

3L
Im 56, N38
NB9
69483



ROYAL BOTANIC GARDENS, KEW

BULLETIN OF
MISCELLANEOUS
INFORMATION

1938

LONDON
PUBLISHED BY HIS MAJESTY'S STATIONERY OFFICE
be purchased directly from H.M. STATIONERY OFFICE at the following addresses:
York House, Kingsway, London, W.C.2; 120 George Street, Edinburgh 2;
20 York Street, Manchester 1; 1 St. Andrew's Crescent, Cardiff;
80 Chichester Street, Belfast;
or through any bookseller.

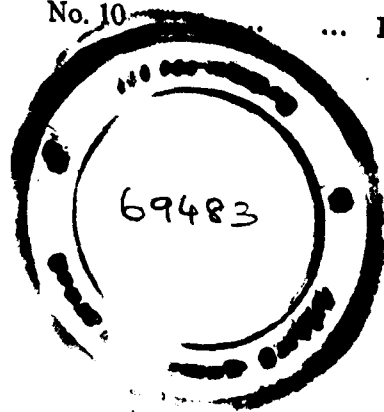
1939

Price 12s. 6d. net

JL
 Im 56, N38
 N39

THE SEPARATE NUMBERS OF THIS VOLUME WERE
 PUBLISHED ON THE FOLLOWING DATES:—

	1938.	Price.
No. 1	February 19	1s. 3d. Net.
No. 2	March 23	9d. „
No. 3	April 26	1s. 0d. „
No. 4	May 23	9d. „
No. 5	June 23	1s. 0d. „
No. 6	August 15	1s. 0d. „
No. 7	October 7	1s. 0d. „
No. 8	November 10	9d. „
No. 9	December 1	1s. 1d. „
No. 10	December 31	1s. 6d. „



CONTENTS

No.	Article.	Subject.	Page.
1	I	Penstemon campanulatus and P. Kunthii -	1
	II	Rain Forest in Ceylon -	9
	III	A Preliminary List of Plant Diseases in Nigeria	17
	IV	Contributions to the Flora of Siam: XLVI -	24
	V	New or Little-known Plants from Southern India: VIII -	32
	VI	On the Occurrence of Fagus Orientalis in Greece	38
	VII	On the Synonymy and Distribution of Strychnos innocua Del. -	45
	VIII	Miscellaneous Notes -	52
2	IX	Euphorbia (Diacanthium) Deightonii, a new Succulent from West Africa, with brief notes on some Allied Species -	53
	X	Contributions to the Flora of Tropical America: XXXIV -	59
	XI	A Note on Certain Malayan Species of Sindora -	73
	XII	The Botanical Name of the Douglas Fir -	79
	XIII	Miscellaneous Notes -	81
3	XIV	Notes on a Botanical Journey in S.W. Greenland, 1937 -	89
	XV	Contributions to the Flora of Siam: XLVII -	98
	XVI	Notes on Carex: III -	106
	XVII	Additions to the Flora of Borneo and other Malay Islands: VI -	110
	XVIII	New or little-known Plants from Southern India: IX -	123
	XIX	Contributions to the Flora of Siam: XLVIII -	127
	XX	Miscellaneous Notes -	133
4	XXI	The Formation of Intumescences containing Fatty Substances on the Stem of Khaya ivorensis -	137
	XXII	African Orchids: X -	141
	XXIII	Notes on Mesembryanthemaceae: II -	153
	XXIV	Meerburgh's Impatiens capensis -	161
	XXV	Contributions to the Flora of Tropical America: XXXV -	163
	XXVI	Miscellaneous Notes -	169
5	XXVII	Additions to the Flora of Borneo and Other Malay Islands: VII -	173
	XXVIII	Additions to the Flora of Borneo and Other Malay Islands: VIII -	175
	XXIX	Notes on African Rubi in the Kew Herbarium -	177
	XXX	A Synopsis of the Labiatae of the Guianas -	187
	XXXI	Two New Species of Senecio from Argentina -	197
	XXXII	Contributions to the Flora of Siam: XLIX -	199

No.	Article.	Subject.	Page.
5	XXIII	Plants New to Assam : X	210
	XXXIV	Miscellaneous Notes	214
6	XXXV	Additions to the Flora of Borneo and Other Malay Islands : IX	221
	XXXVI	Notes on Carex : IV	242
	XXXVII	Researches on <i>Silene maritima</i> and <i>S. vulgaris</i> : XXI	248
	XXXVIII	Extra-Floral Nectaries on <i>Osmanthus</i> Leaves ...	254
	XXXIX	The Correct Name of the Common Parsley	256
	XL	Anatomy of <i>Fraxinus oxycarpa</i> and <i>F. Pallisae</i>	258
	XLI	A New <i>Eugenia</i> from Assam	262
	XLII	Miscellaneous Notes	264
7	XLIII	<i>Alchemillae Novae</i>	269
	XLIV	Additions to the Flora of Borneo and Other Malay Islands : X	275
	XLV	Three New Species from Tibet	285
	XLVI	Notes on <i>Xylocarpus</i>	288
	XLVII	Contributions to the Flora of Tropical America : XXXVI	292
	XLVIII	Contributions to the Flora of Burma : XIV	294
	XLIX	<i>Neopteris</i> and <i>Chilenia</i>	296
	L	Four New Species of <i>Vernonieae</i>	298
	LI	<i>Chileniopsis</i> and <i>Bridgesia</i>	300
	LII	Miscellaneous Notes	301
8	LIII	A Revision of the <i>Eucryphiaceae</i>	317
	LIV	Miscellaneous Notes	350
9	LV	Contributions to the Flora of Tropical America : XXXVII	353
	LVI	Ecological Isolation	384
	LVII	Additions to the Wild Fauna and Flora of the Royal Botanic Gardens, Kew : XVIII	390
	LVIII	Miscellaneous Notes	396
10	LIX	The Siamese <i>Verbenaceae</i>	401
	LX	Contributions to the Flora of Siam : L	445
	LXI	<i>Binghamia</i> , <i>Haageocereus</i> and <i>Pseudoespostoa</i>	454
	LXII	The Taxonomic Position of <i>Tetrathalamus</i>	458
	LXIII	On the Flora of the Nearer East : XIX	460
	LXIV	<i>Pedilanthus</i> versus <i>Tithymalus</i>	468
	LXV	Miscellaneous Notes	470
	Appendix	Review of the Work of the Royal Botanic Gardens, Kew, during 1938	473

BULLETIN OF MISCELLANEOUS
INFORMATION No. 1 1938
ROYAL BOTANIC GARDENS, KEW

I—PENSTEMON CAMPANULATUS AND P. KUNTHII.
T. A. SPRAGUE and A. A. BULLOCK.

Considerable interest appears to have been taken in the cultivation of species of *Penstemon* towards the end of the eighteenth and the beginning of the nineteenth century, and numerous perplexing forms were figured and described in the horticultural literature of that period. The genus *Penstemon* Mitch. (1748) was not accepted by Linnaeus, who included under *Chelone* all the species of *Penstemon* known to him. The two genera are indeed closely related, the essential distinction lying in the seeds, which are winged in *Chelone* and wingless in *Penstemon*. Hence it is not surprising that many species of the latter genus were originally described under *Chelone*.

The first species of *Penstemon* introduced into cultivation in England* appear to have been *P. hirsutus* (L.) Willd. (*P. pubescens* Ait.) and *P. laevigatus*, Ait., both natives of Eastern North America. *P. Kunthii* G. Don was, as shown below, in cultivation at Kew in 1793. The Scientific Expedition of Nueva España [Mexico and Central America] led to the introduction of numerous new species from Mexico into cultivation in the Botanic Gardens, Madrid, and to their description by Cavanilles in his "Icones." Among these were *Chelone campanulata* Cav. Ic. 1, 18, t.29 (1791), and *Ch. barbata* Cav. Ic. 3, 22, t.242 (1794), both species now referred to *Penstemon*.

Cavanilles, in the preface to the first volume of his "Icones," mentions the receipt from Vicente Cervantes, José Longinos, and José Antonio Alzate, of seeds from Nova Hispania. Biographical details of these three botanists are given in Colmeiro, 'La Botánica y los Botánicos de la Península Hispano-Lusitana' (Madrid, 1858). The explorations of Humboldt and Bonpland† in Mexico made known four new species of *Penstemon*, all described under *Chelone*, namely, *Ch. imberbis* H.B.K., *Ch. gentianoides* H.B.K., *Ch. elegans*, H.B.K. and *Ch. angustifolia* H.B.K. Various

* Ait. Hort. Kew. ed. 1, 2, 360 (1789).

† See Sprague, 'Humboldt and Bonpland's Mexican Itinerary' (Kew Bull. 1924, 20-27).

North American species of *Penstemon* discovered by Nuttall, Richardson and Bradbury were introduced into cultivation, and in 1830 eighteen species were enumerated (two of them under *Chelone*) by George Don* as cultivated in Britain. Eleven of these were from North America, while the following seven were stated to be natives of Mexico: *P. campanulatus*, *P. roseus*, *P. elegans*, *P. atropurpureus*, *P. Kunthii*, *Chelone gentianoides*, *Ch. barbata*.

From the evidence now available there seems little doubt that, even as early as 1798, some of the *Penstemons* grown in gardens had originated as horticultural hybrids. Fresh light has been thrown on this question by the examination of numerous plants, now identified as *P. campanulatus* and *P. Kunthii* respectively, grown by Lt.-Col. J. W. C. Kirk in his garden at Gedling House, Gedling, Notts. These were raised from seed collected near Mexico City by Mrs. W. H. Fellowes, and each species came up true to type. Being grown side by side, it was not surprising that seed collected from them produced a medley of intermediate forms, which had presumably originated by crossing. Specimens of the two original batches and of the intermediate forms were sent to Kew for identification and were originally determined, in accordance with Krautter's 'Comparative Study of the genus *Penstemon*'†, as *P. campanulatus* (Cav.) Willd. In that work, *P. Kunthii* G. Don is treated as a synonym of *P. campanulatus*, doubtless on account of the existence of numerous intermediate forms, mainly in cultivation but also in the wild state. Krautter's view was accepted for two reasons: the herbarium material seemed to consist of an almost unbroken series, and the apparent correlation of vegetative with floral characters noted in the two cultivated plants received for identification was not borne out by examination of the dried specimens.

In September 1937, however, one of us was able to examine the living plants in full flower in Col. Kirk's garden, and agreed with him that a *prima facie* case existed for assigning the material to two species. The following summary of the contrasting characters was drawn up from an ample supply of fresh material sent specially by Col. Kirk.

P. CAMPANULATUS.

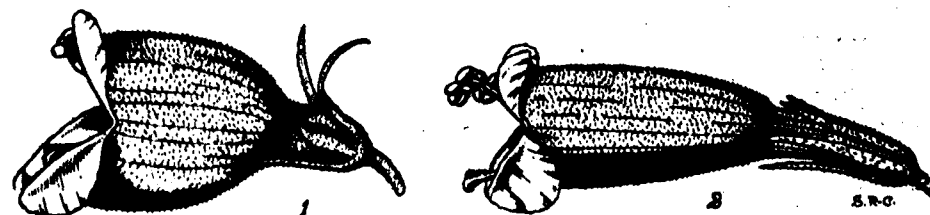
Calyx-segments equalling or longer than the basal part of the corolla-tube, the three upper ones recurved-patulous. *Corolla* blue-purple, whitish below and inside, campanulate-funnel-shaped, constricted about 5 mm. above the markedly swollen base, 2.3-2.5 cm. long; upper lip at first straight in line with the corolla-tube, finally slightly recurved; stamens not exserted (fig. 1).

* Loudon's *Hortus Britannicus*, 243-4 (1830). As stated in the preface, the greater part of this work, namely, the Linnean Arrangement and its Supplement (pp. 1-490) were entirely the work of George Don, who should accordingly be cited as the authority for the new names published therein.

† Contrib. Bot. Lab. Univ. Pennsylv. 3, No. 2 (1908).

P. KUNTHII.

Calyx-segments much shorter than the basal part of the corolla-tube, ascending. *Corolla* crimson-lake, paler inside, tubular-funnel-shaped, gradually narrowed above the slightly swollen base, narrowest about 7 mm. above the base, 2.8-3 cm. long; upper lip at first straight in line with the corolla-tube, finally recurved at right angles; stamens distinctly exserted (fig. 2).



1, Flower of *Penstemon campanulatus*; 2, Flower of *P. Kunthii*: both $\times 2$.

A revision of the numerous specimens in the Kew Herbarium identified as *P. campanulatus* (Cav.) Willd. and *P. pulchellus* Lindl. was undertaken in the light of these diagnoses, with the result that it has been possible to assign four-fifths of the material to one species or the other, the remaining sheets representing, chiefly, cultivated material. The synonymy and geographical distribution of the two species concerned appear to be as follows:—

K = Kew Herbarium; BM = British Museum (Nat. Hist.)
Specimens not specially marked are in the Kew Herbarium.

Penstemon campanulatus (Cav.) Willd. Sp. Pl. 3, 228 (1800); Benth. Pl. Hartweg. 48 (1840); Hook. in Bot. Mag. t. 3884 (1841), excl. syn. nonnull.; Benth. in DC. Prodr. 10, 326 (1846), partim; A. Gray in Proc. Amer. Acad. 6, 74 (1862), partim; Urbina, Cat. Pl. Mex. (Faneróg.) 257 (1897), partim; Krautter in Contrib. Bot. Lab. Univ. Pennsylv. 3, 147 (1908), partim.

Chelone campanulata Cav. Ic. Pl. 1, t. 29 (1791); H.B.K. Nov. Gen. et Sp. 2, 364 (1818).

Penstemon pulchellus Lindl. in Bot. Reg. t. 1138 (1828); Krautter, l.c.

Penstemon Gentryi Standley in Publ. Field Mus. Nat. Hist., Chicago, 17, 209 (1937).

CHIHUAHUA. S.W. Chihuahua, 1885, Palmer 307. Sierra Madre, near Colonia Garcia, 2250 m., July 1899, Townsend and Barber 106 (K)*; near Casas Grandes, 2250 m., July 1899, Townsend and Barber 447 (K, BM). Sierra Canelas, Rio Mayo, Oct. 1935, Scott Gentry 1910.

* Another specimen of Townsend and Barber 106 (BM) is apparently a hybrid—(see p. 5).

DURANGO. Santiago Papasquiario, 1896, *Palmer* 431. Otinapa, July-Aug. 1906, *Palmer* 429. Tejamén, Aug. 1906, *Palmer* 523, 524. COAHUILA. Sierra de Parras, July 1910, *Purpus* 4584 (BM). COAHUILA OR NUEVO LEON. Lerios, E. of Saltillo, 3000 m., 1880, *Palmer* 976.

SAN LUIS POTOSI. "Chiefly in the region of San Luis Potosi, 1800-2400 m.," *Parry and Palmer* 669.

GUANAJUATO. Near Santa Rosa de la Sierra, 2300 m., *Bonpland* 4266 (Herb. Berol.).

HIDALGO. Real del Monte, 2400 m., *Galeotti* 1051. Zimapan, *Coulter* 1277 (K: Herb. Hook., BM).*

MICHOACAN. Morelia, Nov. 1909, *Arsène* 619.

MEXICO. Anganguio, in pine forests, *Hartweg* 358 (K, BM). Valley of Mexico, in woods near Santa Fé, *Schaffner*. Contreras (D. F.), *Orcutt* 3499. Crucero, Temascaltepec, 2880 m., *Hinton* 2113.

PUEBLA. Esperanza, mountain slopes, Aug. 1907, *Purpus* 2694 (BM); Esperanza, Sept. 1911, *Purpus* 5676 (BM).

VERA CRUZ. Xalapa, without collector's name (? *Schiede*).

OAXACA. Without locality, 1842, *Ghiesbreght*.

Also collected in Mexico, without indication of State, by *Tate* 27; and "in hochgelegenen Gegenden, 1856", *Schweitz* 429 (BM). Two specimens from Mexico, Herb. Pavon (BM), inscribed "Chelone penstemon N[ueva] E[spaña]" and "Chelone campanulata Cav. de Mexico" respectively are also referable to *P. campanulatus*. Another specimen of *P. campanulatus* from Mexico (BM), labelled "Cleome [sic] campanulata N[ueva] E[spaña]" probably comes also from Herb. Pavon judging by the handwriting.

P. campanulatus is represented also by one of two specimens in Herb. Nuttall (BM) labelled "Pent. atropurpureum Mexico." The second specimen is *P. Kunthii*.

Penstemon Kunthii G. Don, Gen. Syst. 4, 639 (1838).

Chelone angustifolia H.B.K. Nov. Gen. et Sp. 2, 365, t. 173 (1818).

Penstemon angustifolium (H.B.K.) Poir. in Dict. Sc. Nat. 38, 385 (1825); non Fraser ex Pursh, Fl. Am. Sept. 2, 738 (1814).

DURANGO. Durango, 1896, *Palmer* 825, 851; Tejamén, Aug. 1906, *Palmer* 521.

JALISCO. Real Alto, 2500 m., Jan. 1927, *Mexia* 1582 (BM).—Colour of flower stated to be maroon, but the specimen seen is in fruit, and therefore cannot be identified with certainty. It may be a hybrid.

HIDALGO. Moran, 2400 m., *Bonpland* 4110 (typus in Herb. Berol.). Real del Monte, *Ehrenberg* s.n. (ex Mus. Bot. Berol.); *ibid.*, 2400 m., 1840, *Galeotti* 1052; *ibid.*, *Coulter* 1277 (Herb. Hook.);

* A further specimen of *Coulter* 1277 from Zimapan (BM), represents *P. Kunthii*. A specimen of *Coulter* 1277 (Herb. Hook.), from Real del Monte and an unlocalized one of *Coulter* 1277 (Herb. Benth.), also represent *P. Kunthii*.

ibid., *Berlandier* 518 (BM). Zimapan, *Coulter* 1277 (BM)*. Without locality, *Coulter* 1277 (Herb. Benth.).

MEXICO. Tlalpujahua, July 1828, *Graham*, 287 (K, BM), 288, 289. Pédrégal, *Bourgeau* 341. "Vallée de Mexico," *Bourgeau* 342. Flor de Maria, on calcareous bluffs, Aug. 1890, *Pringle* 3232 (K, BM). District of Temascaltepec: Socabon, Jan. 1932, *Hinton* 148; Los Hornos, Feb. 1932, *Hinton* 268; El Crucero, 2830 m., "two metres high, by the side of the road in the pine forest," June 1932, *Hinton* 872; Rincón, 1960 m., on a cliff, Oct. 1932, *Hinton* 2130; Ocotepc, ± 1500 m., Dec. 1932, *Hinton* 2902; Cajones, 2400 m., *Hinton* 5061. Without locality, *Parkinson* s.n., *Berlandier* 593 (BM).

MORELOS. Cuernavaca, Aug. 1854, *Schaffner* s.n. (Herb. Hook.).

PUEBLA. Acajete, Sept. 1910, *Orcutt* 3942.

OAXACA. Oaxaca, *Andrieux* 172.

A specimen from Hort. Kew. 1793 (BM) also belongs to *P. Kunthii*.

We have been unable to assign certain wild Mexican specimens either to *P. campanulatus* or to *P. Kunthii*. *Pringle's* no. 777, collected on mountains near Chihuahua in September-October 1886, and distributed as *P. pulchellus* Lindl., differs from typical *P. campanulatus* in the smaller calyx. The corollas vary in shape, and the stamens are subexserted in some of the flowers and included in others. It is suggested that the gathering under this number was made from a hybrid population. The Kew specimen of *Townsend and Barber* 106 is *P. campanulatus*, but the British Museum specimen of that number is apparently a hybrid. It has the exserted stamens of *P. Kunthii*, but is nearer *P. campanulatus* in the shape of the corolla, while the calyx is intermediate in character.

A specimen collected by *Coulter* at Zimapan, Hidalgo, under his number 1273 is of even greater interest. The large calyx and the shape and small size of the corolla suggest *P. campanulatus*, but the exsertion of the stamens agrees with *P. Kunthii*. Since *Coulter* collected both *P. campanulatus* and *P. Kunthii* at Zimapan under his no. 1277, apparently failing to distinguish them, the existence of a hybrid population at Zimapan seems indicated.

Various names which have cited as synonyms of *P. campanulatus* by *Krautter* and other authors now remain to be dealt with. These are *Chelone campanuloides* Andr., *Ch. elegans* H.B.K., *Ch. atropurpurea* Sweet and *Ch. rosea* Sweet.

The name *Chelone campanuloides* Andr. Bot. Rep. 1, text of t. 40 (Dec. 1, 1798) is clearly an orthographic or typographic error for *Ch. campanulata*. The latter name occurs on the plate, and *Andrews* states that the species was described and engraved by *Cavanilles* in his first volume of Spanish plants. He mentions that it was introduced along with *Ch. ruellioides* Andr.† (t. 34, Oct. 1, 1798)

* Other specimens of *Coulter* 1277, from Zimapan, belong to *P. campanulatus*, q.v.

† Now treated as a synonym of *Penstemon barbatus* (Cav.) Nutt.

to the Royal Gardens at Kew in the year 1793, by Mr. Boutelow, the son of the gardener to the King of Spain, who was then in England pursuing his botanical studies. According to Aiton (Hort. Kew, ed. 2, 4, 7, 8: 1812) *Chelone barbata* Cav. (*Ch. ruellioides*) and *Penstemon campanulatus* were introduced in 1794 by Sir Joseph Banks. Comparison of Andrew's plate of *Ch. campanulata* with that of Cavanilles and with living material and herbarium specimens reveals important discrepancies in the calyx and corolla. The most probable explanation of these discrepancies is that the plant figured by Andrews was a hybrid.

We know that *P. Kunthii* was cultivated at Kew in 1793 under the name *Chelone campanulata*. It had presumably been introduced via Madrid, where the true *P. campanulatus* flowered in December in the Royal Garden, according to Cavanilles. As the preface to the first volume of his "Icones" is dated "Calendis Januarii anni 1791" it is obvious that *P. campanulatus* must have first flowered at Madrid not later than December 1789. Presumably *P. Kunthii* was also in cultivation at Madrid, since the 1793 Kew "*Chelone campanulata*" (*P. Kunthii*) was stated by Andrews in 1798 to have been introduced by the son of the gardener to the King of Spain. *P. campanulatus* and *P. Kunthii* were not distinguished in gardens until the latter was described, as *Chelone angustifolia*, in 1818, and if, as seems probable, they were cultivated side by side in various countries of Europe, the early occurrence of putative hybrids between them, otherwise so perplexing, is at once explained.

Chelone elegans H.B.K. Nov. Gen. et Sp. 2, 364 (1818) was based on specimens of two plants, one stated to have been collected in Cuba, and the other in Mexico, between Toluca and Tianguillo. The Cuban record is very doubtful, since *Penstemon* is nowhere indigenous in the West Indies. The description is insufficient to identify the species, and no type-specimens are extant, either at Paris or Berlin. Kunth thought that *Ch. elegans* might be a variety of *Ch. campanulata*.

Chelone atropurpurea Sweet (Brit. Fl. Gard. 3, t. 235: Jan. 1828) seems to differ from *Penstemon campanulatus* and *P. Kunthii* in having dark purple flowers. It differs from the former in the narrower corolla, and from the latter in the relatively long calyx, with recurved patulous upper segments, the larger and more spreading limb of the corolla, and the included stamens. G. Don retained it as a distinct species, *Penstemon atropurpureus* (Sweet) G. Don, in Loud. Hort. Brit. ed. 1, 243 (1830). Sweet states that the drawing of *Chelone atropurpurea* was made in the summer of 1827 from specimens given to him by Messrs. Young, nurserymen, of Epsom, and that he had also received specimens of it from R. Barclay of Bury Hill. He had seen further specimens in the herbarium of A. B. Lambert, in whose garden at Boyton they had been raised from Mexican seeds.

