave voluntary assistance in the Herbarium:—Mr. H. N. Ridley in naming Malayan specimens; Miss M. M. Whiting in arranging and classifying the Indo-Malayan material; Miss June Burroughes and Mr. Ogilvie-Grant in naming European collections; and, in the earlier part of the year, Mr. W. Hartley rendered assistance in routine work connected with the Gramineae.

The Library

With the renewal of the special grant for the arrears of binding, this work was continued during the year and many volumes needing attention were bound or re-bound. Many enquiries of a bibliographical and biographical nature have been dealt with by the Library Staff during the year. Further progress has been made with the work of sorting the octavo tracts, selecting those suitable for binding and transferring the remainder to boxes, a more satisfactory method of filing than that previously adopted, affording better protection from dust and damage.

Many presentations have been made to the Library during 1939. Among those who have kindly contributed are the following:—Lieut. Colonel Sir David Prain has presented the continuation of certain periodicals, and a number of other publications as in former years. The Royal Horticultural Society has presented two copies of their *Lily Year Book*, and the Rhododendron Association has sent its *Year Book* for 1939. A number of books and pamphlets have been presented by Mr. H. N. Ridley. The New York Botanical Garden has sent the continuation of certain of its publications. The Crown Agents for the Colonies have sent *The Birds of Tropical West Africa*, vol. 5. The 8th and 9th volumes of the *Flora URSS* have been received from the Botanical Institute of the Academy of Sciences, Leningrad.

We are indebted to the Bentham-Moxon Trustees for the continuation of several periodicals received in exchange for *Hooker's Icones Plantarum*.

A number of miscellaneous books and papers have been given to Kew by the Director of the Imperial Mycological Institute, while several botanical publications have been sent by the Librarian of the Board of Trade. A number of papers by various authors have been received from Mr. W. C. Worsdell, other presentations have been made by Mr. W. J. Bean, Mr. I. H. Burkill, Dr. T. A. Sprague, Dr. A. F. G. Kerr, Col. C. H. Grey, and many others, both at home and abroad. We are also indebted to many authors for copies of their botanical papers.

The Editor of *Nature* has presented a number of books, and among the publishers who have sent books for review in the Bulletin, are the following:—G. Allen & Unwin; Angus & Robertson; Baillière, Tindall & Cox; J. Bale, Sons & Curnow; B. T. Batsford; T. Buncle & Co.; Cambridge University Press; Crosby, Lockwood and Son; McGraw-Hill Publishing Co.; Macmillan & Co.; T. Murby & Co.; Oliver & Boyd; Oxford University Press; Putnam & Co.; J. W. Stacey, Inc.

The following new periodicals have been received during 1939:—*Journal of the South African Forestry Association*, No. 1; *Transactions of the Biological Scientific Research Institute affiliated to the State V.M. Molotov University of Rostov-on-Don*, fasc. 1; *Lloydia*, vol. i. nos. 1–4, vol. ii, nos. 1–3; *Travaux du Jardin Botanique de l'Université de Moscow*, vols. i & ii; *Contributions from the University of Michigan Herbarium*, nos. 1–3; *Contributions from the New South Wales National Herbarium*, vol. i, no. 1; *The Caribbean Forester*, vol. i, no. 1.

Publications of the Imperial Agricultural Bureaux, the Empire Cotton Growing Corporation, and various agricultural, botanical and forestry departments in this country and in the overseas Empire, continue to be received at Kew.

Further maps of the fifth (relief) edition have been sent by the Ordnance Survey Office, Southampton, while additional maps have been presented by the War Office. Other maps have been given by Miss Fischer, Mr. E. Milne-Redhead, and Mr. H. N. Ridley.

ROYAL BOTANIC GARDENS, KEW

LIST OF STAFFS

31ST DECEMBER, 1939

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L. Stenning (*Tropical*).

S. A. Pearce (*Greenhouse and Ornamental*).

G. H. Preston (*Herbaceous*).

CLERK (HIGHER GRADE)—A. Hearn.

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