P. atropurpureus is represented in the Kew Herbarium by three apparently contemporary cultivated specimens. One sheet (Herb. Hook.) is labelled "*Penstemon atropurpureum* Sweet br. fl. gard." A second sheet (Herb. Hook.) is written up in W. J. Hooker's handwriting "*Penstemon atropurpureum* Sweet. Hort. Barcl." The third sheet (Herb. Benth.) was first written up by Benth. as "*Penstemon atropurpureum* Hort. Soc. Hort. Lond. 20-7-29" and afterwards as "*Penstemon campanulatus* Nutt.; Benth. in DC. Prod. 10. 326." All three sheets agree with Sweet's plate of *Chelone atropurpurea*, and may be regarded as well authenticated. The corollas are from 2.3 to 2.5 cm. in length, whereas those shown in the plate range from 2.8 to 3.3 cm., possibly owing to the slight enlargement of flowers often found in illustrations given in horticultural periodicals.

We have no hesitation in referring to *P. atropurpureus* three collections of wild plants from Mexico. Galeotti's no. 1044, from woods of the Cordillera of Oaxaca, 2100-2700 m., agrees with the plate, except that the flowers are described by Galeotti as "red." The leaves are almost exactly like those figured by Sweet. Hartweg's no. 361 (K, BM), from Sumate, near Real del Monte, Hidalgo, differs in having longer and narrower leaves, and corollas 3-3.5 cm. in length.

P. atropurpureus was collected by Gadow (BM) on El Nevado in the State of Jalisco. In his book 'Through Southern Mexico' pp. 509, 510 (1908) he mentions having seen "dark red-purple pentstemons" above 11,000 ft. on that mountain.

The precise status of *Penstemon atropurpureus* will remain doubtful until further observations are made in the field. It is desirable that seed of it should be obtained with a view to genetic studies. The possibility that it may be a hybrid between *P. campanulatus* and *P. Kunthii* cannot entirely be excluded. Both species occur in Oaxaca, and both have been recorded from Real del Monte. On the other hand, it may prove to be a mere variety of *P. campanulatus*, with which it apparently has much more in common.

The name *Chelone rosea* Cerv. ex Sweet first appeared without a description in Sweet, Hort. Brit. 305 (1827). The plant was there stated to have been introduced from Mexico in 1825. A description and coloured plate were supplied in Sweet, Brit. Fl. Gard. 3, t. 230 (Dec. 1827). Judging from these, it may be a hybrid between *P. campanulatus* and *P. Kunthii*. The calyx-segments are intermediate in character, but rather nearer those of *P. Kunthii*. The corolla agrees in size with *P. campanulatus*, and in shape and colour with *P. Kunthii*. The stamens are not exerted, approaching *P. campanulatus* in this respect.

Several published plates remain to be considered. The figures given, under the name *Penstemon campanulatus*, in Jacq. Hort. Schoenbr. 59, t. 362 (1798-) and in Sims, Bot. Mag. t. 1878 (Jan. 1, 1827), seem to agree with *P. campanulatus* (Cav.) Willd., except

for the colour of the corolla, which is too red. The plant named *Pentstemon angustifolium* by Lindley in Bot. Reg. t. 1122 (Jan. 1, 1828) is obviously not that species. The stamens are distinctly exerted as in *P. Kunthii* (*angustifolius*), but the shape of the corolla is much nearer that of *P. campanulatus*, and the corolla is shown as rose-coloured, which agrees with neither species. The plant appears to have been a hybrid. The drawing was made from a plant which flowered in Mr. Tate's nursery in 1827.

The plate named *Pentstemon angustifolium* in Lodd. Bot. Cab. 15, t. 1420 (1828) shows a plant with flowers resembling those of *P. Kunthii*, but with subincluded stamens and entire leaves. Loddiges stated that the plant was first raised by Mr. Barclay, who communicated it to them. The plate conveys the general impression of being a careless representation of *P. Kunthii*.

Similarly the plate issued by Loddiges, Bot. Cab. 15, t. 1429 (1828), as *Pentstemon atropurpureum*, may possibly be a very bad representation of that species. The leaves are less serrate, and no indumentum is shown on stem, leaves or inflorescence. The corollalobes are very acute, and quite inconsistent with those of *P. atropurpureus*. These discrepancies may be due either to extremely bad drawing or to the plant drawn being of hybrid origin.

SUMMARY.

1. *Penstemon campanulatus* and *P. Kunthii*, which have been united by Krautter and other authors, are separated in this paper.
2. *P. pulchellus*, which Krautter and others treated as an independent species, is here reduced to *P. campanulatus*.
3. *P. atropurpureus*, which Krautter reduced to *P. campanulatus*, is here restored provisionally to specific rank. We have assigned to it wild specimens from Jalisco, Hidalgo and Oaxaca.
4. Evidence has been adduced suggesting the existence in a wild state in Mexico of mixed populations consisting of *P. campanulatus*, *P. Kunthii* and hybrids between them.
5. It is shown that *P. campanulatus* was in cultivation at Madrid by the year 1789 or earlier, and that *P. Kunthii* was cultivated at Kew in 1793. Both were grown under the name "*Chelone campanulata*." The Kew plant was introduced from Spain, where both species were presumably cultivated side by side as "forms" of *Ch. campanulata*.
6. The first putative hybrid between these two species was figured in Andr. Bot. Rep. t. 40 (1798). The following illustrations also represent what appear to be hybrids: *Chelone rosea* Cerv. in Sweet, Brit. Fl. Gard. 3, t. 230 (1827); *Penstemon angustifolium* Lindl. Bot. Reg. t. 1122 (1828), non (H.B.K.) Poir.

II—RAIN-FOREST IN CEYLON. JOHN R. BAKER (Department of Zoology and Comparative Anatomy, Oxford).

The south-west part of Ceylon receives both monsoons and has no really dry season, though the rainfall rises to maxima twice a year. The natural vegetation at low and medium altitudes in this area is tropical rain-forest, but there have been extensive clearings for cultivation and for the most part only small patches of the original forest remain. One rather large patch has, however, survived. This is the Sinharaja Forest, which is the subject of the present paper. I have recently given a general description (2) of the geography, climate and natural history of this forest, but the botany was only briefly mentioned. Some photographs were, however, published, which might be of interest to readers of this paper.

Schimper (11) does no more than mention that rain-forest exists in south-west Ceylon and that plank-buttresses on the trees are very common. Campbell (4) says that little forest remains in this area, and that such as remains is not particularly luxuriant. Guenther (6) made several short visits to patches of rain-forest in the south-west of Ceylon, though not to the Sinharaja itself; and he has left an interesting account of what he saw. The forest is mentioned by name by Willis (13) and Charawanamuttu (5), and Lewis (9) records a number of plants as occurring in it.

The Sinharaja Forest is situated south of Ratnapura and about 12 miles away at its nearest point. It is about 26 miles long and has an area of some 90 square miles. It extends from less than 300 feet to 3,838 feet above sea-level. It presents the characteristic features of a virgin tropical rain-forest. A list of the fifty commonest species of higher plants, away from paths, streams and clearings, is given in the Appendix. The straightness of the stems of the trees is a striking feature almost everywhere. Branches are only given off towards the tops, and the vertical pillar-like stems give the impression of the interior of a cathedral, which has struck observers of rain-forest in other parts of the world. One may estimate the height of the forest as a whole at about 115 feet. One tree was chosen as representing the average, and this was measured trigonometrically. The highest leaves were found to be 119 feet above the ground. When the forest is viewed from a distance, however, huge giants may be seen towering above this: these are probably mostly *Doona congestiflora*, *Dipterocarpus hispidus* and *D. zeylanicus*. One may distinguish these giants from the ordinary large trees such as the one measured, and also from small trees such as *Agrostistachys longifolia*; but there are not regular canopies, one below another, such as have been described in other rain-forests. Many of the trees have plank-buttress roots, but very high buttresses are not abundant.

In order to find which are the most abundant of the larger trees, a square half-acre was marked off at a medium elevation (1900 feet), and every tree was counted whose stem had a circumference of four feet or more at four feet above the ground. There were 25 such trees, namely the following:—eight specimens of *Durio zeylanicus*; two specimens of each of the following:—*Myristica dactyloides*, *Calophyllum Calaba*, *Doona congestiflora*, *Palaequium grande*, and "Alaheraliya"; one specimen of each of the following:—*Calophyllum Soulattri*, *Mesua Thwaitesii*, *Mangifera zeylanica*, *Semecarpus subpeltata*, *Anisophyllea cinnamomoides*, *Diospyros quaesita*, and "Yakahalu." The *Guttiferae* and *Dipterocarpaceae* are the families with the greatest number of common species in the forest, though in the area in which the count was made only one large *Dipterocarp* was present. The helicopter-like fruits usual in this family would only be able to serve their purpose in distribution in a species which projects above the general level of a forest. *Durio zeylanicus*, with its great prickly durian-like, but inedible fruit, is abundant everywhere. *Diospyros quaesita*, the calamander, is common; but the beautifully figured and valuable heart-wood is only present in a small proportion of specimens.

In general, the various species of trees are mixed up together, but occasionally one species predominates almost to the exclusion of others. Thus there is a large group of *Mesua Thwaitesii* near the river Elewalaganga, south of the village of Pitakele. This species, common everywhere, is the local iron-wood.

Woody lianas (*Dalbergia* sp., *Chilocarpus* sp., *Calamus* spp. and others) are common, but not so common as in some rain-forests; indeed, there is a certain restraint about the vegetation, contrasting with the wild luxuriance of, for instance, that of the northern New Hebrides. When the wind blows hard above the forest and sways the tree-tops, it is curious to see the lianas moving about near the ground among the immobile bases of the trees. There is no profusion of epiphytic growth on the stems of the trees, at any rate near the ground, and only a moderate growth of creepers (chiefly "Panampeti," *Freycinetia*, and *Pothos scandens*, the latter being remarkable for its flattened petioles).

The undergrowth is scanty, so that with two men going ahead with large knives one may proceed in any direction at about one mile per hour, unless prevented by the steepness of the ground. The poverty of the undergrowth is no doubt mostly due to the density of the leaf-canopy above; though soil conditions may play a part. Kurz (8) says of the tropical rain-forest of Burma that shrubby vegetation "often disappears entirely in the depth of the dark interior." In the Sinharaja the undergrowth is to an extraordinary extent simply a nursery for the trees, but the young specimens are not present in the same proportions as their elders. Young trees of *Dipterocarpus zeylanicus* are particularly abundant, together with *Mesua Thwaitesii*, *Durio zeylanicus*, and the thatching-

leaf tree, *Agrostistachys longifolia*. The young trees are as lacking in lateral growth as their elders. A typical young *Dipterocarpus zeylanicus* was carefully measured, to serve as an example. The stem was unbranched and 10 feet 11 inches high. There were only nine leaves, and these were all large and were borne on the uppermost six inches of the stem. The stem was only one inch in diameter at the ground and $\frac{1}{8}$ inch at four feet. Such curiously-shaped young trees intensify the vertical effect of the whole forest. Many of the young trees produce new leaves which are red and droop vertically downwards. These are adaptations to avoid the ill-effects of brilliant illumination on growing tissues, and are no doubt useful when new leaves are being formed at the tops of the big trees; but in the gloom below the canopy the character must be useless. I did not notice red or drooping young leaves on any forest plant except on those species whose subsequent growth would bring them into brilliant illumination. The young leaflets of the rattans (*Calamus*), which are also reddish, stick vertically upwards instead of drooping.

The really common undergrowth plants, other than young trees, are very few. Young rattans, before the growth of any stem, are abundant. The commonest plants which live all their life in the undergrowth are the ferns *Polystichum carvifolium* and *Cyathea sinuata*; the wild cardamom (*Elettaria Cardamomum*) and another Zingiberaceous plant called "Wal-miya"; and the bush *Apama siliquosa*. The latter is the only common bush of the forest, for this species departs from the general character of nearly all the plants in presenting a much-branched stem. The ground was largely covered at the time of my visit with the big leaves of *Dipterocarpus zeylanicus*, which had fallen some months before. Fallen timber is quite extraordinarily abundant, and impedes passage through the forest more than the undergrowth does. Polyporeae grow on the fallen timber, but I never saw a toadstool (*Agaricineae*) except in one situation: nearly every patch of elephant's dung has one or more, always apparently of the same species.

Fig. 1 illustrates the forest which I have described. It is very difficult to take a photograph which will give an accurate impression of a rain-forest. If one searches the literature, one finds that nearly all the photographs are of the edge of the forest, where it abuts on a river or clearing, or at least where a stream or path passes through it. If one studies such a place, one finds that the vegetation is almost completely different from that of the forest as a whole, owing to the much greater illumination. The photographs therefore represent only a minute fraction of the whole. I have tried to avoid this by placing my camera in the untouched forest, away from any path, stream or clearing. The difficulties of photography under such conditions are very great and technically good results cannot be obtained, but the object is to some extent represented.

The description I have given applies particularly to a medium elevation, namely about 1700–2000 feet. At lower elevations there

is no striking difference, but the following trees become noticeably commoner below 1000 feet :—*Trichadenia zeylanica*, *Homalium zeylanicum*, *Dipterocarpus zeylanicus* and *Vateria acuminata*. There is perhaps a slightly greater development of buttress-roots and lianas. At high elevations, e.g., at the summit of Wanduragala (3028 feet) and at 3400 feet on Rupahinkanda, the differences are more marked. The trees are smaller and more branched. *Wormia triquetra*, *Calophyllum Calaba* and species of *Eugenia* become abundant, and the fallen leaves of the first-named replace those of *Dipterocarpus zeylanicus*. *Doona congestiflora* remains abundant and is the largest tree at this elevation also. The less complete leaf-canopy gives more illumination beneath, and there is correspondingly more undergrowth. Bamboo forms an important part of it in places, and young specimens of *Agrostistachys* no longer abound. Dicotyledonous lianas do not occur, at any rate in any considerable numbers, though both thick and thin rattans persist and help to give a tropical impression.

According to the natives, the characteristically deciduous trees of the forest are *Dipterocarpus zeylanicus*, *D. hispidus*, *Doona nervosa*, *Stemonoporus Wightii*, and *Canarium zeylanicum*. During February or thereabouts these are commonly without leaves. February is the month in which the rainfall tends to be at a minimum. It will be noticed that four of the five deciduous trees mentioned above are Dipterocarps. In this there is agreement with the tropical rain-forest of Burma, of which Kurz (8) says, "The lofty trees towering above the dense forest mass are chiefly leaf-shedders"; and he instances several Dipterocarps. Since none of the deciduous trees is particularly abundant in the Sinharaja, the forest is ever-green; and indeed it would be a very extraordinary thing if it were not so, in such a remarkably unvarying climate. The trees of the forest as a whole are said by the natives to shoot forth their young leaves (often reddish) mostly about February and March. Flowering is said to be seasonal, most of the trees producing flowers about May-June, particularly about the time of the "wesak" full moon (May). The natives deny that any of the kinds of forest trees produces flowers and fruits throughout the year. *Doona nervosa* is said to flower and fruit only once in seven years, all individuals at the same time: the last occasion was about 1932. The fruits of most of the trees are said to ripen about the time of the harvesting of the "yala" rice-crop (August-September). This was borne out by myself, for during August I saw fruits of the following species on the trees or freshly dropped to the ground :—*Trichadenia zeylanica*, *Wormia triquetra*, *Dillenia retusa*, *Garcinia echinocarpa*, *Dipterocarpus zeylanicus*, *Doona congestiflora*, *Vateria acuminata*, *Elaeocarpus subvillosus*, *Durio zeylanicus*, *Kokoona zeylanica*, *Palaequium grande*, and "Alaheraliya."

I collected wood specimens of some of the trees for the study of growth rings, and my brother, Mr. S. J. Baker, has kindly prepared



these for examination. In one species, *Anisophyllea cinnamomoides*, the medullary rays are so well developed as to obscure the concentric rings. In my specimens of *Mesua Thwaitesii* definite rings are not visible, and they are not well marked in *Dipterocarpus zeylanicus*. This is perhaps rather remarkable in a deciduous species. They are rather better developed in *Myristica dactyloides* and (?) *Vitex altissima*. In the other species studied (*Garcinia echinocarpa*, *Doona nervosa*, *D. congestiflora*, *Durio zeylanicus*, *Semecarpus subpellata* and "Alaheraliya") they are as distinct as in ordinary Dicotyledonous trees of temperate regions, despite the small seasonal changes in climate. There is no certainty, however, that the rings are annual. In both species of *Doona* and also in "Alaheraliya" there is a tendency for the dark rings to be approximated in pairs. Since there are two hot wet periods in the year, alternating with two slightly cooler and noticeably less wet ones, it is tempting to suppose that a pair of dark rings is formed annually. *Durio zeylanicus* has the sharpest dark rings, and in this species they are curiously arranged. Many of the dark rings seen in transverse section spread out on one side of the stem in such a way as to enclose a crescentic region of paler wood. This shows that rapid growth of wood has occurred on one side of the stem at a time when it was not occurring on the other side.

Seasonal phenomena in the cultivated plants of the neighbourhood of the Sinharaja may be considered next. Breadfruit is plentiful in July and August, and a little is available in May. The main season for this food is not at the corresponding period of the year in the New Hebrides, in the Southern Hemisphere. Yams (*Dioscorea fasciculata* or "kukul-ala") are only cultivated on a small scale, and are planted and dug at any time of year, without reference to the season. This is in marked contrast to the New Hebrides, where the utmost care is taken always to plant at a definite season (Baker and Baker, 3). Cuttings of the sweet potato are put in twice a year, after the sowing of rice, and the tuberous roots are dug four months later. Two crops of ordinary or swamp rice are grown annually, as is usual in Ceylon. The sowing of the "yala" crop is finished by the Sinhalese New Year on 12th April. Harvesting takes place in August and September. This agrees with the general Ceylon practice, as given by Macmillan (10). The "maha" crop is sown in October–November, three months later than elsewhere, and harvested in February–March. Hill-rice, which grows on the hillside without the necessity for terracing and irrigation, is planted about 13th March, i.e., 30 days before the Sinhalese New Year, and is harvested about the time of the yala crop of swamp-rice. The kitul-palm, *Caryota urens*, flowers at all seasons of the year. The areca palm (*Areca Catechu*), unlike the kitul, is strongly seasonal. In the least wet month, February, some of the leaves fall and the flowers appear. The fruits are small in August and fully ripe by October.

Other plants commonly cultivated in the neighbourhood are Hevea rubber, manioc, tea, coconut, taro, and kurakkan.

I now turn to by far the most striking phenomenon presented by the forest as a whole. This is the shape of the leaves. Nearly every plant has the tip of the leaf or leaflet drawn out into a point. The common Monocotyledons of the forest mostly have such very narrow leaves that further narrowing to a special tip is not easily recognized, but in the Dicotyledons it is most obvious. Of the 41 Dicotyledons that are the commonest in the forest (apart from the vicinity of streams and paths), no fewer than 37 have the tips drawn out, and these 37 belong to more than 20 families. The phenomenon is common to the trees, to the bush *Apama siliquosa*, and to the lianas and creepers. (There is no very common Dicotyledonous undergrowth-plant.) The only exceptions among the common plants are *Wormia triquetra*, *Dillenia retusa*, *Calophyllum Calaba* and *Kokoona zeylanica*. The leaves and leaflets of the Dicotyledons are represented in Fig. 2. It might be thought that I had specially chosen those with pointed tips, but this is emphatically not so. The figure simply shows the leaves of those species which I regard as the most abundant at middle elevations in the forest.

Pointed tips to leaves are characteristic of plants of wet regions, and especially of tropical rain-forests, but I doubt whether any rain-forest can show the phenomenon more markedly than the Sinharaja. Attention was called to the subject by Jungner (7), who was struck by the prevalence of drawn-out tips to leaves ("Stachelspitzen") in the plants of the rain-forest of the Cameroon region of West Africa. He concluded that the function of the pointed tip was to hasten the run-off of water from the leaf, and thus help to prevent insects and lower plants from attacking them. He noticed that leaves whose points have been broken off are much parasitized. He remarked that those Cameroon species which are not provided with the "Stachelspitze" have usually some other means (e.g., poisonous sap) of protecting their leaves from parasitism. Stahl (12) made an elaborate study of the subject in West Java. He used the term "Träufelspitze" to indicate his conviction that the purpose of the drawn-out tip is to facilitate the run-off of water from the upper surface of the leaf. He timed the period required for the drying of a wetted leaf before and after the cutting off of the point, and noted large differences. He considered that the rapid run-off of water presents three advantages in addition to that stressed by Jungner. He pointed out that less mechanical strain is put upon the plant if the leaves are not weighted down by water; that the water is directed straight towards the roots, instead of being dispersed or evaporated; and that transpiration is aided by the reduction of the humidity of the air in the neighbourhood of the leaves. In the Sinharaja one notices that when it rains, one is not much protected by the canopy above, although it appears so dense. No doubt the "Träufelspitzen" are the cause.

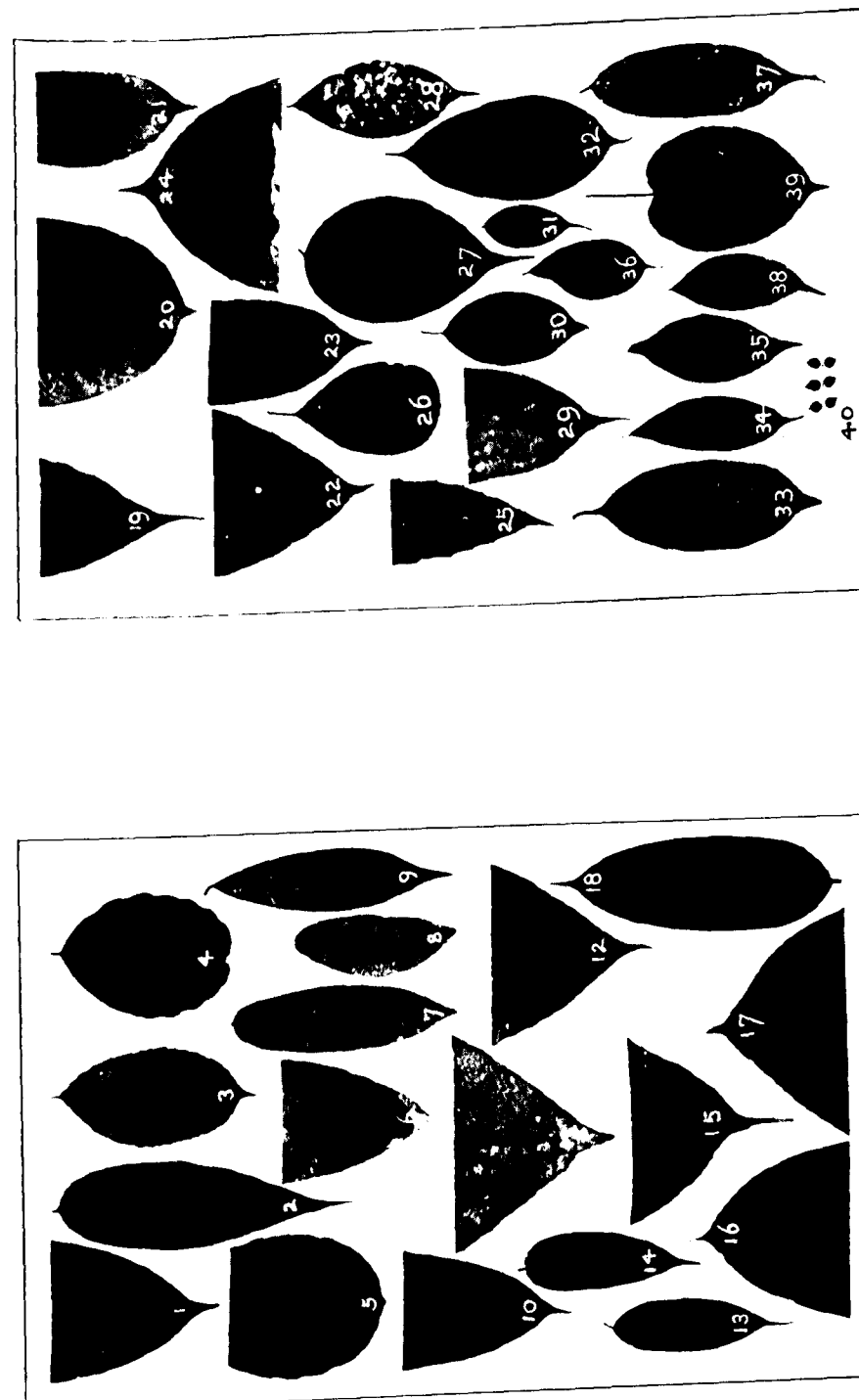


Fig. 2. The leaves and leaflets of the forty commonest Dicotyledons of the Sinharaja Forest, illustrating the prevalence of drip-points. The bases of the larger leaves have been omitted to save space. For names of the species

As is usual in tropical rain-forests, many of the trees have very large leaves (e.g., *Dipterocarpus hispidus*, *Vateria acuminata*, *Canarium zeylanicum*, and *Semecarpus subpeltata*).

I wish to thank Messrs. A. H. G. Alston, A. W. Exell, W. R. Philipson and T. B. Worthington for much help in the identification of the plants. The scientific names are mostly those used by Alston (1). Mr. A. B. Lushington and Mr. W. M. McNeill kindly gave me valuable advice.

Summary.

(1) The Sinharaja Forest, situated in the wet (south-west) part of Ceylon, is the only considerable area of virgin tropical rain-forest in the island. It covers about 90 square miles.

(2) It would appear that despite the relatively small climatic changes during the year, the flowering and fruiting is largely seasonal, and some of the largest trees are deciduous.

(3) Drip-points to leaves or leaflets are present in the great majority of the plants.

REFERENCES.

1. ALSTON, A. H. G. Supplement to H. Trimen's *Handbook to the Flora of Ceylon*. Dulau, London (1931).
2. BAKER, J. R. in *Geog. Journ.* **89**, 539 (1937).
3. BAKER, J. R. & I. in *Journ. Linn. Soc. Zool.* **39**, 507 (1936).
4. CAMPBELL, D. H. *An Outline of Plant Geography*. Macmillan, London (1926).
5. CHARAWANAMUTTU, V. E. *The New School Geography of Ceylon*. 2nd edit. Colombo (1930).
6. GUENTHER, K. *Einführung in die Tropenwelt*. Leipzig (1911).
7. JUNGNER, J. R. in *Bot. Centralbl.* **47**, 353 (1891).
8. KURZ, S. *Forest Flora of British Burma*. Calcutta (1877).
9. LEWIS, F. *A Descriptive Catalogue of the more useful Trees and Flowering Plants of the Western and Sabaragamuwa Provinces of Ceylon*. Colombo (1902).
10. MACMILLAN, H. F. *Tropical planting and gardening*. Macmillan, London (1935).
11. SCHIMPER, A. F. W. *Plant Geography upon a Physiological Basis*. Oxford (1903).
12. STAHL, E. in *Ann. Jard. Bot. Buitenz.* **11**, 98 (1893).
13. WILLIS, J. C. *Ceylon: a Handbook for the Resident and Traveller*. Colombo (1907).

APPENDIX.

List of the fifty flowering plants and ferns (excluding epiphytes) of the Sinharaja Forest, judged to be the commonest at medium altitudes, away from paths, streams and clearings. The numbers in the second column correspond with those in Fig. 2. The Sinhalese names are those used by the natives of the locality, who in some cases use a name for a plant differing from that used by the natives of other parts of Ceylon (e.g., Katamoda), and in other cases use the same name for a different plant (e.g., Na).

Family.	No.	Species.	Local * Sinhalese Name.	Habit.
DICOTYLEDONS—				
Myristicaceae ...	1	<i>Myristica dactyloides</i>	... Malaboda	... Tree.
Aristolochiaceae ...	2	<i>Apama siliquosa</i>	... Kepun-kiriya	... Bush.
Flacourtiaceae ...	3	<i>Homalium zeylanicum</i>	... Liyan	... Tree.
Dilleniaceae ...	4	<i>Wormia triquetra</i>	... Supara	... Tree.
	5	<i>Dillenia retusa</i>	... Godapara	... Tree (small).
Guttiferae ...	6	<i>Garcinia echinocarpa</i>	... Madol	... Tree.
	7	<i>Calophyllum Soulattri</i>	... Domba-kina	... Tree.
	8	<i>Calophyllum Calaba</i>	... Gutu-kina	... Tree (small).
	9	<i>Calophyllum bracteatum</i>	... Walu-kina	... Tree.
	10	<i>Mesua Thwaitesii</i>	... Na	... Tree.
Dipterocarpaceae	11	<i>Dipterocarpus hispidus</i>	... Buhora	... Tree (very large)
	12	<i>Dipterocarpus zeylanicus</i>	... Hora	... Tree (very large)
	13	<i>Doona nervosa</i>	... Hin-beraliya	... Tree (very large)
	14	<i>Doona congestiflora</i>	... Tinniya	... Tree (very large)
	15	<i>Valeria acuminata</i>	... Hal	... Tree (very large)
	16	<i>Stemonoporus Wightii</i>	... Maha-beraliya	... Tree.
Tiliaceae ...	17	<i>Elaeocarpus subvillosus</i>	... Gal-weralu	... Tree (small).
Malvaceae ...	18	<i>Durio zeylanicus</i>	... Katamoda	... Tree.
Sterculiaceae ...	19	<i>Sterculia Balanghas</i>	... Nava	... Tree (small).
Euphorbiaceae ...	20	<i>Agrostistachys longifolia</i>	... Beru	... Tree (small).
	21	<i>Agrostistachys coriacea</i>	... Hin-beru	... Tree (small).
Burseraceae ...	22	<i>Canarium zeylanicum</i>	... Dik-kekuna	... Tree (very large)
Anacardiaceae ...	23	<i>Mangifera zeylanica</i>	... Etamba	... Tree.
	24	<i>Semecarpus subpellata</i>	... Maha-badulla	... Tree.
Sapindaceae ...	25	<i>Pometia eximia</i>	... Na-imbul	... Tree.
Celastraceae ...	26	<i>Kokoona zeylanica</i>	... Kokun	... Tree.
Leguminosae ...	27	<i>Dalbergia sp. (?)</i>	... Bambara-wel	... Woody liana.
Rhizophoraceae ...	28	<i>Carallia calycina</i>	... Ubberiya	... Tree (very large)
	29	<i>Anisophyllea cinnamomoides</i>	... Welipiyenna	... Tree.
Combretaceae ...	30	<i>Terminalia parviflora</i>	... Hampalanda	... Tree (small).
Myrtaceae ...	31	<i>Eugenia phylliracoides</i>	... Pinibaru	... Tree (small).
Sapotaceae ...	32	<i>Palaquium grande</i>	... Kiri-himbiliya	... Tree.
Ebenaceae ...	33	<i>Diospyros quacsita</i>	... Kalumederiya	... Tree.
Apocynaceae ...	34	<i>Chilocarpus sp. (?)</i>	... Kiri-wel	... Woody liana.
Verbenaceae ...	35	<i>Vitex altissima (?)</i>	... Milla	... Tree.
Unidentified	36	—	... Alaheraliya	... Tree.
	37	—	... Yakahalu	... Tree.
	38	—	... Kirindi-wel	... Woody liana.
	39	—	... Panu-wel	... Woody liana.
	40, 41.	—	... Hin- & wal-panampeti.	... Creepers.
MONOCOTYLEDONS—				
Pandanaceae ...	42	<i>Freycinetia pycnophylla</i>	... Viya-keyiya	... Creeper.
Palmaceae ...	43, 44, 45.	<i>Calamus spp.</i>	... We- kukulu- & thambutu-wel.	... Lianas.
Araceae ...	46	<i>Pothos scandens</i>	...	... Creeper.
Zingiberaceae ...	47	—	... Wal-hiya	... Undergrowth
	48	<i>Eleotaria Cardomomum</i>	...	... Undergrowth plan
FERNS—				
Filicaceae ...	49	<i>Polystichum carvifolium</i>	... Wal-miyena	... Undergrowth plan
Cyatheaceae ...	50	<i>Cyathea sinuata</i>	...	... Undergrowth plan

III—A PRELIMINARY LIST OF PLANT DISEASES IN NIGERIA. J. WEST (Department of Agriculture, Nigeria).

Two collections of fungi made by Mr. C. O. Farquharson in Southern Nigeria and one made by Dr. J. W. Scott Macfie in Northern Nigeria were published by Miss E. M. Wakefield in the Kew Bulletin (1, 2, 3). These collections included a number of parasitic fungi. Numerous records and descriptions of specific plant diseases have appeared in the Annual Reports and Annual Bulletins of this Department and in various scientific journals. A list of plant diseases occurring in Nigeria was prepared by Mr. T. Laycock in 1929, but was never published.

This preliminary list presents a summary of all the records which are now available. Consequently, it contains records made by several individuals. The position of Mycologist was first held by Mr. C. O. Farquharson from 1911 to 1917, when he was lost at sea. Mr. T. Laycock was Mycologist between 1919 and 1932, and Mr. G. H. Jones was second Mycologist from 1923 to 1929. Early in 1932, on the retirement of Mr. Laycock, the Mycological and Botanical Sections were amalgamated, and since then the problems of plant pathology and plant breeding have been undertaken by a unified Section.

The work of Mr. Farquharson is worthy of note. At a time when the Department was in its infancy and when facilities were extremely limited, he laid a sure foundation for plant pathology in Nigeria. His views and outlook on his work are well expressed in a letter of his which was published in the Kew Bulletin (4).

Wherever possible, the initials of the individual responsible have been added after each record included in this list. It will be obvious that many of the diseases must have been noted in the past, but since no records exist, the initials of the author and a comparatively late date have perforce to appear after them.

A certain number of records have been included in which the symptoms of leaf mosaic or yellow chlorosis suggest that they represent virus diseases. Where no investigation of them has as yet been undertaken, the presumed virus cause is entered with a query.

The majority of the identifications have either been made or have been confirmed by the staff of the Imperial Mycological Institute, Kew, for whose help full acknowledgment is due.

REFERENCES.

1. Kew Bulletin, 1912, 141-144.
2. *Ibid.* 1914, 253-261.
3. *Ibid.* 1917, 105-111.
4. *Ibid.* 1918, 353-361.

Acacia decurrens Willd. (Black Wattle).
Macrophomina phaseoli (Mauhl.) Ashby. Root disease. Jos, 1927. T.L.

Ananas comosus (Linn.) Merr. (Pineapple).
 Undetermined. Fruitlet brown rot. Agege, 1933. J.W.
 Undetermined. Wilt. Agege, 1933. J.W.

Andropogon tectorum Schumacher.
Uredo sp. Rust. Ibadan, 1935. J.W.
 ? *Ustilago amadelpha* Syd. & Butl. Smut. Ibadan, 1935. J.W.

Arachis hypogaea Linn. (Groundnut).
Cercospora personata (Berk. & Curt.) Ell. & Ev. Leaf spot. Ibadan, 1913. C.O.F.
Corticium Solani (Prill. & Del.) Bourd. & Galz. Root disease. Ibadan, 1923. T.L.
Pestalotzia versicolor Speg. Leaf spot. Ibadan, 1932. J.W.
Sclerotium Rolfsii Sacc. Root disease. Ibadan, 1923. T.L.
 Rosette. Virus. Ibadan, 1913. C.O.F.

Cajanus cajan (Linn.) Druce. (Pigeon Pea).
Fomes lignosus Kl. White root disease. Colony, 1913. C.O.F.

Canavalia ensiformis DC. (Jack Bean).
Gibberella sp. Stem disease. 1922. T.L.
Sclerotium Rolfsii Sacc. Root disease. Ibadan, 1932. J.W.
 Leaf Mosaic. ? Virus. Ibadan, 1934. J.W.

Capsicum annum Linn. and **C. frutescens** Linn. (Chillies).
Colletotrichum Capsici (Syd.) Butl. & Bisby. Fruit rot. Ibadan, 1933. J.W.
 Leaf Mosaic; mild and acute forms. ? Virus. Ibadan, 1935. J.W.

Carica Papaya Linn. (Pawpaw).
Phyllosticta Caricae-papayae Allesch. Leaf spot. Ibadan, 1933. J.W.

Citrus spp.
Botryodiplodia Theobromae Pat. Branch cankers, following injury due to *Sahlbergella* sp. On *C. paradisi* Macf. (grapefruit). Agege, 1935. J.W.
Elsinoë Fawcetti Bit. & Jenkins. Scab disease. On *C. paradisi*, *C. Aurantium* L. (sour orange), *C. Limon* Burm. f. (lemon). Ibadan, 1934. J.W.
Fomes noxius Corner. Brown root disease. On root stocks of *C. paradisi* Macf. var. (hybrid lemon), *C. aurantiifolia* (Christen.) Swingle (lime) and *C. Aurantium*. Agege, 1934. J.W.
Macrophomina Phaseoli (Maubl.) Ashby. Root disease. On stocks of *C. Limon*. Ibadan, 1935. J.W.
Penicillium sp. Green mould of fruits. On *C. paradisi*. Ibadan, 1935. J.W.
Phytophthora sp. Gummosis. On root stocks of *C. aurantiifolia*. Ibadan, 1932. J.W.
 Undetermined. Russet of fruits. On *C. paradisi*. Ibadan, 1936. J.W.
 Undetermined. Silver scurf of fruits. On *C. paradisi*. Ibadan, 1937. J.W.

Clitoria sp.
Heterodera marioni (Cornu) Goodey. Root knot. Ibadan, 1932. J.W.

Cocos nucifera Linn. (Coconut).
 Undetermined. Bud rot. Awka, 1917. C.O.F.

Codiaeum sp. (Croton).
Cercospora Codiaei Cif. & Frag. Leaf spot. Ibadan, 1933. J.W.

Coffea spp. (Coffee).
Cercospora coffeicola Berk. & Curt. Leaf spot. On *C. arabica* Linn. Ibadan, 1933. J.W.
Colletotrichum coffeanum Noack. Berry and leaf disease. On *C. liberica*. Benin, 1931. T.L.
Fomes lignosus Kl. White root disease. On *C. liberica*. Agege, 1913. C.O.F.
Fomes noxius Corner. Brown root disease. On *C. arabica*. Ibadan, 1933. J.W.

Cola acuminata (Beauv.) Schott. & Endl. and **C. nitida** (Vent.) Schott. & Endl. (Kola).
Botryodiplodia Theobromae Pat. Rot of nuts. Ibadan, 1925. T.L.
Marasmius scandens Mass. Thread blight. Ajia, 1934. J.W.

Corchorus sp.
Heterodera marioni (Cornu) Goodey. Root knot. Ibadan, 1935. J.W.

Crotalaria ? **anagyroides** H.B. & K.
Fomes noxius Corner. Brown root disease. Owena, 1937. J.W.

Cyperus sphacelatus Rottb.
Cintractia peribebuyensis Speg. Smut. Ibadan, 1935. J.W.
Uredo sp. Rust. Ibadan, 1935. J.W.

Dactyloctenium aegyptium (Linn.) Beauv.
Ustilago dactylocteniphila P. Henn. Smut. Ibadan, 1935. J.W.

Dahlia sp. (Dahlia).
Entyloma Dahliae Syd. Smut. Plateau Province, 1931. T.L.

Dioscorea spp. (Yams).
Anguillulina bradys (Steiner & LeHew) Goodey. Tuber disease. Ibadan, 1932. J.W.
Bagnisiopsis Dioscoreae Wakef. Witches' broom. Okigwi, 1917. C.O.F.
Phyllosticta Graffiana Sacc. Leaf spot. Ibadan, 1933. J.W.
 Yellow Chlorosis. ? Virus. Oyo, 1935. J.W.

Dolichos Lablab Linn.
Heterodera marioni (Cornu) Goodey. Root knot. Ibadan, 1933. J.W.

Elaeis guineensis Jacq. (Oil Palm).
Fomes lignosus Kl. White root disease. Agege, 1913. C.O.F.
 Yellow Leaf. ? Physiological. Nkwele, 1933. J.W.
 Infertile Bunch. ? Physiological. Benin, 1936. J.W.

Eugenia uniflora Linn. (Pitanga Cherry).
Marasmius scandens Mass. Thread blight. Ibadan, 1935. J.W.

Gossypium spp. (Cotton), including **G. peruvianum** Cav., **G. vitifolium** Lam. and **G. hirsutum** Linn.
Alternaria macrospora Zimm. Leaf and boll disease. Ibadan, 1923. G.H.J.
Bacterium malvacearum (E. F. Sm.) E. F. Sm. Bacterial disease. Cotton districts, 1912. C.O.F.
Botryodiplodia Theobromae Pat. Boll rot. Cotton districts, 1912. C.O.F.
Cephalosporium sp. Boll rot. Ibadan, 1926. T.L.
Cercospora gossypina Cooke. Leaf spot. Ibadan, 1927. G.H.J.
Cerotelium desmium (Berk. & Br.) Arth. Rust. Colony, 1912. C.O.F.
Colletotrichum Gossypii South. Anthracnose. Cotton districts, 1912. C.O.F.
Fusarium sp. Boll rot. Ibadan, 1923. T.L.
Macrophomina Phaseoli (Maubl.) Ashby. Damping off. Ibadan, 1927. G.H.J.
Nematospora Gossypii Ashby & Nowell. Boll rot. Ibadan, 1923. T.L.
Ramularia areola Atk. Areolate mildew. Cotton districts, 1912. C.O.F.
 Leaf Curl. Virus. Ibadan, 1912. C.O.F.
 Crinkle. Physiological. Ibadan, 1924. C. H. Wright and T. G. Mason.
 Leaf Roll. Physiological. Ibadan, 1923. G.J.J.

Hevea brasiliensis Muell.-Arg. (Rubber).
Botryodiplodia Theobromae Pat. Die back. Agege, 1912. C.O.F.
Ceratostomella (Ophiostoma) sp. Mouldy rot of tapped surface. Sapele, 1920. T.L.
Colletotrichum coffeanum Noack. Leaf spot. Ibadan, 1933. J.W.
Corticium salmonicolor Berk. & Br. Pink disease. Calabar, 1911.
Fomes lignosus Kl. White root disease. Sapele, 1912. C.O.F.
Fomes noxius Corner. Brown root disease. Agege, 1912. C.O.F.
Ganoderma pseudoferreum (Wakef.) van Overcem & Steinm. Wet rot. Sapele, 1920. T.L.
Marasmius scandens Mass. Thread blight. Sapele, 1920. T.L.
Phytophthora palmivora Butl. Canker. Sapele, 1920. T.L.
Phytophthora sp. Black stripe disease. Sapele, 1920. T.L.
Ustilina zonata Lév. Collar rot. Calabar, 1913. C.O.F.
 Undetermined. Brown bast. Sapele, 1920. T.L.

Hibiscus esculentus Linn. (Okra).
 Leaf Curl. Similar to that on cotton. Agbor, 1912. C.O.F.

Hippeastrum equestre (Ait.) Herb.
 Leaf Mosaic. ? Virus. Ibadan, 1937. J.W.

Imperata cylindrica Beauv. (Spear Grass).
Sphacelotheca Schweinfurthiana (Thum.) Sacc. Smut. Ibadan, 1935. J.W.

Ipomoea sp.
Heterodera marioni (Cornu) Goodey. Root knot. Ibadan, 1933. J.W.

Lawsonia inermis Linn. (Egyptian Privet).
Septobasidium sp. Twig disease. Vom, 1933. J.W.

Lycopersicum esculentum Mill. (Tomato).
Fusarium bulbigenum Cooke & Mass. var *Lycopersici* (Brushi) Wollenw. & Reink. Wilt. Buea, Cameroons, 1922. T.L.
 Leaf Mosaic. ? Virus. Ibadan, 1934. J.W.

Mangifera indica Linn. (Mango).
Cercospora Mangiferae Koord. Leaf spot. Ibadan, 1933. J.W.

Manihot spp. (Cassava, Ceara Rubber).
Cercospora Henningsii Allesch. Leaf spot. On *M. utilisissima* Pohl and *M. Glaziovii* Muell.-Arg. Ibadan, 1932. J.W.
Fomes lignosus Kl. White root disease. On *M. utilisissima*. Agege, 1913. C.O.F.
 Leaf Mosaic. Virus. On *M. utilisissima*, *M. Glaziovii* and *Manihot* sp. Ijebu-Ode, 1926. G.H.J.

Mariscus umbellatus Vahl.
Cintractia limitata Clint. Smut. Ibadan, 1935. J.W.

Momordica sp.
 Yellow Chlorosis. ? Virus. Ibadan, 1935. J.W.

Mucuna aterrima Holland. (Bengal Bean).
Cercospora Stizobii Syd. Leaf spot. Ibadan, 1933. J.W.
Macrophomina Phaseoli (Maubl.) Ashby. Root disease. Ibadan, 1932. J.W.
Sclerotium Rolfii Sacc. Root disease. Ibadan, 1932. J.W.
 Leaf Mosaic. ? Virus. Ibadan, 1934. J.W.

Nicotiana Tabacum Linn. (Tobacco).
Cercospora Nicotianae Ell. & Ev. Leaf spot. Ilorin, 1924. G.H.J.
Heterodera marioni (Cornu) Goodey. Root knot. Oshogbo, 1935. J.W.
 Leaf Curl. Virus. Meko, 1912. C.O.F.
 Leaf Mosaic. ? Virus. Ilorin, 1924. G.H.J.

Panicum maximum Jacq.
Ustilago heterospora P. Henn. Smut. Ibadan, 1935. J.W.

Pennisetum typhoides Stapf & Hubbard. (Millet).
Sclerospora graminicola Schroet. Green ear disease. Makurdi, 1928. T.L.
Sphacelotheca cruenta (Kühn) Potter. Smut. Makurdi, 1928. G.H.J.
Sphacelotheca Sorghi (Link) Clint. Smut. Zaria, 1928. G.H.J.

Tolyposporium Penicillariae Bref. Smut. Northern Provinces, 1924. G.H.J.

Phaseolus lunatus Linn. (Lima Bean).
Heterodera marioni (Cornu) Goodey. Root knot. Ibadan, 1932. J.W.
Macrophomina Phaseoli (Maubl.) Ashby. Root disease. Ibadan, 1932. J.W.
Sclerotium Rolfsii Sacc. Root disease. Ibadan, 1932. J.W.
 Yellow Chlorosis. ? Virus. Ibadan, 1929. T.L.
 Leaf Mosaic. ? Virus. Ibadan, 1932. J.W.

Ricinus communis Linn. (Castor).
Cercosporina ricinella (Sacc. & Berl) Speg. Leaf spot. Ibadan, 1933. J.W.

Rottboellia exaltata Linn. f.
Uredo Rottboelliae Diet. Rust. Ibadan, 1935. J.W.

Sesamum indicum Linn. (*Sesamum orientale* Linn.). (Beniseed).
Macrophomina Phaseoli (Maubl.) Ashby. Wilt. Makurdi, 1928. T.L.

Setaria longisetia Beauv.
Ustilago heterospora P. Henn. Smut. Ibadan, 1935. J.W.

Sida sp.
Puccinia heterospora Berk. & Curt. Rust. Ibadan, 1935. J.W.

Sida sp.
 Leaf Curl. Similar to that on cotton. Ibadan, 1935. J.W.

Solanum tuberosum Linn. (Potato).
Bacterium solanacearum (E. F. Sm.) E. F. Sm. Wilt. Buca, Cameroons, 1923. T.L.

Sorghum vulgare Pers. (Guinea Corn).
Sorosporium Reilianum (Kühn) McAlp. Smut. Ilorin, 1929. T.L.
Sphacelotheca Sorghi (Link) Clint. Smut. Makurdi, 1928. G.H.J.

Tectona grandis Linn. (Teak).
Fomes lignosus Kl. White root disease. Mamu, 1915. C.O.F.
Fomes noxius Corner. Brown root disease. Mamu, 1915. C.O.F.
Ustilina zonata Lév. Collar rot. Mamu, 1915. C.O.F.

Tephrosia spp.
Fomes noxius Corner. Brown root disease. On *T. candida* DC. Mamu, 1935. J.W.
Heterodera marioni. (Cornu) Goodey. Root knot. On *T. candida*. Owena, 1937. J.W.
 Yellow Chlorosis. ? Virus. On *T. candida* and *T. vogelii* Hook. Ibadan, 1935. J.W.

Theobroma Cacao Linn. (Cacao).
Aspergillus flavus Link, *A. Tamaris* Kita, *A. fumigatus* Fresen, and *A. Sydowi* Bain. & Sartory. Mouldiness in cacao beans. Ibadan, 1929. T.L.

Botryodiplodia Theobromae Pat. Brown pod and die back. Colony, 1912. C.O.F.

Cephaleuros mycoidea Karst. Algal disease. Benin, 1932. J.W.

Colletotrichum theobromicola Del. Pod anthracnose. Colony, 1912. C.O.F.

Fomes lignosus Kl. White root disease. Agege, 1912. C.O.F.

Fomes noxius Corner. Brown root disease. Colony, 1912. C.O.F.

Marasmius scandens Mass. Thread blight. Ajia, 1934. J.W.

Phytophthora palmivora Butl. Black pod and canker. Colony, 1912. C.O.F.

Undetermined. Stone pod. Victoria, Cameroons, 1921. T.L.

Urochloa lata (Schum.) C. E. Hubbard.
Uromyces leptodermus Syd. Rust. Ibadan, 1935. J.W.

Vernonia amygdalina Delile.
 Leaf Curl. Similar to that on tobacco. Ogbomosho, 1935. J.W.

Vigna unguiculata (Linn.) Walp. (Cowpea).
Heterodera marioni (Cornu) Goodey. Root knot. Ibadan, 1935. J.W.
Uromyces Vignae Barclay. Rust. Ibadan, 1934. J.W.
 Leaf Mosaic. ? Virus. Ibadan, 1934. J.W.

Zea Mays Linn. (Maize).
Fusarium sp. Pink mould of tassels. Ibadan, 1933. J.W.
Helminthosporium turcicum Pass. Leaf blight. Ibadan, 1933. J.W.
Ophiobolus heterostrophus Drechs. Green mould of tassels. Ibadan, 1933. J.W.
Physoderma Zeae-maydis Shaw. Brown spot. Ibadan, 1933. J.W.
Ustilago Zeae (Beckm.) Ung. Smut. Ibadan, 1934. J.W.
 Streak Disease. Virus. Ibadan, 1936. J.W. Determined by Dr. H. H. Storey, Amani.

MISCELLANEOUS RECORDS.

Cephaleuros mycoidea Karst. Commonly producing spots on leaves of *Citrus* spp., *Theobroma Cacao* Linn., *Cassia siamea* Lam., *Dalbergia Sissoo* Roxb., *Persea americana* Mill. and *Piper nigrum* Linn.

Thonningia sanguinea Vahl (Balanophora). Plant parasite on the roots of *Hevea brasiliensis* Muell.-Arg. Sapele, 1917. C.O.F. Also on forest trees.

Loranthus sp. Commonly parasitic on *Citrus* spp., *T. Cacao*, and ornamental plants.

IV—CONTRIBUTIONS TO THE FLORA OF SIAM.
ADDITAMENTUM XLVI.*

Rhododendron talense Hutch. [Ericaceae—Rhododendreae]; affine *R. Henryi* Hance, sed foliis angustioribus et longioribus, pedicellis longioribus, floribus albis differt.

Arbor circiter 10 m. alta; ramuli sicco purpureo-brunnei, glabri. Folia subverticillata, oblongo-oblancheolata, acute acuminata, basi acuta, 10–14 cm. longa, 3–3.5 cm. lata, glabra, nervis lateralibus utrinsecus circiter 10 utrinque prominulis; petioli 1.5 cm. longi, supra anguste sulcati; perulae breviter ciliatae, extra glabrae. Inflorescentia terminalis, circiter 4-flora, perulis mox deciduis; pedicelli 1.5 cm. longi, glanduloso-pilosi. Calyx brevis, undulatum lobatus, glaber. Corolla infundibuliformis, 4 cm. longa, glabra; lobi 5, oblongo-elliptici, 2 cm. longi. Stamina corolla leviter breviora; filamenta leviter pilosa; antherae 3 mm. longae. Ovarium glabrum, sicco sulcatum; stylus glaber, corollae aequilongus, stigmate magno discoideo.

Nakawn Sritamarat Prov.; Kao Luang, about 1400 m., in evergreen forest, Apr., A. F. G. Kerr 15512 (type).

The specific name refers to Tai, the Siamese name for Siam.

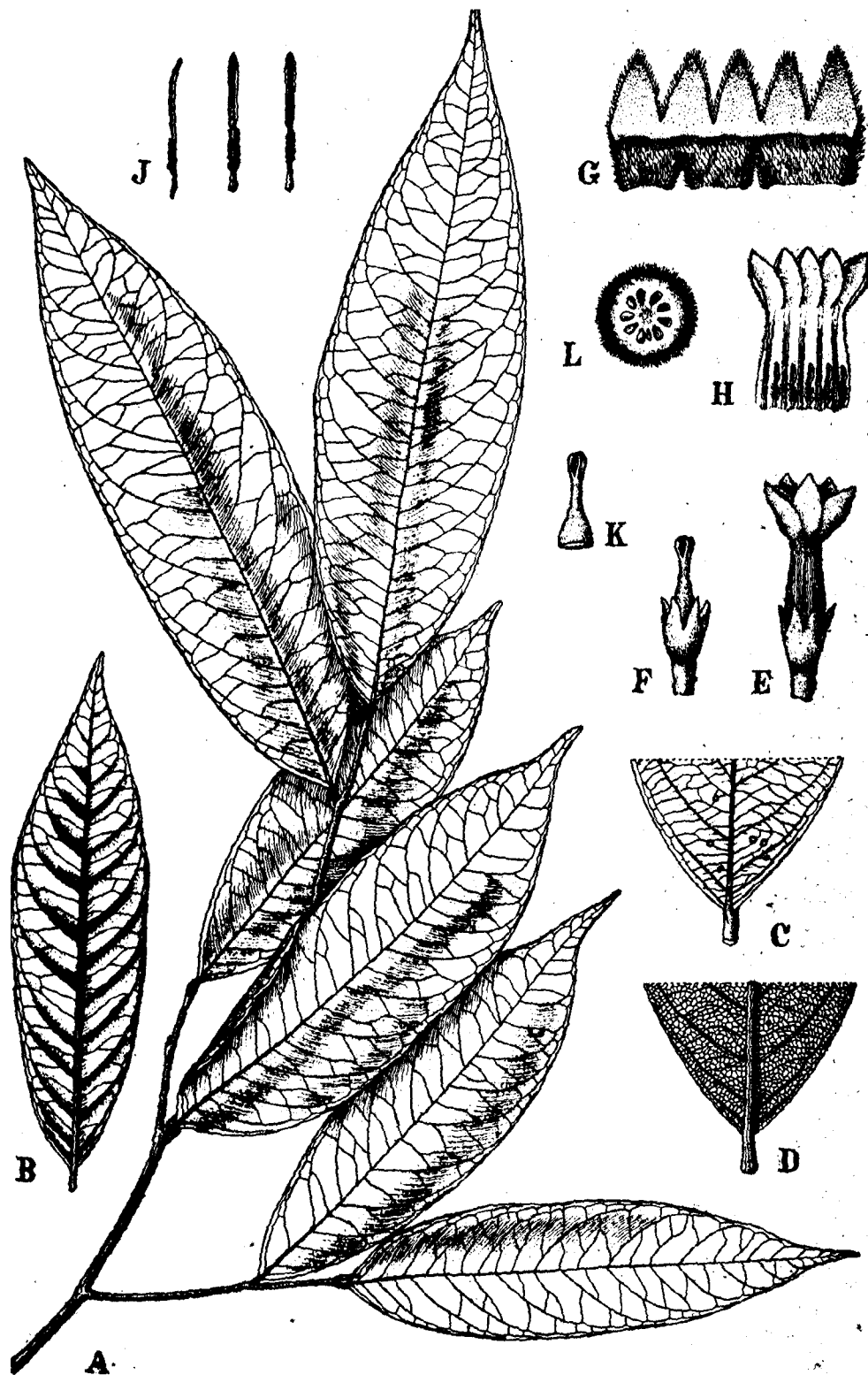
Diospyros Vanprukii Bakh. [Ebenaceae]; *D. apiculatae* Hiern affinis, sed ovario 10-loculari et corolla tomentella praecipue differt.

Frutex. Ramuli teretes, graciles, fulvo-tomentosi, deinde glabrescentes, rimosi, statu sicco albicantes et nigricantes, gemmis oblongis tomentosis. Folia alterna, bifaria, breviter petiolata, oblongo-lanceolata, 10–20 cm. longa, 4–6 cm. lata, basi obtuse cuneata vel obtusa, apice acuminata, subacuta, integerrima, margine reflexa, membranacea, statu sicco supra olivacea, subopaca, costa excepta glabrata vel glabra, subtus pallidiora, opaca, costa excepta glabrata vel glabra, basi glandulis parvis orbicularibus munita, penninervia; costa supra depressa, subtus prominens, utrinque fulvo-tomentosa, nervis lateralibus 10–17-paribus perspicuis supra depressis glabris vel glabratiss, subtus valde prominentibus pilosis vel glabrescentibus adscendentibus secus marginem arcuatis non vel obscure anastomosantibus, venis laxis transverse parallelis utrinque prominulis; petiolus teres vel subteres, rugosus, rufotomentosus, glabrescens, 3–5 mm. longus. Flores dioici, parvi. Flores masculi adhuc ignoti. Flores feminei 5-meri, breviter pedicellati vel subsessiles; calyx campanulatus, basi angustatus, usque

*Continued from K.B. 1937, 510.

Explanation of Figure on opposite page.

Diospyros Vanprukii Bakh. A, Leaf branch (nat. size). B, Leaf, seen from below (nat. size). C, D, Leaf base ($\times 2$): C, seen from above and D, seen from below. E–L, Flower with details: E, Expanded flower seen from side ($\times 4$); F, Calyx and ovary ($\times 4$); G, Calyx opened, seen from inside ($\times 10$); H, Corolla with staminodes, slit lengthwise, seen from inside ($\times 4$); J, Staminodes ($\times 20$); the left one seen from side, the middle one seen from outside, the right one seen from inside; K, Ovary ($\times 4$); L, Ovary in transverse section. (Vanpruk 623, ♀, III–1915, Siam, Sin Pun, Krabi, type specimen in Herb. Kew.)



ad medium vel profundius 5-lobatus, utrinque sed praecipue extra appresse subdense pubescens, 3-4 mm. longus, lobis ovato-oblongis acutis ciliatis; corolla hypocrateriformis, 5-lobata, extra tomentella, intus glabra, 1-1.3 cm. longa, tubo cylindrico apice angustato 6-8 mm. longo 2-2.5 mm. diam., lobis ovato-ellipticis obtuse acuminatis extra tomentellis intus glabris aestivatione sinistrorse imbricatis 4-5 mm. longis 2.5-3 mm. latis; staminodia 4-5, basi corollae inserta, 2-2.5 mm. longa, filamentis parte exteriori pilosis, antheris lineari-lanceolatis glabris; ovarium ovoideum, apicem versus in stylum angustatum, dense hispidum, 5-6 mm. longum, 10-loculare, loculis uniovulatis, stylo elongato dense tomentello apice 5-lobato 4-5 mm. longo, stigmatibus linearibus suberectis incurvis 1-2 mm. longis. *Fructus* ignotus.

Sin Pun, Krabi, alt. 150 m., March 1915, *Vanpruk* 623, fol. et flor., ♀.

When I was working up the *Ebenaceae* of the Malay regions, part of the rich materials of the Asiatic species of this family, treasured up in the Kew Herbarium, were sent to me for examination. Among them I met with the specimen *Vanpruk* 623, collected in Sin Pun, Siam, which seemed to belong to a new species. Notwithstanding the sparingly setulose base of the ovary, I think the species should be placed in my section *Basithrix* (see Bulletin du Jardin Botanique de Buitenzorg, Série 3, 15, 27: 1936). It seems intermediate between *D. apiculata* Hiern and *D. selangorensis* Bakh. From *D. apiculata* it may be distinguished at once by the hairy corolla. Noteworthy are also the one-sidedly hairy filaments.

Up to now only the female plant is known with certainty to me. Possibly in future the specimen *Vanpruk* 619 (Siam, Trang, March 1915, ♂) will be considered the male one. On account of the nearly glabrous corolla-lobes, I provisionally reduced this material in my revision to *Diospyros sumatrana* Miq. var. *flavescens* (Wall.) Bakh. forma *siamensis* Bakh. Only a closer examination of the Siamese species can decide whether these two specimens are conspecific or not.

R. C. BAKHUIZEN VAN DEN BRINK.

***Jasminum calcicolum* Kerr** [Oleaceae]; a *J. didymo* Forst., cui affine, floribus multo majoribus, inflorescentia minore distinguitur.

Frutex scandens, inflorescentia excepta glaber, ramulis gracilibus teretibus, lenticellis ellipticis parce obsitis. *Folia* opposita, trifoliolata, petiolo 0.6-1.8 cm. longo suffulta; foliola subaequalia, vel saepius lateralia paulo minora, ovata vel ovato-lanceolata, basi rotundata vel parum cordata, apice longe sensimque acuminata, acuta, margine interdum leviter corrugata, 4-7.5 cm. longa et 1.3-3.5 cm. lata, chartacea, supra vernicosa, subtus opaca, basi 3-5-nervia, nervis supra leviter impressis, subtus prominulis, fere apicem attingentibus; petioluli medii 9-14 mm., laterales 5-11 mm. longi, dimidio superiore conspicue articulati. *Inflorescentia* lateralis vel terminalis, paniculata, 6-18-flora, minute puberula, ad 3 cm. longa et lata, pedunculo communi subnullo vel ad 1.6 cm.

longo, pedunculis secundariis 0.3-1.4 cm. longis. *Calyx* cupuliformis, minute puberulus, 2 mm. longus, breviter 5-dentatus, dentibus 0.5 mm. longis. *Corolla* alba, glabra; tubus 12 mm. longus, superne parum ampliatus; lobi 5, oblongo-lanceolati, subacuti, 10 mm. longi, 3.5 mm. lati. *Stamina* dimidio superiore tubi inserta, inclusa, antheris acute mucronatis, 3 mm. longis, filamentis 1 mm. longis. *Ovarium* 1 mm. altum, stylo 2.5 mm. longo, stigmatibus clavato 2 mm. longo. *Fructus* ut videtur simplex, ellipsoideus, 9 mm. longus, 5 mm. latus.

Lampang, Che Hom, c. 400 m., in deciduous forest on rocky limestone hill, *Kerr* 4789 (*type*). Menam Pasak, Keng Koi, in evergreen forest on limestone hill, *Kerr* 7968.

***Jasminum carissoides* Kerr** [Oleaceae]; affine *J. eleganti* (Hemsl.) Yam., foliis basi cordatis, haud cuneatis, foliorum nervis minus distinctis, inter alia, differt.

Frutex scandens; ramuli patentes, angulo recto e ramo orientes, teretes, fistulosi, statu juvenili minute puberuli, mox glabrescentes. *Folia* simplicia, opposita, late ovata, vel fere triangularia, basi leviter cordata, apice rotundata, mucronulata, ad 2.8 cm. longa, 2.1 cm. lata, supra nitida, glabra, subtus opaca, secus nervos minute puberula, nervis basalibus 5 supra inconspicuis subtus subprominulis; petiolus 1-1.5 mm. longus, puberulus. *Flores* solitarii, axillares vel terminales, subsessiles vel brevissime pedicellati, bracteis minutis, ovatis. *Calyx* minute puberulus; tubus 1.5 mm. longus; lobi 6, subulati, 4 mm. longi. *Corolla* alba, glabra; tubus 20 mm. longus, superne leviter ampliatus; lobi 8, ovato-oblongi, apice acuminati, acuti, 12 mm. longi, 5 mm. lati. *Stamina* apicem tubi versus inserta, inclusa, antheris 4.5 mm. longis mucronatis, filamentis 1 mm. longis. *Ovarium* 0.75 mm. altum, stylo 3.5 mm. longo, stigmatibus bilobo 2 mm. longo. *Fructus* ignotus.

Surat, Ban Kawp Kep, 100-200 m., climbing on bushes on rocky limestone hill, *Kerr* 13353.

***Jasminum Craibianum* Kerr** [Oleaceae]; ex affinitate *J. Griffithii* C. B. Clarke atque *J. rufo-hirti* Gagnep., ab ambobus foliis minoribus, floribus longe pedicellatis, calycis lobis longioribus distinguendum.

Frutex scandens, ramulis dense rufo-hirsutis, pilis patentibus. *Folia* simplicia, opposita, oblongo-obovata vel elliptica, basi cuneata vel rotundata, apice abrupte acuteque acuminata, ad 10 cm. longa, 4 cm. lata, supra pilis appressis sparse instructa, subtus rufo-hirsuta, praesertim secus costam nervosque, nervis lateralibus 5-7-paribus, supra inconspicuis subtus cum costa prominulis, nervis transversis inconspicuis; petiolus 4-8 mm. longus, dense rufo-hirtus, pilis patentibus. *Inflorescentia* terminalis vel lateralis, 3-5-flora, foliis multo brevior, 3.5-5 cm. longa; pedunculus communis subnullus vel ad 2 cm. longus, cum pedicellis dense patentihirtus; pedicelli graciles, 1-1.5 cm. longi; bractae lineares, ad

4 mm. longi. *Calycis* tubus 2 mm. longus, ut lobi dense rufo-hirtus; lobi 5, lineares, 9-10 mm. longi. *Corolla* alba, glabra, alabastro apice longe sensimque attenuato; tubus gracilis, 20 mm. longus; lobi 7-8, lineari-oblongi, subacuti, 14 mm. longi, 2 mm. lati. *Stamina* tubi apicem versus inserta, subsessilia, antheris mucronatis 2.5 mm. longis. *Ovarium* obtusum, 0.75 mm. altum, stylo gracili 12 mm. longo. *Fructus* ignotus.

Lomsak, Kao Keo Ngoi, c. 1000 m., evergreen forest, *Kerr* 5755.

This species is also represented by a collection from Laos (Chieng Kwang, Muang Awm, c. 1000 m., *Kerr* 20970).

***Jasminum insularum* Kerr** [Oleaceae]; a *J. carissoidi* Kerr foliis pro rata angustioribus, basi rotundatis, haud cordatis, distinguendum.

Frutex scandens, ramulis teretibus laevibus nisi raro lenticellis magnis ovalibus obsitis, juventute minute puberulis mox glabrescentibus. *Folia* opposita, simplicia, forma magnitudineque variabilia, ovata, oblongo-ovata, vel fere linearia, basi rotundata, apice obtusa vel rotundata, mucronata, margine revoluta, 1.5-5.5 cm. longa, 0.6-2.7 cm. lata, rigide coriacea, supra nitida, subtus opaca et minute verruculosa, utrinque glabra, costa supra impressa subtus prominente, nervis lateralibus 1-2-paribus e basi orientibus subconspicuis, ceteris inconspicuis; petiolus 2-3 mm. longus, minute puberulus. *Flores* ut videtur solitarii, terminales vel axillares; bracteae subulatae, ad 2 mm. longae, minute puberulae. *Calyx* haud visus. *Corollae* tubus cylindricus, glaber, 27 mm. longus; lobi 8, oblongi, acuminati, longitudine et latitudine variabiles, ad 18 mm. longi, 6 mm. lati. *Stamina* 11 mm. supra basin tubi inserta, antheris mucronatis 5.5 mm. longis. *Ovarium* non visum; stylus gracilis, 21 mm. longus, stigmate breviter bilobo. *Fructus* ignotus.

Pang-nga, Pulau Tebun, *Haniff et Nur* 3605.

The material on which the above description is based consists of a branch with most of the leaves detached, and two detached flowers. Though this is poor material, it indicates such a distinct species that it has been considered worthy of description.

***Jasminum plumosum* Kerr** [Oleaceae]; a *J. annamensi* Wernham, cui affinis, calycis lobis multo longioribus, corollae tubo longiore differt.

Frutex scandens, ramulis teretibus dense fulvo-pubescentibus. *Folia* simplicia, opposita, late ovata, basi rotundata vel truncata, apice breviter acuminata, acuta, usque ad 8 cm. longa, 6 cm. lata, chartacea, siccitate supra olivacea, subtus pallidiora, supra sparse appresseque pubescentia, subtus sat dense fulvo-pubescentia, costa cum nervis supra impressa, subtus prominente, nervis lateralibus utrinque 3-4 acute ascendentibus leviter arcuatis prope marginem obscure anastomosantibus; folia suprema sub inflorescentia posita, minora, anguste elliptica, basi apiceque longe attenuata; petiolus

0.7-2.5 cm. longus, medio articulatus. *Inflorescentia* ramulum lateralem terminans, trichotoma, omnino dense pubescens; cymae secundariae plus minusve longe pedunculatae, pedunculis ad 5 cm. longis, cymulis subcapitatis; bracteae anguste lanceolatae vel lineares, 10-15 mm. longae; pedicelli 1-2 mm. longi. *Calyx* patenter pubescens; tubus 1.5 mm. longus; lobi 6-7, filiformes, plumosi, 18-25 mm. longi. *Corolla* alba, glabra; tubus gracilis, 25 mm. longus; lobi 6-7, lineari-lanceolati, apice breviter acuteque acuminati, 12 mm. longi, 2.5 mm. lati. *Antherae* 4 mm. longae, breviter mucronatae, filamentis 1 mm. longis suffultae. *Stylus* 7 mm. longus, dimidio superiore incrassatus.

Chantabun, Makam, c. 50 m., in evergreen forest, *Kerr* 9594.

***Jasminum Putii* Kerr** [Oleaceae]; affine *J. Roxburghiano* Wall.; foliis basi cordatis, inflorescentiae pedunculo multo brevioribus, inter alia, differt.

Frutex omnino griseo-puberulus, ramulis novellis subquadrangularibus. *Folia* opposita, simplicia, deltoidea, basi late cordata, apice obtusa, ad 3.5 cm. longa et lata, chartacea, siccitate supra olivacea, subtus interdum cyaneo-tincta, supra parce, subtus dense griseo-puberula, costa ut nervi supra inconspicua subtus prominente, nervis lateralibus 5-6-paribus, 2 paribus proximis e basi orientibus arcuatis prope marginem evanescentibus; petiolus 10-11 mm. longus, puberulus, infra medium articulatus. *Inflorescentia* terminalis, cymosa, patens, 15-20-flora, omnino puberula, ad 3 cm. longa; 5 cm. lata; pedunculus communis subnullus; pedunculi secundarii ad 1.5 cm. longi; bracteae subulatae, ad 4 mm. longae; pedicelli 5-8 mm. longi. *Calyx* campanulatus, puberulus; tubus 1.5 mm. longus; lobi 5-6, triangulares, 0.5 mm. longi. *Corolla* non visa. *Fructus* simplex (an semper?), ovoideus, 5 mm. diametro.

Nakawn Sawan, Hua Wai, *Put* 4092.

***Jasminum rarum* Kerr** [Oleaceae]; *J. Ritchiei* C. B. Clarke affine, inflorescentia saepius uniflora, calycis lobis brevioribus distinguuntur.

Frutex scandens, fere glaber, ramulis teretibus gracilibus glabris juventute leviter compressis. *Folia* simplicia, opposita, lanceolata vel ovato-lanceolata, basi rotundata vel late cuneata, apice sensim et sat longe acuteque acuminata, 5-7 cm. longa, 1.8-2.8 cm. lata, membranacea, supra nitidula, siccitate fusco-viridia, subtus opaca, paululo pallidiora, minute papuloso-punctata, supra basin versus costa parum pubescente, subtus nervorum axillis interdum hirsutis, ceterum glabra, costa supra leviter impressa cum nervis subtus prominula, nervis lateralibus 4-paribus ascendentibus sensim arcuatis et sat longe a margine anastomosantibus, nervis transversis interdum subconspicuis; petiolus 2-5 mm. longus, supra concavus, crispatis pubescens. *Inflorescentia* axillaris, rarius terminalis, saepius uniflora; pedunculus communis subnullus, basi bracteis minutis instructus; pedicellus 15-20 mm. longus, pergracilis, bracteolis linearibus

circiter 1 mm. longis munitus. *Calycis* tubus infundibuliformis, glaber, 2 mm. longus; lobi triangulares, 0.75 mm. longi. *Corolla* alba; tubus pergracilis, apicem versus parum ampliatus, 22 mm. longus; lobi circiter 6, oblongo-lanceolati, apice acuti, 10 mm. longi, 1.5 mm. lati. *Stamina* tubi corollae apicem versus inserta, antheris 4.5 mm. longis breviter mucronatis subsessilibus. *Ovarium* 1 mm. altum, stylo cum stigmate 20 mm. longo. *Fructus* ignotus.

Kanburi, Baw Re, *Put* 211.

Only one collection of this plant has been seen, hence its specific name. In addition to its affinity with *J. Ritchiei*, this species is very closely related to a Philippine plant, *J. oliganthum* Merrill, which has longer calyx-teeth, and leaves with a distinct vein reticulation.

***Jasminum sempervirens* Kerr** [Oleaceae]; species *J. crassifolium* Blume affinis, foliis majoribus, floribus minoribus, inter alia, differt.

Frutex scandens, glaber, ramulis novellis leviter compressis lenticellis parce obsitis. *Folia* simplicia, opposita, late elliptica vel oblongo-elliptica, apice breviter obtuseque acuminata, basi rotundata vel late cuneata, margine breviter revoluta, 12.5–22 cm. longa, 6–10 cm. lata, coriacea, siccitate supra olivacea, subtus pallidiora minute glanduloso-punctataque, glabra nisi subtus interdum in nervorum axillis barbata, costa supra impressa subtus valde prominente, nervis lateralibus 6–7-paribus supra subconspicuis subtus prominentibus prope marginem arcuatis et obscure anastomosantibus; petiolus crassus, irregulariter curvatus, infra medium inconspicue articulatus, 1.5–2.5 cm. longus. *Inflorescentia* axillaris, trichotoma, circiter 10-flora; pedunculus communis nullus vel perbrevis; pedunculi secundarii 3–3.5 cm. longi. *Calyx* campanulatus, 3.25 mm. longus, minute glanduloso-punctatus, breviter 5-dentatus, dentibus 0.25 mm. longis margine minute ciliatis. *Corolla* alba, alabastro apice obtuso; tubus 26 mm. longus, triente superiore parum ampliatus; lobi 7–8, oblongi, apice rotundati, 13 mm. longi, 5 mm. lati. *Stamina* corollae tubi triente superiore inserta; antherae breviter mucronatae, 5.5 mm. longae; filamenta 0.5 mm. longa. *Ovarium* apice bilobum, 1 mm. altum; stylus cum stigmate 8 mm. longus. *Fructus* ignotus.

Chiengmai, Me Rim, c. 600 m., evergreen forest, *Kerr* 6445.

***Jasminum stellipilum* Kerr** [Oleaceae]; ab affini *J. Evansii* Ridl. foliis ellipticis, indumento foliari densiore differt.

Frutex scandens, ramulis novellis dense stellato-pubescentibus, mox glabrescentibus. *Folia* saepius elliptica, interdum elliptico-obovata, basi late cuneata, apice breviter acuteque acuminata, ad 8.5 cm. longa, 3.5 cm. lata, supra sparse stellato-pubescentia mox glabra, subtus sat dense stellato-pubescentia, praesertim secus costam nervosque, costa supra impressa subtus cum nervis prominente, nervis lateralibus 3-paribus ascendentibus;

petiolus 3–5 mm. longus, pubescens, articulatus, supra alte canaliculatus. *Inflorescentia* axillaris vel terminalis, 2–3-flora; pedunculus communis subnullus vel usque ad 7 mm. longus, cum pedicellis bracteisque dense pubescens; pedicelli 1–2 mm. longi; bractae lineares, 2–3 mm. longae. *Calyx* dense pubescens; tubus 2 mm. longus; lobi 6–7, lineares, 3 mm. longi. *Corolla* alba, glabra; tubus 22 mm. longus; lobi 8, oblongo-lanceolati, apice subacuti, 11 mm. longi et 3.5 mm. lati. *Stamina* in medio tubi inserta, subsessilia, antheris 3.5 mm. longis. *Stylus* gracilis, 15 mm. longus, *Fructus* ignotus.

Ranawng, Kao Talu, c. 50 m., climbing in scrub, *Kerr* 11809.

***Jasminum trangense* Kerr** [Oleaceae]; *J. Wrayi* King et Gamble affinis, sed foliorum nervis lateralibus paucioribus, inflorescentia pauciflora laxioreque differt.

Frutex scandens, glaber, ramulis gracilibus teretibus. *Folia* late elliptica, vel ovato-elliptica, basi late cuneata, apice leviter acuminata, mucronata, chartacea, 12–15 cm. longa, 5–8.5 cm. lata, glabra nisi subtus ad nervorum axillas interdum barbata, costa supra leviter impressa subtus ut nervi prominente, nervis lateralibus 3–6-paribus ascendentibus leviter arcuatis prope marginem evanescentibus; petiolus 7–15 mm. longus, infra medium articulatus, supra canaliculatus. *Inflorescentia* terminalis vel lateralis, laxa 2–10-flora, interdum ut videtur racemosa, ad 15 cm. longa; pedunculus communis 2.5–7 cm. longus; bractae subulatae, 2 mm. longae; pedicelli graciles, 1.5–3 cm. longi. *Calyx* 5–6-partitus, glaber; tubus 1.5 mm. longus; laciniae lineares, 6–8 mm. longae. *Corolla* alba, alabastro apice longe attenuato; tubus superne sensim ampliatus, 17 mm. longus; lobi 6–8, lineari-lanceolati, apice sensim acuminati, acuti, 17 mm. longi, 2.5–4 mm. lati. *Stamina* corollae tubi apicem versus inserta, inclusa, antheris mucronatis 6 mm. longis, filamentis 0.5 mm. longis. *Ovarium* 1 mm. altum, stylo gracili cum stigmate claviforme 15 mm. longo. *Fructus* ignotus.

Trang, Palien, under 50 m., in evergreen forest at foot of limestone hill, *Kerr* 19099.

***Jasminum virgatum* Kerr** [Oleaceae]; species habitu erecto, foliis lineari-lanceolatis, calycis lobis filiformibus distincta.

Frutex erectus, usque ad 1 m. altus, simplex vel parce ramosus, omnino puberulus. *Folia* simplicia, opposita, lineari-lanceolata, basi anguste cuneata, apice sensim attenuata, acuta, margine plus minusve revoluta, ad 7.5 cm. longa et 1.2 cm. lata, chartacea, supra glabrescentia nisi secus costam puberula, subtus minute pustulata glanduloso-punctataque, secus costam puberula, costa supra alte impressa subtus prominente, nervis lateralibus 2–3-paribus ascendentibus supra inconspicuis subtus prominulis; petiolus puberulus, infra medium articulatus, 3–4 mm. longus. *Inflorescentia* terminalis, vel rarius lateralis, sessilis vel subsessilis,

compacta, puberula, 3-6-flora, bracteis lineari-lanceolatis ad 11 mm. longis, pedicellis 3-5 mm. longis. *Calycis* tubus infundibuliformis, puberulus, 2 mm. longus; lobi 5-6, filiformes, puberuli, ad 17 mm. longi. *Corolla* non visa. *Bacca* ovoidea, simplex, c. 7 mm. longa.

Nawngkai, Pon Pisai, c. 200 m., open deciduous forest, *Kerr* 8580.

V—NEW OR LITTLE KNOWN PLANTS FROM SOUTH INDIA: VIII.*

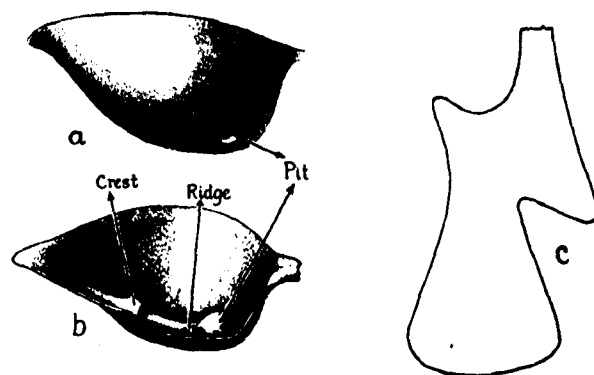
Blrophytum intermedium Wright [Oxalidaceae].

In the Fl. of the Pres. Madras this species is stated to occur in the Pulney Hills, but all the specimens so identified in the Kew Herbarium belong to the variety *pulneyense* Edgew. et Hook. f. The typical plant, known from Ceylon, has now, however, been found in S. India.

Tinnevely District near Nadugani, in evergreen forest, 2000-2500 ft., fls. Dec., *E. Barnes* 1392, 1404. Stems procumbent, up. to 30 cm. long.

Impatiens munnarensis E. Barnes, sp. nov. [Balsaminaceae].

I. pusillae Heyne affinis, sed multo major diffusiorque, floribus majoribus, labello parte inferiore foveolato intus costato et cristato differt.



Impatiens munnarensis E. Barnes. a, Diagram of lip seen from below showing pit; b, Diagram of lip (partly cut away) seen from above showing pit, ridge and crest; c, outline of wing (all $\times 4$).

A weak erect or semi-erect *herb* up to 1 m. high; stem slender, sparingly branched, often procumbent below and rooting at the nodes. *Leaves* variable, usually lanceolate, broadest at the shallowly cordate base, tapering to an acute apex, sometimes narrowly ovate with a subacute base, up to 5.5 cm. long and 1.7 cm. wide, usually narrower, margins distantly serrate with apiculate teeth becoming setose at the base, pubescent above, glabrous and pale, sometimes glaucous, below; petioles up to about the length of the blade

flattened and red above, decurrent on the stem and forming filiform pointed stipules; stipules red with darker tips, bent twice at right angles, finally pointing downwards, a rib running down the stem below each to the next node. *Pedicels* solitary or up to 4 fascicled in the axils, very short in bud, in flower 1-2.5 cm. long, only partially reflexed in fruit, with a longitudinal line of hairs. *Flowers* 1-1.3 cm. long. *Lateral sepals* filiform, curved, 6 mm. long. *Lip* boat-shaped, cuspidate in front, white with purple veins, bottom somewhat flattened with a small pit instead of a spur, inside convex and continued forward as a ridge with a small yellow or orange crest about the middle. *Standard* ovate, keeled, tip mucronate. *Wings* white with lilac or violet markings; distal lobe obovate-triangular; basal lobe triangular; dorsal auricle bluntly conical or rounded, placed at right angles, very dark-purple. (The two auricles lie near and parallel to one another a little below the stamens.) *Capsules* fusiform, slender till the seeds swell and about as long as the flowers, later swollen, acuminate, 1.3-1.5 cm. long, few-seeded. *Seeds* black, glossy, 1.5 mm. long.

Travancore: High Range near Munnar, 4000 ft., common on the edges of streams and in marshy places, fls. and frt. Sept.-Dec., *E. Barnes* 571, 573, 574, 575, 576, 1275, 1276, 1277, (in *Barnes' Herb.*) 1281, 1282 (type—in Kew Herb.)

The depression on the underside of the lip appears to be a unique feature in this group of balsams, but it is not easily seen in dried specimens.

Impatiens pandata E. Barnes, sp. nov. [Balsaminaceae].

I. akka Bedd. peraffinis, sed robustior, foliis glabris apice rotundatis, scapo parte superiore abrupte deflexo, floribus majoribus, labello sine calcar distat.

A small, succulent, scapigerous *herb*; tuber spherical, 7 mm. diam., white. *Leaves* radical, solitary or few, orbicular-reniform, base cordate, 1.7-4.5 cm. diam., rather thick and fleshy, glabrous, green above, dark-purple below, margins very shallowly crenate, basal nerves 3-4 pairs, curved, not reaching the margins, one pair of nerves arising from a little higher up; petioles 2-6 cm. long. *Scapo* solitary up to 20 cm. long to the first flower, usually much shorter, rather thick and succulent, pale-green with numerous red streaks, bent abruptly at right-angles at the first pedicel. *Raceme* 9- or fewer-flowered; lower bracteoles broad and short, upper narrowly ovate, up to 5 mm. long; pedicels slender, up to 2.7 cm. long, in fruit hanging down. *Lateral sepals* about the size of the bracteoles, streaked brownish-red. *Lip* spoon-shaped, spurless, posteriorly light brownish-purple shading to white anteriorly. *Standard* broadly elliptic with the long axis sideways, concave, margin entire, 1 cm. wide. *Wings* 3-lobed, up to 2.9 cm. long; lobes oblong, rounded, the two upper curved outwards, white slightly tinted with a dark shade of blue within, hairy at the base

* Continued from K.B. 1936, 278.

within. *Capsules turgid*, 1.2 cm. long, glabrous. *Seeds* very numerous, narrowly ovoid, 1 mm. long, reddish-brown, covered with scattered white granules which swell to hairs when wetted.

Travancore: High Range, Anaimudi slopes, 8000 ft., on wet rocks, often in cushions of moss., fls & frt. Sept., *E. Barnes* 535, 537 (type in Kew Herb.), 534, 536 (in Barnes' Herb.)

I. akka Bedd., *I. nilagirica* C. E. C. Fischer and *I. pandata* E. Barnes are very similar plants occurring in similar situations on the Coimbatore Anaimalais, the Nilgiris and Travancore High Range respectively. Beddome's original description of *I. akka* in the Madr. Journ. (1858) is very brief and no further details about it appear to have been published. Later Beddome united it with his *I. crenata* from which, however, it differs in several particulars. The type of *I. akka* (Beddome 840) in the Brit. Mus. appears to be the only material available. It has cordate leaves rounded at the apex, up to 2.5 cm. diam, with scattered hairs on the upper surface; the scape is not bent; the lip has a bluntly conical spur; the wings are up to 1.6 cm. long. *I. pandata* differs from it in all these characters and still more from *I. crenata*.

***Osbeckia kewensis* C. E. C. Fischer, nom. nov. [Melastomataceae].**

In Bot. Mag. t. 5085, published in 1858, a plant grown in Kew Gardens from seed obtained from Ceylon was figured as *Osbeckia aspera* Wight et Arn. (1834). But this plant is not the same as that described under the same name by Blume in 1831 (Flora, 14, 474), as was recognised by Triana in 1873 who identified it as *O. glauca* Benth. in Wall. Cat. (Trans. Linn. Soc. 28, 54). This name, however, was invalid since it had already been used in 1850 by Naudin (Ann. Sc. Nat. Ser. 3, 14, 68) for a different plant from Sylhet, sent to him by Bentham.

On the cover containing the sheets of the plant figured in Bot. Mag. t. 5085, the late Mr. Gamble has pointed out that they are not at all the *O. glauca* of sheet no. 4073A of the Wall. Cat. on which that name is inscribed. Actually that sheet contains 3 different species which Mr. Gamble has identified as: 1. *O. aspera* Bl., from Courtallam, S. India; 2. *O. minor* Triana, from the Travancore Hills of S India, and 3. *O. glauca* Benth. from Trincomali in Ceylon.

The plant under discussion does not agree with any of the three. It differs from *O. aspera* Bl. by the rather long and often dense bristles on the twigs, especially at the nodes, the wider and more bristly leaves and the stellately bristly calyx-tube; and from *O. glauca* Naud., by the distinctly petioled leaves, the bristly calyx-tube and the 5-merous corolla. Prof. E. Barnes has recently found it in S. India.

As neither of the two epithets applied are available for it and as it was described from plants grown at Kew, I propose to call it *O. kewensis*.

Ceylon: loc. incert., type (cult.) in Kew Herb.

S. India: Travancore, Munnar, fls. Sept., *E. Barnes* 1357.

***Osbeckia wynaadensis* C. B. Clarke [Melastomataceae].**

Reported from Wynaad only.

Cochin: Perambikulam Hills, Kuriarkutti, fls. Dec., *E. Barnes* 994.

The plants found by Prof. Barnes are considerably larger than the Wynaad specimens and it is desirable to record the dimensions.

Shrub over 2 m. high; leaves up to 18.5 cm. long and 6.2 cm. wide; petioles 1.5 cm. long; calyx-tube up to 1 cm. long; petals up to 2.1 cm. long.

***Sonerila Barnesii* C. E. C. Fischer, sp. nov. [Melastomataceae].**

S. tinneveliensi C. E. C. Fischer peraffinis, ramulis quadrangularibus canaliculatis, foliis ovatis basi rotundatis, pedunculis longioribus, floribus paucioribus, tubo calycis nudo vel fere nudo distincta.

An erect herb; stems up to 24 cm. tall, rooting near the base, branching above, terete at the base, quadrangular and channelled on 2 opposite sides above. Leaves thinly membranous, ovate, acute or obtuse, base rounded or subcordate, one side usually 3-7 mm. longer than the other, 3-7 cm. long, 1.8-3.7 cm. wide, margins finely serrate, the teeth pointing forward, becoming ciliae at the base, deep green and with scattered bristles above, paler and almost glabrous below, basal ribs 2 on the longer side usually inserted below the base of the other side, not reaching much above the middle, a third arising from somewhat higher up and running almost to the apex, on the shorter side the outer rib running to about the middle and the inner almost to the apex, veins slender, ascending, ultimate reticulations fine; petioles slender, channelled, 1-5 cm. long, glabrous except for a very few ciliae near the apex, red. Cymes terminating the stem and its branches; peduncles 1.2-3 cm. long, 4-11-flowered; pedicels 3-5 mm. long in flower, very little longer in fruit. Calyx-tube narrowly funnel-shaped, 6-ribbed, the ribs more or less decurrent on the pedicel, 6 mm. long, green, glabrous or with a few glandular hairs (fide Barnes); lobes very broadly ovate, acute, 1 mm. long, reddish-green. Petals broadly elliptic-ovate, apiculate, 1-ribbed, 7.5-8.5 mm. long, 5-6 mm. wide, very pale-pink, a little deeper in shade on the back where exposed in bud. Stamens 3; filaments glabrous, 2.5 mm. long; anthers cordate, bluntly acuminate, 2.5 mm. long. Style slender, 5 mm. long. Capsules narrowly turbinate, 6-ribbed, 7-8 mm. long, glabrous, pale-brown, darker on the ribs, shining. Seeds minute, oblate, pale-brown, muriculate on the rounded apex.

Tinneveli Hills, near Nadugani, 2500 ft., fls. & frt. Dec., *E. Barnes* 1405 (type in Kew Herb.), 1414.

"A form with leaves dark-red below and deep-pink petals was found, but was scarce" (Barnes).

***Ophiorrhiza munnarensis* C. E. C. Fischer, sp. nov. [Rubiaceae].**

O. pallidae Thw. affinis, sed minor, foliis angustioribus nervis paucioribus margine ciliolatis, cymis minoribus terminalibus,

bracteis multo latoribus, corollis angustioribus longioribus ore glabris, antheris semiexsertis, filamentis brevioribus, stylo filamentorum basin attingente differt.

A herb or undershrub; stems erect or procumbent and rooting below, 5-13 cm. long, the larger woody and glabrous below, more or less densely short brown-hairy upwards or hairy throughout. Leaves elliptic-lanceolate, acute to caudate-acuminate, base tapering and sometimes shortly decurrent, 2.5-6.7 cm. long, 1.1-2.4 cm. wide, lateral nerves 6-8 pairs, arching, anastomosing close to the ciliolate margins, dark-brown when dry and with scattered, often curled, hairs above, pale and with fewer hairs below; petioles slender, 3-12 mm. long, puberulous; stipules ensiform, acuminate or setaceous and finely acuminate, glabrous or nearly so. Cymes terminal, small, capitate; peduncle slender, 2.5-3.5 cm. long, glabrous; bracts linear-lanceolate in flower, becoming oblong-ovate in fruit, 5-8 mm. long, pale and thinly membranous in flower, brown (when dry) and stiffer in fruit; pedicels 1 mm. long, glabrous. Calyx-tube 0, or very short; lobes 5, rarely 2 united for more than half their length, elongate triangular, 1.3-1.6 mm. long, glabrous. Corolla elongate funnel-shaped, 9.5 mm. long, glabrous except for a band of crisped hairs (pale-brown when dry) within at the base of the stamens; lobes 5, ovate, acute, 2 mm. long. Stamens 5, inserted a little above the middle of the corolla-tube; filaments slender, 2 mm. long; anthers linear, slightly shorter than the filaments, half exserted. Disk of 2 fleshy quadrate lobes 0.6 mm. long. Ovary narrowly turbinate, 1.8 mm. long; style 4.4 mm. long, slender below, narrowly fusiform in the upper $\frac{1}{2}$, shortly bifid, just about reaching the base of the filaments. Fruit (not quite mature) 1.6 mm. long, 4.1 mm. wide, crowned by the disk-lobes.

Travancore: Munnar Ghat road, 4000-5000 ft., fls. & frt. Sept., E. Barnes 2005 (type in Kew Herb.); Cochin, Perambikulam Hills, 3000 ft., fls. Dec., E. Barnes 2004.

Exacum pumilum Griseb. [Gentianaceae].

Known from the Bombay Presidency.

On p. 875 of the Fl. Pres. Madras a specimen from the Anaimalais is referred tentatively to this species. A similar plant, differing from the type only by being less branched, has been found by Prof. Barnes and the species should now be added to the Flora of Madras.

Cochin: Perambikulam Hills, Vengolimalai, 4000 ft., on wet rocks, fls. bright blue, Sept., E. Barnes 1268.

Didymocarpus Gambleana C. E. C. Fischer, nom. nov. [Gesneriaceae].

The first use of the combination *Didymocarpus lanuginosa* was made in MS. on sheet No. 791 of the Wallich Herb. and was validated by A. de Candolle in his Prod. 9, 268 in 1845 by a description.

In 1883 in Monogr. Phanerog. 5, 66, C. B. Clarke transferred this species to another genus as *Didissandra lanuginosa*.

Wight applied the epithet *Didymocarpus lanuginosa* in MS. to his sheet No. 561 (now in Kew Herb.) and this C. B. Clarke in Monogr. Phanerog. 5, 102, reduced to *D. Rottleriana* Wall. var. *lanuginosa*.

In 1924 in Fl. Pres. Madras, 989, Gamble restored Wight's 561 to specific rank as *D. lanuginosa* Wt., not of Wall. As this combination had already been applied to another and validly published species Wight's plant must receive a new name and I propose the combination at the head of this paragraph.

Didymocarpus macrostachya E. Barnes, sp. nov. [Gesneriaceae]; a *D. Gambleana* C. E. C. Fischer foliis oblongatis vel anguste ovatis sessilibus, scapo longiore robustiore, cymis dichotomis, floribus majoribus, scapis calycibus et capsulis eglandulosis, capsulis angustioribus differt.

A perennial, scapigerous herb; roots felted. Leaves in a radical rosette, oblong to narrowly ovate, apex rounded, tapering or abruptly narrowed to the base without any definite petiole, 11-17 cm. long, 4-7 cm. wide, margins obscurely crenate, dull-green and velvety with a dense mat of curved hairs above, pale-brown felted below, the young leaves very pale-green and very soft above, thickly brown-felted below, the felt obscuring the bases of the leaves and the central bud; lateral nerves 5-6 pairs, veins reticulate, all more or less indistinct owing to the hairs. Scapes 1 or more, rather stout, terete, grooved on 2 opposite sides, up to 44 cm. long, densely pale-brown felted. Calyx-lobes ovate, obtuse, 6 mm. long, 3 broad, 2 narrow, glabrous and 3-nerved within, so densely tomentose without that the lobes cannot be distinguished. Corolla broadly campanulate, 1 cm. long, up to 1.9 cm. across, mouth oblique; lobes orbicular, pale-blue or mauve, downy without and dotted with small, sessile, yellow glands. Stamens included, 2 perfect with filaments 2.5 mm. long and spherical anthers 1.5 mm. diam., 2 reduced to slender filaments 2.5 mm. long with curved or hooked ends. Ovary 4 mm. long, tomentose; style 3 mm. long; stigma not wider than the style. Capsules linear, stout, up to 1.5 cm. long, acute, light-brown tomentose. Seeds minute, ovoid, flattened, reddish-brown (possibly not mature).

Travancore: High Range, on the Ottaparai Ridge, 5500 ft., on rocks exposed for a large part of the year to monsoon conditions, fls. and almost mature capsules Sept., E. Barnes 1263, 1265 (in Barnes' Herb.), 1264, 1266 (type in Kew Herb.)

Amorphophallus commutatus Engl. [Araceae].

Known only from the Konkan.

S. Malabar, Sappal, fls. May, P. V. Mayuranathan without number (in Kew Herb.).

VI—ON THE OCCURRENCE OF FAGUS ORIENTALIS IN GREECE. O. GREBENCHIKOFF.

The occurrence and distribution of *Fagus orientalis* in the kingdom of Greece has been very little investigated. In 1934 the author found a beech in the ravines of Mt. Olympus, Thessaly, which agreed in the characters of leaves and fruits with *F. orientalis*. Another excursion was undertaken in 1936 with the aim of collecting new data concerning the distribution of the beech in Greece. During this excursion Mt. Ossa and the whole length of Athos Peninsula were explored and the results are incorporated in the present paper.

Madame Hanna Czeżcott, in her paper published in 1932 (6) summarized the Greek records to that date, as follows:—

Cekir Dag, Thrace (Stoyanoff 1927); Hagion Oros, Athos (Koch, after Grisebach); Mt. Kholomunda, Chalkidiki (Mattfeld); Mt. Ossa, Thessaly (Heldreich, 1882 under *F. silvatica*); Oxya Mtns, Aetolia (de Vaillant); Euboea (Deprat, 1905). These records are doubtful, or the specimens on which they are based are scanty.

MT. OSSA, THESSALY.

The whole eastern slope of Mt. Ossa (2000 m.), facing the sea, is almost completely covered with dense luxuriant forests from sea-level to 1600 m. Three major zones are distinguishable.

1. A zone of macchie, from the sea shore up to 400–500 m., with the following species predominant: *Quercus Ilex*, *Phillyrea media*, *Erica arborea*, *Ostrya carpinifolia*, *Quercus coccifera*, *Cistus villosus*, *Cercis Siliquastrum*, *Juniperus Oxycedrus*, *Similax aspera*.

2. Chestnut and oak forests, between 400 and 900 m., with *Castanea sativa*, *Quercus petraea*, and *Q. lanuginosa* dominant, and including, among others, the following species: *Quercus Ilex*, *Tilia cordata*, *T. tomentosa*, *Fraxinus Ornus*, and *Acer campestre*.

3. Luxuriant beech forests, from approximately 900–1000 m., up to the very limit of the woody vegetation.

Heldreich (1882) noted the presence of beech forests on Mt. Ossa between 915 and 1220 m. My observations, however, showed that the beech forests in some places extend to 1600 m. altitude.

Beech on Ossa is mentioned by Heldreich under the name *Fagus silvatica*. It is true that the beech forests between 950 and 1600 m. altitude consist mainly of beech trees with taxonomic characters very similar to those of *F. silvatica*. After a closer examination, however, of the ravines stretching from the sea towards the centre of the mountain, I found groups of beech trees differing considerably from *F. silvatica*, and occurring, not in the zone of beech forests but in that of *Castanea* and *Quercus*.

The taxonomic features distinguishing *F. orientalis* from *F. silvatica* are as follows (10):

Fagus silvatica.

1. Leaf oval, medium in size; with up to 8 or 9 pairs of side-nerves.
2. Bracts of the fruit-involucre awl-like, hard, pointed, short, brownish.

3. Lobes of the perianth of the male flowers narrow or pointed, longer than the tube of the perianth.

Fagus orientalis.

1. Leaf elongated, large, often with a narrowed base; with up to 14 pairs of side-nerves.
2. Bracts of the fruit-involucre long, linear or linear-spathulate, enlarging at the top in the form of a little narrow green spade.
3. Lobes of the perianth of the male flowers obtuse, rounded, shorter than the tube of the perianth.

The following is a summary of the results that have been obtained after an examination of the leaves and fruit-involucres of a considerable number of trees on Mt. Ossa. Unfortunately, since the material was collected in the second half of the summer, no data concerning the third character (male flowers), could be procured.

All the beeches examined by me and differing from typical *Fagus silvatica*, can be arranged according to their taxonomic features into two groups:

(1) Leaves soft and thin, very large, up to 11.5 cm. in length, mostly with narrowed bases, sometimes resembling in shape the leaves of a chestnut tree, or oval but very wide, with elongated apical part; with from 10 to 14 pairs of side-nerves. Taxonomic features of the leaves completely corresponding to those of *F. orientalis*.

Practically no fruit was found, the trees being of a bushy type, or occasionally large trees occurred but also without a single fruit.*

Trees of this type grow at the bottom of the ravines, in their narrowest and darkest parts, where the sun's rays very rarely penetrate. The leaves are distinctly of a mesophytic type, but probably the complex of ecological conditions is not favorable for fruiting.

(2) Leaves harder, medium in size, from 8 to 9 cm. long, oval or with a markedly narrowed base. The number of side nerves almost always 8 to 9. The taxonomic features thus approximate to those of *Fagus silvatica*. Abundant fruiting. Peduncles about 2.5 cm. long. The bracts of the fruit-involucre are green and leaf-like near the apex of the fruit, but thin, soft and very long (up to 2 cm. long) at its base, making the fruit-involucres look curly green. Occasionally, fruits are found with less characteristic bracts, but at the bottom of the fruit-involucre they are always long and thin. This taxonomic feature completely corresponds to that of *Fagus orientalis*.

Trees of this type grow in more abundantly lighted places on the edges of the ravines. The amount of sunlight in such places is

* In 1936 beech was fruiting very abundantly everywhere in Yugoslavia and Greece.

sufficient, and, apparently, the complex of the ecological circumstances gives the tree a possibility of normal fruiting.

It is evident that in no one specimen of the "doubtful" species of beech examined by me, the two main taxonomic features—those of the leaf and fruit-involucre—appeared together, since in cases where the leaves corresponded to those of *Fagus orientalis*, the fruits were always absent, while the specimens with leaves of *F. silvatica* type bore fruit with the taxonomic features of *F. orientalis*.

Brief reference may now be made to the ecological environment of beech of the two types described above. The altitude of their ranges above the sea level varies from 600 to 900, and, in some places up to 1000 m. The geological substrata consist of mica-schists and some other siliceous rocks. The zone of the occurrence of this beech extends from that of the zone of macchie, and from this it might be concluded that the annual mean temperature of the habitats is high. Samples of both types of beech have been found in groups or growing singly in the woody gorges and ravines. At the bottom of such ravines are streams with abundant water. Even on the hottest days the air is always cool and damp. The abundance of wet mosses on the walls of the ravines is an additional proof of their dampness. Since almost all of the ravines stretch west to east and on the southern sides are always shielded by one of their higher slopes, the intensity of the sunlight in them is very low. From the same circumstances the ravines are shielded by the northern slopes from the cold northern winds. Both of these factors, apparently, soften the climate, making it uniformly temperate and damp. The development of the types of beech mentioned above is normal, with the exception of samples growing at the bottom of the ravines. Such trees fruit very scantily, and are often greatly modified from their normal habit, and develop only as large sized shrubs. Whether this occurs as a consequence of some biotic factors (cutting down and grazing) or not, I was unable to ascertain.

In order to sketch out the social environment of both types* of *Fagus orientalis* I give below the most characteristic notes from various places (ravines) on Mt. Ossa. The species are in the sequence of most frequent first.

(1) 26.vii.1936. A woody ravine above the monastery of Ag. Dimitrios not far from the village of Tsaigesi. Altitude 700 m. Mica-schists. *Castanea sativa*, *Fagus orientalis*, *Tilia cordata*, *Ilex Aquifolium*, *Fraxinus Ornus*, *Aesculus Hippocastanum*.

(2) 29.vii.1936. A woody ravine at an altitude of 700 m., near the village of Karitza, not far from the village of Tsaigesi. Mica-

* In the future I shall mention these two types under the common name of *Fagus orientalis*, for their taxonomic features correspond to those of *F. orientalis* on Strandza in Bulgaria (Stoyanoff), and to the samples of this species in the herbarium of Belgrade Botanical Garden collected by Czerniavski and others.

schists. In the ravine there are blocks of limestone fallen from the upper portion of Mt. Ossa.

Trees:—*Platanus orientalis*, *Alnus glutinosa*, *Aesculus Hippocastanum*, *Taxus baccata*, *Ilex Aquifolium*, *Fraxinus Ornus*, *Fagus orientalis*, *Ficus Carica*, *Spartium junceum*.

Herbs:—*Inula viscosa*, *Rubia peregrina*, *Campanula incurva*, *Polypodium vulgare*, *Nephrodium lobatum*, *Asplenium Trichomanes*, *Cystopteris fragilis*, *Orchis maculata*.

(3) 29.vii.1936. In the same ravine at an altitude of about 900 m. The stream makes a small pond in a small, very damp hole. Abundance of mosses and ferns.

Trees:—*Fagus orientalis*, *Castanea sativa*, *Ilex Aquifolium*, *Platanus orientalis*, *Aesculus Hippocastanum*, *Quercus Ilex*, *Acer intermedium*, *Abies cephalonica*, *Fraxinus Ornus*, *Acer Reginae-Amaliae*.

Herbs:—*Ruscus hypoglossum*, *Scolopendrium vulgare*, *Dryopteris lobata*, *Nephrodium lonchitis*, *Polypodium vulgare*, *Epilobium palustre*, *Equisetum Telmateja*, *Carex pendulina*, *Poa nemoralis*, *Brachypodium distachium*, *Oxalis corniculata*.

Bryophyta:—*Fegatella conica*, *Plagiochilla asplenoides*, *Thamnum alopecurum*, *Mnium undulatum*, *M. punctatum*, *M. cuspidatum*, *Brachythecium rivulare*, *B. rutabulum*, *Homalothecium sericeum*.

On the rocks are also found:—*Umbilicus pendulinus*, *Sedum Cepaea*, *Samolus Valerandi*, *Agrostis vulgaris*.

If we try to draw a line between the distribution of *F. orientalis* and that of *F. silvatica*, we discover that it depends largely on the relief of the surface. Namely, that where a narrow and dark ravine gradually (towards the top of the mountains) becomes shallow and passes into a smooth open slope of the mountain, the taxonomic features of *F. orientalis* are gradually replaced by those of *F. silvatica*. While where the relief and microclimate change abruptly at the outlet of the ravine (on its slopes and edges) the beech also abruptly loses the characteristics of *F. orientalis* and acquires those of *F. silvatica*.

Above 900–1000 m. there stretch luxurious forests consisting of *F. silvatica*, and there beeches with taxonomic features of *F. orientalis* are no longer met with in any kind of ravine.

CHALCIDICE (KHOLOMONDA MTS.).

According to Mattfeld, *F. orientalis* has been found by him on the Kholomonda Mts., Chalcidice Peninsula, at an altitude of 500 to 600 m. (3).

Unfortunately during my trip through these mountains I was able to make only a brief examination of several beeches of a beech forest on the steep slopes at an altitude of 600–700 m. I was unable to see fruiting specimens but the leaves of almost all the beeches examined by me, had up to 12 side-nerves. Above an altitude of 800 m. beeches with the taxonomic features of *F. silvatica* are to be found exclusively.

On my way from the village of Arnea to Stratoniki I was unable to collect any material, but I took the following notes on the mixed local forest vegetation at an altitude of 500–600 m.:—*Quercus conferta*, *Fagus orientalis*, *Castanea sativa*, *Erica arborea*, *Sorbus Aucuparia*, *Corylus Avellana*, *Populus tremula*.

It is reasonable to suppose that beeches growing among *Castanea sativa* and *Erica arborea* would not be typical *F. silvatica*, but would have the taxonomic features of *F. orientalis*.

ATHOS PENINSULA.

The woody vegetation on the Athos Peninsula can be roughly grouped according to the following zones:

(1) From the sea shore up to the altitude of 400 m. there is a zone of wild impenetrable evergreen macchie where the following species are predominant:—*Quercus coccifera*, *Erica arborea*, *Spartium junceum*, *Phyllirea media*, *Quercus Ilex*, *Q. lanuginosa*, *Arbutus unedo*, *Pinus halepensis*,* *Pistacia Terebinthus*, *Cercis Siliquastrum*, *Cistus villosus*, *Coronilla emeroides*, *Osyris alba*, *Smilax aspera*, etc.

(2) Above an altitude of 400 m. as well as in places at an altitude of 300 m. there are oak woods showing predominance of the following species:—*Quercus conferta*, *Q. lanuginosa*, *Q. Ilex* (large frees), *Ostrya carpinifolia*.

(3) Still higher, approximately from 500–600 m. upwards, there are chestnut and fir forests (*Castanea sativa*, *Abies Borisii-regis*). Among these main species there can be also found *Ilex Aquifolium*, *Acer platanoides*, *Populus tremula*.

In the same altitudinal zone (500–900 m.) there can be found small groves of *Pinus nigra* and isolated groups of beech.

(4) Above 1000 m. on the peak of Mt. Athos in places where the slopes are more gradual (south-western, southern and partly south-eastern), there are growing very sparse forests of *Abies Borisii-regis* and *Pinus nigra*, which occur up to an altitude of 1800 m.

In the zone of the mixed chestnut-fir forests, in the deep shady ravines, running near the ridge of the main chain of the mountains, along the wooded road from the village of Karyes to the monastery of St. Paul, at an altitude of 800 m. I found some small groups of beech with the taxonomic features of *F. orientalis*.

Before I describe this beech and its ecology, I wish to repeat the information given by Mattfeld about the beech on Athos:

“Nach Grisebach soll auch *Fagus silvatica*, die er bestandbildend an den Westhängen der Berge etwas weiter südlicher fand, bis in den Wald oberhalb Karyes gehen. Wir suchten sie dort aber vergeblich.”

On the western slopes of the mountain ridges, in the place mentioned above, I also was unable to find beech, but I found some in the ravines on the eastern slopes. It is quite possible that at the

* Forming groves of high trunked trees with an undergrowth consisting of other species of macchie.

time when Grisebach was there the beech forest actually did exist on the western slopes, but has now been cut down; while in the place where it was found by me it has been conserved owing to its remoteness from any of the large monasteries and to the unfavourable circumstances for the transportation of wood.

The steep and deep ravines run from the mountain ridge down towards the sea. In four such ravines at an altitude of 800 m., I found *F. orientalis* everywhere. If we compare the taxonomic features of this beech with the beech of Mt. Ossa, we find that all the samples from Athos Peninsula examined by me belong to the second type, that is with the leaves generally rather small, hard, with 8 to 9 pairs of side nerves, the fruit-involucres being identical with those of typical *F. orientalis*. The bracts of the fruit-involucres, either at their bases, or more commonly along their whole surface, are green, soft and very long, more than 2 cm. in length.

In one case only, there were found leaves of enormous size—11.5 cm. long with 10 to 12 pairs of side-nerves. Such a tree was growing at the bottom of a dark ravine.

I give a brief description of the ecology of this kind of beech on Athos. It occurs in isolated groups among chestnut-fir forests on the slopes of ravines at an altitude of 800 m. Occasionally it is met with standing singly in deep dark woody ravines. Geologically these ravines can be regarded as consisting of gneiss and mica-schists. The moisture of such places is rather considerable and numerous but shallow streams cross the path.

Most of such ravines run west to east. The development of the trees is normal, the fruiting abundant. The composition of the forest where *F. orientalis* is met with is:—*Fagus orientalis*, *Acer platanoides*, *Castanea sativa*, *Ilex Aquifolium*, *Abies Borisii-regis*, *Ruscus hypoglossum*.

Very seldom, beech was found in close proximity to the ravines, in open places of the high parts of the relief, and then it always showed the taxonomic features of *Fagus silvatica*, both in respect to fruit and leaves. The absence of the male flowers unfortunately deprived me of the possibility of utilizing this characteristic feature.

GENERAL.

In order to determine what species of trees and shrubs are most characteristic of the closest association with *Fagus orientalis*, in Greece, I give here the synthetic list compiled from the lists of the five places visited by me, namely three on Mt. Ossa, one on Mt. Olympus, and one on Athos. The figures in brackets indicate the number of the occurrences of the respective species in all five lists.

Ilex Aquifolium (5), *Castanea sativa* (3), *Aesculus Hippocastanum* (3),* *Fraxinus Ornus* (3), *Platanus orientalis* (2), *Taxus baccata* (2), *Acer Reginae-Amaliae* (2), *Abies spp.* (2), *Ruscus hypoglossum* (2), *Tilia cordata* (1), *Alnus glutinosa* (1), *Ficus carica* (1), *Daphne Laureola* (1), *Spartium junceum* (1), *Quercus Ilex* (1), *Acer intermedium* (1), *Acer platanoides* (1), *Juglans regia* (1), *Pinus nigra* (1).

Sorbus meridionalis (1), *Salix Caprea* (1), *Ostrya carpinifolia* (1), *Corylus Avellana* (1), *Lonicera Formanekiana* (1), *Hedera Helix* (1).

The most characteristic species in these localities are:—*Ilex Aquifolium*, *Taxus baccata*, *Platanus orientalis*, *Castanea sativa*, *Aesculus Hippocastanum*, *Acer Reginae-Amaliae*.

The first three of these are ancient species characteristic of damp woody associations of the Mediterranean and the Atlantic regions. *Juglans regia* is a very characteristic species in constant association with *Fagus orientalis* in some localities in the Balkan Peninsula, e.g., Olympus, Rodopes (11), South Serbia, but is completely absent from the woods of Ossa and Athos Peninsula.

According to the observations made by Cernjavski, who has paid special attention to *Fagus orientalis* in Jugoslavia (on Mt. Belasica) (4), no sharp line can be drawn between the occurrences of *Fagus orientalis* and *F. silvatica*. Their morphological features give a gradual transition from one species to another, this phenomenon being in immediate relation to the external ecological circumstances (relief, micro-relief, abundance of light, dampness).

In the course of my excursions to Ossa, Athos, and Olympus I paid special attention to this fact and it was entirely confirmed by my observations.

When these varying and transitional taxonomic features, which can be easily explained by the ecological circumstances, are observed, one naturally begins to doubt whether they are not ecotypic features and whether they are really sufficient for drawing a distinction between *Fagus orientalis* and *F. silvatica*.

The great number of the transitional forms from *Fagus orientalis* to *F. silvatica* in the Balkan Peninsula, and the fact that the taxonomic features of the fruit-involucre do not always correspond to the characteristics of the leaves confirms my doubts as to the correctness of the modern systematic division of *Fagus*. Taking into consideration the results of our investigation, it is clear that great care is necessary in drawing conclusions as to the systematic position of the beech in Greece.

The author wishes to express his gratitude to Dr. Glisich, the Director of the Botanical Garden in Belgrade, who gave him kind permission to use the herbarium and the available literature, to P. Cernjavski, his assistant, for his great help in actually carrying out the work, and to T. Soshka, the Inspector of the Botanical Garden, for his help in the determination of herbarium material.

He also wishes to express his sincerest gratitude to Sir A. W. Hill, the Director of the Royal Botanic Gardens, Kew, for his kind assistance in arranging for the publication of this paper, and to Dr. W. B. Turrill for correcting the English.

Postscript. Mr. Grebenschikoff's paper is of considerable interest and importance. It was written in admirable English and only a relatively small number of corrections had to be made.

To the localities he gives for *Fagus orientalis* in Greece, others can be added from W. Thrace. H. G. Tedd has collected material, which must be placed under this species, or considered as more or less intermediate between it and *F. silvatica*, from Tchal Dag (Mt. Zante), c. 700 m., No. 679; Kara Oghlan, 600 m., No. 721; and from near Ketcheli, c. 250 m., No. 1919.

W. B. TURRILL.

LITERATURE.

1. CZECZOTT, H. "Distribution of *Fagus orientalis* Lipsky." *Veröffentl. Geobot. Inst. Rübel in Zürich*, 8 (1932).
2. STOYANOFF, N. "Ueber d. Verbreitung der orient. Buche auf der Balkanhalbinsel." *Magyar Bot. Lapok*, 25 (1926).
3. MATTFELD, J. "Aus Wald u. Macchie in Griechenland." *Mitteil. d. Deutsch. Dendrolog. Gesellsch.* (1927).
4. CERNJAVSKI, P. "Das Vorkommen von *Fagus orientalis* Lipsky in Südserbien." *Bull. de l'Inst. Bot. de l'Univ. de Belgrade*, 1-2 (1931-1932).
5. WULFF, E. "The Beech in the Crimea." *Veröffentl. Geobot. Inst. Rübel in Zürich*, 8 (1932).
6. CZECZOTT, H. "A Study on the variability of the leaves of beeches: *F. orientalis* Lipsky, *F. silvatica* L. and intermediate forms." *Annales d. la Soc. dendrolog. de Pologne*, 5 (1933).
7. RÜBEL, E. "Zusammenfassende Schlossbetrachtung zur Vortragsrunde über die Buchenwälder Europas." Rübel, "Die Buchenwälder Europas." *Veröffentl. Geobot. Inst. Rübel in Zürich*, 8 (1932).
8. REGEL, C. "Die Vegetationsverhältnisse einiger Gebirge im östlichen Teile des Mittelmeergebietes." *Beiträge zur Systematik und Pflanzengeographie*, 10, in *Fedde. Rep. Sp. Nov.* 71 (1933).
9. GREBENCHIKOFF, O. "*Fagus orientalis* Lipsky auf dem Thess. Olymp." *Zap. Russk. Nauchn. Inst. Belgrad.* 14 (1936).
10. WOLFF, E., PALIBIN, S. "Opredelitelj derevjev i kustarnikov, etc." (Bäume und Sträucher des eur. Russlands, Krim und Kaukasus). St. Petersburg (1904).
11. TURRILL, W. B. "The Plant-Life of the Balkan Peninsula." Oxford (1929).

VII—ON THE SYNONYMY AND DISTRIBUTION OF *STRYCHNOS INNOCUA* DEL.

A. A. BULLOCK AND E. A. BRUCE.

The investigation of the synonymy of *Strychnos innocua* Del. was commenced several years ago, when most of the Kew specimens were examined and annotated. For various reasons this work was suspended, but owing to a number of enquiries concerning the annotated specimens, it has been completed in the belief that the collected references will be of some value to herbarium workers and to forestry and agricultural officers.

The map shows a distribution which is now recognised as normal for a large number of African dry-country plants. The lengthy list of synonyms is due to the fact that earlier workers have regarded such an extensive distribution as impossible and have founded species on the mere fact of geographical separation.

It must be admitted that Gilg (1893) considered as varieties the numerous forms with which he was confronted, but Baker (1895 and 1903), working with different material, described species with differential characters which we have found to be inconstant and uncorrelated.

De Wildeman (1902-3), when describing his var. *obovata*, set out in tabular form the characters by which the various varieties are to be separated. We have studied each of these characters in turn and in association with one another, and have found that there is no correlation between them, and that each varies independently of the others. Gilg (1905) made some attempt to associate his varieties with the species described by Baker (1903), but this appears to be the last occasion on which any work on the synonymy of the plants concerned has been published. Later references quoted below are mainly to published lists, where specimens are referred to one or other of the described species.

***Strychnos innocua* Del.** Cent. Pl. Afr. 53 (1826); DC. in DC. Prodr. 9, 17 (1845); Schweinf. Pl. Nilot. 30, t. 10 (1862), et Beitr. Fl. Aethiop. 133 (1867); Dur. et Schinz, Étud. Fl. Congo, 195 (1896); Baker in Dyer, Fl. Trop. Afr. 4, 1, 533 (1903); Broun, Cat. Sudan Fl. Pl. 49 (1906); Dur. et Dur. Syll. Fl. Cong. 372 (1909); Broun et Massey, Fl. Sudan, 241 (1929); Burt Davy et Hoyle, Check List Trees and Shrubs, No. 2, Nyasaland, 48 (1936). Oberm. Schweick. et Verd. in Bothalia, 3, 249 (1937).

S. innocua var. *pubescens* Solered. in Engl. Bot. Jahrb. 17, 556 (1893).

Unguacha Simiarum Hochst. in Flora, 27, 103 (1844), nom. nud. in obs., et Pl. Schimp. Exsicc. No. 1817.

S. Unguacha A. Rich. Voy. Abyss. Bot. Atlas, t. 73 (1847), et Tent. Fl. Abyss. 2, 52 (1851); Walp. Ann. 3, 72 (1852-53); Benth. in Journ. Linn. Soc. 1, 80 (1857), in obs. et l.c. 103; Oliv. in Trans. Linn. Soc. 29, 113 (1875); Gilg. in Engl. Bot. Jahrb. 17, 562 (1893); Warb. in Engl. Pflanzenw. Ost-Afr. B, 225 (1895); Baker in Dyer, Fl. Trop. Afr. 4, 1, 534 (1903).

S. Unguacha var. *dschurica* Gilg in Engl. Bot. Jahrb. 17, 564 (1893).

S. Unguacha var. *dysophylla* (Benth.) Gilg, l.c. (1893), et in Engl. Pflanzenw. Ost-Afr. C, 310 (1895); Schinz* in Mem. Herb. Boiss. No. 10, 56 (1900).

S. Unguacha var. *grandifolia* Gilg in Engl. Bot. Jahrb. 17, 564 (1893).

S. Unguacha var. *micrantha* Gilg, l.c. 563 (1893), et in Engl. Pflanzenw. Ost-Afr. C, 310 (1895).

S. Unguacha var. *microcarpa*, Gilg, l.c. 564 (1893); De Wild. Notes Fl. Katanga, 2, 64 (1913), et l.c. 6, 60 (1921), et Étud. Fl. Katanga, 2, 121 (1913).

S. Unguacha var. *Steudneri* Gilg, l.c. 563 (1893), et in Engl. Pflanzenw. Ost-Afr. C, 310 (1895).

S. Unguacha var. *polyantha* Gilg in Engl. Bot. Jahrb. 30, 374 (1901); De Wild. Étud. Fl. Katanga, 2, 121 (1913), et Notes Fl. Katanga, 2, 64 (1913), et l.c. 6, 60 (1921), et Contrib. Fl. Katanga, 149 (1921), et l.c. Suppl. 1, 69 (1927).

S. Unguacha var. *obovata* De Wild. Étud. Fl. Katanga, 1, 98, t. 27, f. 6-7 (1902-3), et l.c. 2, 121 (1913), et Contrib. Fl. Katanga, 149 (1921); Dur. et Dur. Syll. Fl. Cong. 373 (1909).

S. Unguacha var. *retusa* Chiov. Fl. Somalia, 2, 305 (1932).

S. Lokua A. Rich. Tent. Fl. Abyss. 2, 52 (1851); Walp. Ann. 3, 72 (1852-53); Benth. in Journ. Linn. Soc. 1, 103 (1857); Schweinf. Beitr. Fl. Aethiop. 134 (1867).

S. dysophylla Benth. in Journ. Linn. Soc. 1, 103 (1857); Baker in Dyer, Fl. Trop. Afr. 4, 1, 533 (1903); Prain et Cummins in Dyer, Fl. Cap. 4, 1, 1054 (1909); Bews, Fl. Natal and Zululand, 159 (1921); Henkel, Woody Pl. Natal and Zululand, 161 (1934); Bremek. et Oberm. in Ann. Transv. Mus. 16, 428 (1935); Burt Davy et Hoyle, Check List Trees and Shrubs, No. 2, Nyasaland, 48 (1936).

S. randiiformis Baill. in Bull. Soc. Linn. Paris, 1, 246 (1880).

S. Quaqua Gilg in Engl. Bot. Jahrb. 17, 567 (1893), et in Engl. Pflanzenw. Ost-Afr. C, 310 (1895); Busse, Gilg. et Pilger in Engl. Bot. Jahrb. 32, 176 (1902); Baker in Dyer, Fl. Trop. Afr. 4, 1, 531 (1903); Gilg in Engl. Bot. Jahrb. 36, 93 (1905); S. Moore in Journ. Linn. Soc. 40, 148 (1911); Burt Davy et Hoyle, Check List Trees and Shrubs, No. 2, Nyasaland, 48 (1936).

S. alnifolia Baker in Kew Bull. 1895, 150, et in Dyer, Fl. Trop. Afr. 4, 1, 532 (1903); Gilg in Engl. Bot. Jahrb. 36, 93 (1905).

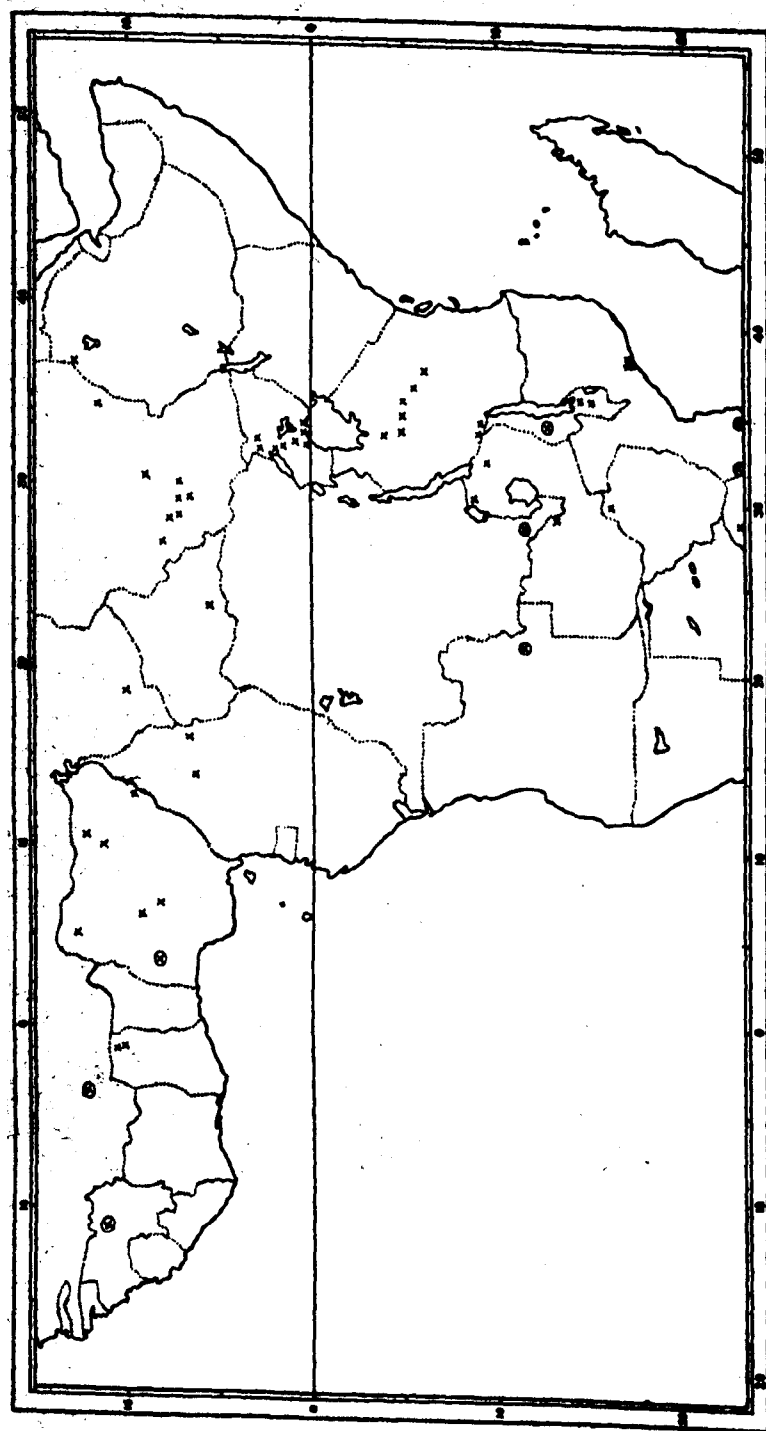
S. Burtoni Baker, l.c. 98, et l.c. 533; Dawe, Rep. Bot. Miss. Uganda, 51 (1906); Eyles in Trans. Roy. Soc. S. Afr. 5, 441 (1916); R. E. Fries, Wiss. Ergebn. Schwed. Rhod.-Kongo Exped. 1, 259 (1916).

S. trichisioides Baker, ll. cc.; Lely, Useful Trees N. Nigeria, 106 (1925), cum fig.; Hutch. et J. M. Dalz. Fl. W. Trop. Afr. 2, 22 (1931); Aubréville, Fl. For. Côte d'Ivoire, 3, 153 (1936); J. M. Dalz. Useful Pl. W. Trop. Afr. 364 (1937).

S. xerophila Baker, l.c. 98, et l.c. 534; Broun, Cat. Sudan Fl. Pl. 49 (1906); A. Chev. Miss. Chari-Lac Chad, 1902-4, 1, 204 (1913); Broun et Massey, Fl. Sudan, 242 (1929).

S. Behrensiana Gilg et Busse in Engl. Bot. Jahrb. 32, 175 (1902); Baker in Dyer, Fl. Trop. Afr. 4, 1, 531 (1903).

* The spelling "*Ungascha*" was used by Schinz for the specific epithet.



Map illustrating the distribution of *Strychnos innocua* Del. in Tropical Africa. Ringed crosses indicate that the exact locality was not given by the collector.

S. penduliflora Baker, l.c.; Gilg in Engl. Bot. Jahrb. 36, 92 (1905); Broun, Cat. Sudan Fl. Pl. 49 (1906); Broun et Massey, Fl. Sudan, 241 (1929).

S. spinosa Fiori, Bosch. Pl. Legn. Eritrea, 303 (1909-12), quoad syn. (et nom. vern.), non Lam. (1793).

S. dshurica Gilg. ex A. Chev. Miss. Chari-Lac Chad, 1902-4, 1, 203 (1913), et Expl. Bot. Afr. Occ. Franç. 1, 443 (1920).

FRENCH GUINEA. Without locality (sterile), *Pobeguini* 860, "medium-sized tree, flowers green, small, fruit size of orange with a hard pericarp, edible but acts as an emetic if eaten in large quantity."

GOLD COAST. Passankwia to Bugiyenga, May 1927 (fl.), *Kitson* 664; Santejan to Nebiowalli (?), May 1927 (fl.) *Kitson* 775; (locality?, *Kitson* 834;) Gwanbele to Bantala, April 1927 (sterile), *Kitson* 909.

NIGERIA. Nupe, on hill-sides (fl., young fr.), *Barter* 1160 (type of *S. trichisioides*), "shrub 8-14 ft., fl. yellow, seeds poisonous." Lukuja, Niger confluence (sterile), *Dalton* s.n. Sokoto, 450 m., May 1923 (fl.), *Lely* 836, "a small tree 20 ft. high, with yellow flowers and round yellow fruits 2 in. in diameter, seeds in sweet pulp—'Kokiya'." Katagum, (fl.), *Dalziel* 421, "shrub or small tree,—'Namijin kokia'." Yola, April 1909 (fl.), *Dalziel* 197, "fruit yellow, not edible, and smaller than the edible *Kokia* (*S. spinosa* Lam.),—'Namijin kokia'." Without locality, June 1909 (sterile), *Shaw* 45, "tree 15 ft." Bauchi Plateau, savannah, Febr. 1929 (fl.), *Lely* P.155, "small tree, yellowish flowers, spherical green fruits some 2 in. diam." Interior of western Lagos (fl.), *Rowland* s.n. (syntype of *S. alnifolia*).

FRENCH SUDAN. Without locality, March 1899 (fl.) *Chevalier* 623.

CHAD TERRITORY. Pays de Saras, June 1903 (fl.), *Chevalier* 8591.

CAMEROONS. Bosum, Kojali, savannah, March 1914 (fl.), *Tessmann* 2262, "—'Kobodaua'"; *ibid.*, May 1914 (fl.), *Tessmann* 2439. East of Babua, about 1000 m. (5° 50'N., 14° 50'E.), May 1914 (sterile), *Mildbraed* 9271a.

OUBANGUI-CHARI. Dar Banda, Jan. 1903 (fl.), *Chevalier* 7235.

SUDAN. Djur-land (=Bongo-land): Seriba (Kutschuk Ali), May 1869 (fl.), *Schweinfurth* 1719 (syntype number of *S. Unguacha* var. *grandifolia* and of *S. xerophila*); Wau, May 1869 (fl.), *Schweinfurth* 1672 (type of *S. penduliflora*); Pongo River, between Wau and Dein Zeebeir, on stony ground, March 1902 (sterile), *Broun* 362, "flowers green, tube long,—'Hogel Fil'"; Djur River, south of Wau, on iron-stone rocks, [Akwallakalla-Djur: Amonlenya-Zonde; Büsseri-Wau; Tambura Road-Shambe Yirrol Road], April 1931 (fl., fr.), *Turner* 26, "small tree, fruit size and shape of orange"; Gir, April 1869 (fl.), *Schweinfurth* 1412 (syntype number of *S. Unguacha* var. *Steudneri*); Seriba Ghattas, near Addai, April 1869 (young fr.), *Schweinfurth* 1432 (type number of *S. Unguacha* var. *microcarpa*); Bahr el Ghazal,

March 1902 (sterile), *Broun* s.n.; Duniaka, top of ironstone hill [Imawerangi-Zande; Gorogoro-Bongo], fairly common, April 1931 (fl.), *Turner* 17, "small tree, bark smooth, glaucous-gray, fruit globular, eaten by monkeys." Blue Nile: Jebel Fazoghli, Nov. 1900, *Muriel* L/38, "shrub, roots said to be applied burning to snake-bite, 'Erg et Saggat';" Gallabat, Matamma, June 1865 (sterile), *Schweinfurth* 1660 (syntype number of *S. Unguacha* var. *grandifolia*); Gallabat, June 1931 (fl.), *Cooke* 45, "medium-sized tree up to 30 ft. high, light gray bark, small flowers in dense clusters, buds yellow, opening white, leaves deeply veined, usually, but not always, in whorls of three;" *ibid.*, June 1931 (fr.), *Cooke* 62, "tree up to 25 ft. high, smooth gray bark, fruit very hard, size of a small orange, said to be edible,—'Kudkudda';" Southern Kordofan, Rohr el Afen, near Kadugli, Dec. 1907, *Broun* 1347, "fruit 1½ in. diam."

ABYSSINIA. "Arbor in demissis versus fluvium Tacaze prope Djeladjeranne," April 1841 (fl.), *Schimper* 1817 (type number of *Unguacha Simiarum*).

UGANDA. West Nile: without exact locality, July 1863 (sterile), *Speke and Grant* s.n. (syntype of *S. xerophila*), "fruit the size of an orange, pulp yellow, sweetish, edible;" Mt. Ito, Terego country, 1470 m., Febr. 1934 (fl.), *Eggeling* 1515 [U.F.D.* 1445], "common bush up to 15 ft. high, flowers whitish green, fruits green, smaller than a tennis ball"; Amua, (fl., fr.), *Eggeling* 904 [U.F.D. 1252], "tree 20 ft. high, flowers light green with white hairs in the throat, fruit blue-green, said to be eaten by monkeys,—'Lumboro' (Madi)". Unyoro: Chiope and Acholi country (fl.), *Dawe* 830, "tree 6–15 ft. said to yield a large edible fruit". Mubende: near Bukomero, Singo, on rocky hillsides (young fr.), *Eggeling* 483 [U.F.D. 819], "small scrubby tree up to 20 ft. high, fruit spherical, just over 1 in. diam., green". Lango: near Lira, 1050 m., Jan. 1931 (fl., fr.), *Hill* 13, "large tree, flowers greenish-yellow, fruits globose, green, about the size of an orange." Teso: Serere, on rocky hills (fr.), *Eggeling* 753 [U.F.D. 1150], "small tree up to 20 ft. high, fruit woody, green, the size of a tennis-ball"; *ibid.*, 1080 m., Dec. 1931 (fr.), *Chandler* 343, "tree 20–25 ft. high, orange-coloured fruit the size of a large orange, flowers small, light in colour, tinted pale pink." Busoga: without exact locality, 1050 m. (fr.), *Snowden* 216, "a small tree, round fruit, large seeds,—'Muonda'".

TANGANYIKA TERRITORY. Shinyanga: without exact locality, 1200 m., on savannah hills, June 1931 (sterile), *B. D. Burtt* 3301, "shrub up to 12 ft. high." Tabora: without exact locality, Dec. 1926 (sterile), *Wallace* 13, "tree with large round fruit,—'Mtonga', 'Mkukuru', 'Mkrukuru'." Singida: Muwera, 1260 m., in *Berlinia* savannah, March 1928 (sterile), *B. D. Burtt* 1387, "a

common dark-green-leaved shrub, 12 ft.* high,—'Mpundu'." Kondoa Irangi: Kolo, Dec. 1925 (sterile), *B. D. Burtt* 312. Dodoma: Mpwapwa, 1050 m., in red-clay soil in *Vitex* formation, Dec. 1931 (fl.), *Hornby* 428, "tree 20 ft. high"; Kilosa, on *Brachystegia* hillsides, Jan. 1926 (sterile), *B. D. Burtt* 88. Unyiha: Mbozi, in dry forest, Oct. 1932 (young fl.), *Jessel* 60. Rungwe: Bulambya (Kyimbila Distr.), Dec. 1912 (fl.), *Stolz* 1735.

NYASALAND. Ntondwe (=Ntonda?), 1905 (fl.), *Cameron* 168. Shire Highlands (fl.), *Buchanan* 478. Shire Valley (young fl.), *Waller ex Kirk* s.n. (type of *S. Burtoni*), "'Inteme'". Without locality (sterile), *Buchanan* 93.

PORTUGUESE E. AFRICA. Quilimane (sterile), *Stuhlmann* 1041 (type of *S. Quaqua*, in Berlin herb., photo. in Kew herb.), "—'Mquaqua'". Shupanga, Jan. 1863 (young fl.), *Kirk* 368, "pulp of the fruit orange-coloured; dried, beaten up and eaten,—'Intheme'". Kongone, Jan. 1861 (sterile), *Kirk* s.n. "pulp of fruit good, like strawberry,—'Mtheme', 'Ntemo'." *ibid.*, Nov. 1859 (young fl.), *Kirk* s.n., "shrub 12 ft. high, on sandy soil." Chibabava, Lower Buzi River, in the Madanda Forest, 120 m., Dec. 1906 (sterile), *Swynnerton* 1076, 1077, 1078, "a somewhat large tree with large yellow hard-shelled edible fruits, the pulp of which is used by natives as food,—'Mukwakwa'". Chirinda (fl.), *Swynnerton* 1959, "a large tree with edible fruits,—'Mukwakwa'". Chibuli (fl.), *Honey* 753, "fruit yellow when ripe, globose, 4 in. diam. or more, full of edible pulp in which the seeds are embedded, acid in flavour,—'M'Quaqua', 'Puffin Orange'." Delagoa Bay (fl.), *Forbes* s.n.

BELGIAN CONGO. Katanga, Oct. 1916 (fl., fr.), *Ringoet* 99, "small tree, fruit edible,—'Kakomekome'".

NORTHERN RHODESIA. South of Chiengi, on gneiss outcrops, June 1933 (fr.), *Michelmores* 382, "fruit edible, ripens and browns in September,—'Mulungi'". Mufulira, in open forest, May 1934 (fr.), *Eyles* 8202, "slender tree, unarmed, 15–20 ft., fruit blue." Between Nyabisonga and Mumbeshi Rivers, Solwezi District, near a stream on the edge of *Brachystegia* woodland, July 1930 (fr.), *Milne-Redhead* 792, "small tree, 10 ft., fruit sea-green, unripe, 3 in. diam.; leaves larger than those of other species seen—'Munkolokolo' (Chikaonde)".

SOUTHERN RHODESIA. Lomagundi, 1200 m., July 1926 (sterile), *Herb. Dept. Agr. S. Rhodesia* 1200; *ibid.*, May 1926 (sterile), *Herb. Dep. Agr. S. Rhodesia* 1243, "fruit round, smooth, hard, blue, not eaten."

ANGOLA. Malange: (fl.) *Gossweiler* 1121; *ibid.* (sterile), *Gossweiler* 1123.

SOUTH AFRICA. Transvaal: west of Blueberg and Hangklip Mts., south of the Limpopo River, Nov. 1871 (sterile), *Baines* s.n., "bush with sweet, well-tasted black berry"; Potgietersrust, Magouta River gorge, on the Zebediella Estate, Dec. 1931 (fl.),

* Uganda Forestry Department. All the specimens received at Kew from this department bear two numbers, and both are cited here to avoid confusion, as at least some of the distributed duplicates bear only one of them.

Galpin 11624, "shrub 10 ft;" Zoutpansberg, occasional on the north slopes, Nov. 1932, *Obermeijer, Schweickerdt and Verdoorn* 161 (Nat. Herb. Pretoria). Natal: Tugela, *Gerrard* 1660, "a low tree."

The distribution apparently covers the whole of the savannah—dry deciduous forest country from French Guinea westwards through the Sudan to Abyssinia, southwards through Uganda and Tanganyika to Nyasaland, Portuguese East Africa, Transvaal and Natal, and westward through the Rhodesias and southern Belgian Congo to Angola. There are important gaps in the known distribution, but these include only areas in which botanical exploration has not been seriously undertaken, and it may be assumed that the plant has a continuous distribution through the areas mentioned.

The only similar area which has been extensively explored and where *Strychnos innocua* has not been collected is western Kenya Colony. It may be absent or very rare in that area on account of the higher altitude of the grasslands and deciduous forest.

VIII—MISCELLANEOUS NOTES.

New Year Honours.—We record with pleasure the following Honours: C.I.E., Mr. C. F. BELL, Chief Conservator of Forests, Central Provinces and Berar; C.M.G., Dr. J. D. TOTHILL, Director of Agriculture, Uganda Protectorate; M.B.E., Mr. JOHN COUTTS, lately Curator, Royal Botanic Gardens, Kew.

The New York Botanical Garden.—We learn with interest that Dr. William J. Robbins, Professor of Botany, Chairman of the Department of Botany, and Dean of the Graduate School of the University of Missouri, has been appointed Director of the New York Botanical Garden. Dr. Robbins has been Professor at Missouri since 1919 and he became Dean of the Graduate School of the University in 1930. After obtaining his Ph.D. at Cornell in 1915 he taught plant physiology there, and it is in this branch of botany that he has made his mark. Lehigh University conferred upon him last year the honorary degree of doctor of science. Perhaps his best known published work is that written in collaboration with H. W. Rickett: "Botany, a Text-book for College and University Students," 1929. A second edition appeared in 1934.

Printed under the authority of His Majesty's STATIONERY OFFICE
By the South Essex Recorders, Ltd., High Road, Ilford.

(2387) Wt. 16/32 800 2/38 S.E.R. Ltd. Gp. 381

BULLETIN OF MISCELLANEOUS INFORMATION No. 2 1938 ROYAL BOTANIC GARDENS, KEW

IX.—*EUPHORBIA* (*DIACANTHIUM*) *DEIGHTONII*, A NEW SUCCULENT FROM WEST AFRICA, WITH BRIEF NOTES ON SOME ALLIED SPECIES. LEON CROIZAT (U.S.A.)

In the latter part of 1933 the writer had the pleasure of entering into correspondence with Mr. F. C. Deighton, Mycologist in the Department of Agriculture, Njala, Sierra Leone. Knowing that the writer was interested in *Euphorbia*, Mr. Deighton suggested that the investigation of a succulent bush believed to be *E. kamerunica* Pax might profitably be undertaken. The binomial—Mr. Deighton felt—might be misplaced for the plant of Sierra Leone.

From 1934 to 1936 several samples, at first fragmentary, and two live-rooted cuttings were sent to the writer. Upon this material, as will be later said, *E. Deightonii* is proposed. The specific name honours the discoverer of the new species.

E. kamerunica holds in the flora of West Tropical Africa precisely the place taken by *E. abyssinica* G. F. Gmel. in the flora of East Tropical Africa. There exists in the literature a well defined tendency to reduce to these two species whatever doubtful or imperfectly known material is collected in the supposed specific range. *Elaeophorbium drupifera* Stapf*, one may add, is another West African *Euphorbiaceae* that embraces more than the binomial of Stapf truly appears to warrant.

Under the circumstances the writer feels to have some justification if he gives an extended account of what he was able to learn of *E. kamerunica* and allied species. Certain data irrelevant to the strict title of the publication may later be found useful by investigators bent on analyzing critically the species in the group. It is plain that numerous succulent kinds of *Euphorbia*, African, Asiatic and American, beg investigation.

The description of *E. kamerunica* (Engl. Bot. Jahrb. 34, 75: 1905) is very brief. The diagnostic summary ends with the note that its cyathia are subsessile, in the Latin description *paullo supra podaria glomerulati*. N. E. Brown describes the inflorescence of the type (Fl. Tr. Afr. 6, pt. 1, 586: 1912) as follows: "Involucres 5-7 together, in a dense cluster, on peduncles [branches of subsessile cyme] 1-1½ lin. long."

* Needless to say, the writer rejects the concept of modern French taxonomists who maintain the species under *Euphorbia*. Their interpretation agrees, however, with the strict Linnean notion of the genus (cf. Baillon in Adans. 3, 144, 1863).

A. Chevalier interprets Pax's species (Rev. Bot. Appl. Agr. Trop. 13, 566 : 1933) in these words, so far as the cyme is concerned : "Cyathia 4-6 mm. broad, borne singly or in 2's or 3's upon glabrous, fairly thick pedicels 3 mm. long ; bracts short, thick, carnose, glabrous." This description gives evidence of being made from two specimens (1, Dalaba, Chevalier sine numero ; 2, between Irebeleya and Kouria, Chevalier 18248), three other specimens being sterile from textual inference.

Also, as *E. kamerunica* Chevalier accepts (op. cit., 567) "a large cactus-like aphyllous *Euphorbia*, planted as fetish in the majority of the villages of the Ivory Coast, within the forest, or near it." A specimen growing at Tiebissou is described by him (l.c.) as follows : "the lowest branches reach down to the ground and become buried therein, giving birth to an erect branching stem. This in turn branches out, the plant eventually bearing a likeness to *Ficus religiosa* . . . Each one of the 1-3 peduncles [in each cyme] supports 2 pedicelled cyathia, monoecious, male and female, glabrous. The pedicels measure 5 mm."

Brief diagnostic notes on Pax's species, *sensu clar. auct.*, are contributed by Hutchinson & Dalziel (Fl. W. Trop. Afr. 1, pt. 2 : 313 : 1928), by Irvine (with question mark, Pl. Gold. Coast, 191 : 1930) and by writers whose works, implicitly or admittedly, are devoted to the furtherance of forestal lore rather than to taxonomy. Chevalier, Hutchinson & Dalziel, and Irvine, accept *E. Barteri* as the synonym of *E. kamerunica*. Chevalier, in addition, believes that *E. garuana* is probably not distinct from the Paxian plant, and ends his summary by mentioning for the Cameroon and for the French Sudan, respectively, two 3-winged *Euphorbia* plants (op. cit. 568) in the group of *E. kamerunica*. These unnamed plants, Chevalier believes "are, perhaps, *E. trigona* Haw. (non Roxb.) which Mr. Cruzet connects with *E. Hermentiana*." The writer of these notes happens to be the Mr. Cruzet (naturally, *in litt.*) spoken of by Chevalier !

The host of published binomials revolving around *E. kamerunica*, it will be noticed, is truly great, and the nexus of the synonymy less clearly established than may be desired. The writer felt, however, that the very fragmentary cymes at first sent by Mr. Deighton excluded Pax's species. Deighton's *Euphorbia* had comparatively long, thin peduncles, and failed to agree with the plants described by Chevalier in bracts * and in sexual characters. Such differences, the first two particularly, implicitly established different species. The cyme of a succulent *Euphorbia* is a reduced pseudo-umbel in the nature of the evolved "umbel" of the species of the genus, sect. *Tithymalus* auct. The degree of its reduction (here read, length and thickness) bears upon the place that the species takes in the

evolution of the genus, or genera. The bracts are likewise reduced floral leaves, and have the same diagnostic value that generally must be attributed to the cyme.

The attention of the writer having been thus focussed upon the nature and length of the cyme and upon the nature of the bracts, inquiries were pursued on the material preserved in Paris and in Berlin. Grateful acknowledgment must be made of the kind interest of Prof. A. Guillaumin and of Dr. R. Mansfeld. The former wrote : "We have in the herbarium [of the Museum of Natural History, Paris] Barter 1012,* which does not appear under *E. kamerunica* in Dyer, Fl. Trop. Afr. 6, pt. 1, but has been used by Hutchinson & Dalziel in Fl. W. Trop. Afr. 1, pt. 2. The sample in question is floriferous : the cymes are fairly crowded and somewhat agree with those of your plant (Deighton's *Euphorbia*), but the bracts are markedly different, thinner, evidently carinate, less concave, saccate at the base. The spines are two to three times shorter than those of your plant. In the Chevalier herbarium are preserved numerous specimens from French West Africa, none of which is in flower. N. E. Brown attributed them in a MS. note to a species near *E. kamerunica*, not to the species itself. I should judge that these specimens come nearer to your plant than the specimen of Barter. The length of the cyme is probably not worth mention, but I am impressed by the evident difference exhibited by the bracts." This analysis was returned from an all too scanty material as expressing the opinion of my kind correspondent. Dr. Mansfeld wrote, from Berlin : "The cyathia of *E. kamerunica* [Preuss 511] are mostly ternate and short-pedunculate. So far as it can be seen from the scanty material at hand the cymes are paired, and clusters of 5-6 cyathia result from the crowding together of the cymes so paired. It is not to be excluded that one cyme in the type carries more than 3 cyathia, but the data could be verified only at the price of breaking up the type altogether." Dr. Mansfeld's report defined the cyme of *E. kamerunica* as being of a kind usually found in the species of the group. N. E. Brown's description, quoted above, might be understood to mean precisely the contrary.

Barring lesser considerations, these communications, live specimens, and the evidence in the literature, appeared to establish that :—

(a) Pax's binomial was misapplied to Deighton's *Euphorbia*. The length of the cyme and the nature of the bracts (this latter at least in Chevalier's interpretation) excluded the identity.

(b) Deighton's *Euphorbia* might be *E. Barteri* from description. The geographic range from Sierra Leone to northern Nigeria in itself was not prohibitive. The diffusion of *Euphorbiaceae* and of *Euphorbia* (not to mention other families) from west to east in Africa, and generally in the world, is obvious to the careful investigator. The succulent species of the Indian lands are a fair

* In this paper, bracts must be understood as bracts to the cyme and to the cyathium.

* This is the type number of *E. Barteri* N. E. Br.

match to those of West Africa. The tracks of migration, of course, admit secondary paths but these do not obscure the trend of the movement.

(c) The synonymy *E. kamerunica* = *E. Barteri* required definite confirmation. The descriptions in themselves made it improbable.

(d) Chevalier's *E. kamerunica* might include different species.

(e) Deighton's *Euphorbia* was not *E. trigona* Haw. (non Roxb.) (*E. Hermentiana* Lem.) from which it wholly disagreed in spine-shield and habit.

(f) Deighton's *Euphorbia* was not *E. garuana* N. E. Br. The writer has seen a cultivated succulent *Euphorbia* fully agreeing in vegetative cycle and in "habit" with the species of the West African Coast north of the equator. This specimen had the odd, weak, orbicular spine-shields described in the publication of *E. garuana* and was quite unlike Deighton's *Euphorbia*.

Better samples having been received meanwhile (cymes in fluid, Deighton 3109A, B), thanks to Sir A. Hill's kind interest, it became possible to compare the material from Sierra Leone with the specimens and types of *E. kamerunica* and *E. Barteri* in the herbarium of the Royal Botanic Gardens, Kew. The analysis made by Miss E. A. Bruce and Mr. E. Milne-Redhead, whose assistance the writer gratefully acknowledges, established that Mr. Deighton's *Euphorbia* was unrecorded. The writer may transcribe the record as follows:—

	<i>E. kamerunica.</i>	<i>E. Barteri.</i>	Deighton 3109B (<i>E. Deightonii</i> , cotype)
Spines ...	2-2.5 cm. apart.	1-1.5 cm.	1.5-1.8 cm.
Peduncle ...	2 mm. long	5-7 mm.	5-10 mm.
Lateral branches	3 mm. long	5-7 mm.	5-9 mm.
Primary bracts	3.5 mm. long × 5 mm. wide	4 × 5 mm.	2 × 2.5 mm.
Cyathium bracts	4 mm. long × 4.5 mm. wide ± triangular.	3.5 × 4 mm. ± rectangular.	3.5 × 3 mm. ± rectangular.

These two botanists wrote: "In these three species the nature of the inflorescence is fundamentally the same. In all three species it is probable that 3 three-cyathied cymes may be produced at each floral eye, giving a maximum of 9 cyathia. Frequently some cyathia are suppressed, and fewer cymes are produced. The varying lengths of the peduncle and cyme-branches give the species a distinct appearance when in flower. According to a drawing of the type specimen of *E. garuana* N. E. Br. the spine-shields are smaller than those of *E. Deightonii*."

Mr. Deighton furnished the writer with data of habit and branching as they appeared from the type-trees (growing in Mr. Deighton's garden at Njala, 5½ years old, 10 ft. high and 4 ft. across), and interesting notes on habitat, which are here transcribed *verbatim*. "The plants originated from cuttings.

I have seen older plants about 15 ft. high and 30 ft. across. Branches 3-6 angled, mostly 4-angled. Branching candelabriform with new shoots appearing from below the ground also. Normally the branches appear in whorls about 10 in. apart up the stem, which seem to correspond to one season's growth, though lengths of stem up to about 3 ft. occur without whorls of branches. At the end of the season's growth the measurements of the last whorl are: main stem between point of origin of next to last, and of last branch-whorl 10 in., branches up to 8 in. long. Some branches from the lower whorls may grow quicker and slightly exceed the main stem in length, but the whole bush is a flat hemispherical shape when very old (specimens have been recorded up to 30 ft. across, and my own plants are more or less flat on top).

"This plant, as far as I know, is always cultivated in Sierra Leone, and therefore I feel that "type localities" are hardly applicable. My Njala plants (Southern Province) originally came from Makene (Northern Province), but there are plants at Njala that have come from Kenema (Southern Province). I have seen this species also in gardens in Freetown. It usually is grown as a hedge-plant." (Deighton *in litt.*, July 12th, 1935.)

The notes that follow are taken from one of the rooted cuttings sent by Mr. Deighton, and now 2 ft. tall:—

Stems dark green, occasionally mottled with pale green, variously obstructed, broadly grooved to flat winged, on weak shoots 3-angled, otherwise 4-angled, up to 4.5 cm. across. Wings toothed, up to 1.5 cm. broad, 2-3 mm. thick at the margin; teeth scarcely 2.5 cm. apart, the sinus between them 3-5 mm. deep, ultimately more or less evanescent; spines 2, reddish brown, becoming gray, sharp, of hard consistence, each 12 mm. long or less, horizontal or, occasionally, weakly ascending, diverging at 110°-145°, their tips up to 2 cm. apart; spine-shields subobovate, at first free, up to 9 mm. long, 6 mm. broad, ultimately subdecurrent to decurrent along the margin of the wings. Floral-eye lower than the centre of the sinus, covered by 1-2 fugacious minute elliptic scales, at first free, later connected with the spine-shield. Leaf caducous, subobovate, fleshy, keeled on the back, up to 3 mm. long, 2.5 mm. broad; leaf-scar round-triangular, inclosed by the spine-shield; auricles* in pairs laterally to the leaf-scar, scarious to fleshy, subpersistent.

In addition to the data already given the inflorescences in fluid show the following:—

Cymes 1-3 per floral-eye, at the end of anthesis up to 2 cm. tall; cyathium ultimately to 9 mm. broad, 3-4 mm. deep, broad-campanulate; bracts thin, scarious, deciduous, mostly with evident longitudinal fibro-vascular threads under the lens, keeled, more or

* These "auricles" together with the leaf, or so-called "scale" in the very succulent forms, are aborted members of a ternate foliar verticil, and fully equivalent to the "glandular stipules" of *Euphorbia* sect. *Gonio-stema*, *Poinsettia*, etc. They would be called stipules but for the confused terminology now current and the attending risk of misunderstanding.

less rectangular and denticulate, usually produced into an extended tip. Nectaria (glands) 5, scarcely contiguous, elliptic, minutely granular, 4 mm. broad, 2 mm. wide. Lobes subquadrangular, lacinate, the central laciniae longest, 2 mm. broad, 1-1.5 mm. high. Stamens in the ♂ stage slightly exerted and up to 4 mm. long, articulate above the middle of the filament. Staminodia numerous, mostly linear, deeply lacinate-cleft to plumose, hyaline, up to 4 mm. long. Ovary subinclosed, broad-ovate, 2 mm. broad, 2 mm. long, the cocci scarcely evident, insident upon a fleshy obconic stipe, 1-1.5 mm. high, sublobulate at the tip. Branches of style 3, 1-1.5 mm. long, free nearly to base; stigma deeply bifid, spreading.

Capsule (fragmentary, and perhaps under size) about 1 cm. broad, the cocci manifestly distinct, narrowed or much narrowed at the keels, glabrous; stipe Seed ecarunculate, globular, 3 mm. broad, light brown, smooth, not marbled or spotted; aril thin; raphe dark brown.

Type: *Deighton* 3109A, B, Njala, Mano district, Sierra Leone, 3 samples of cymes and strips of wing in fluid, 18.1.1936; 25.1.1936. In the herbarium of the author.

Syntype: *Deighton* 3109 B, from the type, in the Kew Herbarium.

The data originally sent by Mr. Deighton, and reported above, should be taken into consideration for the habitat of the new species, the type-locality of which, technically, must remain Njala.

The author has identified as *E. Deightonii* two sheets kindly sent for verification from the Kew Herbarium. The material is sterile, but there is scarcely a doubt that it belongs to the species just presented. These sheets are: *Deighton* 2609, Njala, Mano district, Sierra Leone, Febr. 1933; and *S. Rowe*, s.n., Sierra Leone, without nearer indication, January 1886.

The latter specimen has been accepted as *E. leonensis* N. E. Br., in an unsigned MS. note by Dr. J. Hutchinson. Mr. Deighton sent last year to the writer a specimen, which unfortunately arrived dead, of what was described as "an *Elaeophorbia* with 3-4 angles." Although nothing much could be learned from such material the writer inclines to the opinion that it was *E. leonensis*. This much misunderstood species, *sensu quodam*, is intermediate between *E. Teke* (*E. helicothale* Hort. Bot. Kisantu) and *E. paganorum* (v.v.) which are quite different from *E. Deightonii* and the whole natural group to which it belongs. There can be no question but that the succulent species of *Euphorbia* of Africa not only will still yield much new in point of taxonomy, but will furnish data of the first importance for a history of the evolution and of the migration of the genus and of the family. We have barely scratched the surface of a most promising field.

***Euphorbia Deightonii* Croizat, sp. nov.**—*Arbor vel frutex dumosus*, multiceps, ad 15 pedes altus, ad 30 pedes latus, fide amicissimi

Deightonii. *Ramuli* 3-6-angulati, hinc inde obstricti, e specimine vivo ad 4.5 cm. lati, canaliculati vel patente alati; alis dentatis ad 1.5 cm. latis, margine 2-3 mm. crassis; dentibus (podariis) 2.5 cm. discretis; sinubus inter dentes 3-5 cm. profundis obsolescentibus; aculeis binis horizontalibus apice ad 2 cm. discretis; puncto florifero infra medium sinum sito; folio caduco subobovato carnosio 3 mm. longo 2.5 mm. lato; auriculis binis subpersistentibus. *Cymae* 1-3 aggregatae, anthesi peracta ad 2 cm. altae; bracteis tenuibus deciduis scariosis plus minusve rectangularibus denticulatis apice in acumen productis; cyathio denique ad 9 mm. lato 3-4 mm. profundo late campanulato; nectariis (glandulis) 5 subdiscretis 4 mm. latis 2 mm. longis; lobis subquadrangularibus laciniatis laciniis medianis longioribus 2 mm. latis 1-1.5 mm. longis; staminibus ad 4 mm. longis supra medium filamentum articulatis; staminodiis plurimis hyalinis linearibus profunde laciniato-fissis plumosisve; germine subincluso ovoideo 2 mm. lato longoque, coccis obscuris, stipiti insidente carnosio obconico 1-1.5 mm. longo ad apicem sublobulato; stylis 3 fere ad basin discretis 1-1.5 mm. longis; stigmatibus profunde bifidis patentibus. *Capsula* (ejus fragmentum: an vero matura?) ad 1 cm. lata; coccis glabris discretis ad costas angustatis; stipite . . . ; semine globoso ecarunculato 3 mm. lato pallide brunneo laevi haud marmorato vel maculato; arillo tenuiore; raphide badio.

SIERRA LEONE: Njala, Mano district, 18 et 25.1.1936, *Deighton* 3109 A, B [Typus, in herbario auctoris; syntypus (*Deighton* 3109 B) in Herb. Kew]. Locus classicus est Njala, sed vide notas *Deightonii* ejusdem in textu anglico.

X—CONTRIBUTIONS TO THE FLORA OF TROPICAL AMERICA: XXXIV.* PLANTAE HINTONIANAE: VI.*

ACANTHACEAE.† E. C. LEONARD.

Recent plant collections from the District of Temascaltepec and adjacent regions of Mexico by Mr. G. B. Hinton are proving remarkable for the many new and rare species they contain. Through the courtesy of the Director of the Royal Botanic Gardens, Kew, I have been able to study most of the *Acanthaceae*, 14 of which appear to be new. These are described herewith. The three species of *Ruellia* are based upon older collections, but the others are known only from Mr. Hinton's material.

***Ruellia Galeottii* Leonard, sp. nov.**; suffrutescens; caules pilosi vel glabrati; folia ovata vel oblongo-ovata vel elliptica, apice acuminata, basi angustata, undulata vel leviter dentata, utrinque pilosa; cymae axillares, subsessiles; bracteolae oblongo-ellipticae, plus minusve glanduloso-pilosae; calyces glanduloso-pilosi, laciniis

* Continued from K.B. 1937, 505.

† Published by permission of the Secretary of the Smithsonian Institution.

lineari-spathulatis apice rotundatis; corolla purpurea, parce pubescens, hypocrateriformis, lobis rotundis emarginatis; capsula glabra.

Suffrutescent; stem simple or branched, pilose or glabrate below; petioles slender, up to 6 cm. long, sparingly pilose; leaf blades ovate to oblong-ovate or elliptic, 4 to 16 cm. long, 2.5 to 8 cm. wide, short-acuminate at apex, cuneate at base and decurrent, undulate or shallowly dentate, both surfaces hispid-pilose, the costa and lateral nerves (7 or 8 pairs) prominent; flowers borne in short axillary cymes; bractlets oblong-elliptic, about 8 mm. long and 2 to 3 mm. wide, glandular-pilose; pedicels up to 0.5 mm. long; calyx 7 to 10 mm. long, glandular-pilose, the lobes linear-spatulate, rounded at apex; corolla purplish, sparingly pubescent, 2 cm. long, the tube ventricose, the narrow portion 8 mm. long and 1 mm. in diameter, the mouth about 7 mm. in diameter, the limb 10 to 13 mm. broad, the lobes rounded, 5 mm. wide, shallowly emarginate; stamens didynamous, the shorter filament of each pair 3 mm. long, the longer 4 mm., glabrous; anthers oblong, 1.5 mm. long and 0.5 mm. wide; style about 12 mm. long, minutely pilosulous; capsule 8 mm. long and 3 mm. wide, pointed at apex, narrowed to a slender solid base about 3 mm. long, glabrous, 2- to 4-seeded; retinacula curved, unguiculate, about 2 mm. long, acute at apex; seeds flat, oval, 3 mm. long and 2 to 2.5 mm. wide, appearing glabrous when dry, mucilaginous-pilose when immersed.

Type in the U.S. National Herbarium, no. 572,853, collected at Sola, Oaxaca, Mexico, Oct. 1844, by H. Galeotti (no. 510 J).

Additional specimens examined.—SINALOA: Culiacan, Brandegee, Oct. 19, 1904; Mazatlán, Ortega 5705; El Roble, Ortega 6540; without definite locality, Ortega 4756. MEXICO: Tejupilco, Distr. Temascaltepec, Hinton 2659. COLIMA: Colima, Palmer 1321. GUERRERO: Acapulco, Palmer 194. OAXACA: Tomellin Canyon, Pringle 6259; Picacho to San Gerónimo, Purpus 6843.

Closely related to *R. inundata* H.B.K., but easily distinguishable by its linear-spatulate and relatively much broader calyx segments (strictly linear in *R. inundata*), its smaller corolla, not over 2 cm. long (2 to 2.5 cm. long in *R. inundata*), with the enlarged portion of the tube short-funnelform instead of subcylindric, and its flowers which are borne in much shorter and more compact clusters.

***Ruellia oaxacana* Leonard**, sp. nov.; suffrutescens; caulis pubescens vel internodiis glaber; folia oblongo-ovata vel oblongo-elliptica, apice acuminata, basi angustata, glabra vel costa puberula; inflorescentia fascicularis, axillaris, sessilis vel subsessilis; bracteae oblanceolatae; bracteolae triangulares parce pubescentes; calycis laciniae lanceolatae puberulae; corolla lilacina, parce pubescens, hypocrateriformis, lobis suborbiculatis; capsula puberula.

Suffrutescent; stem erect or ascending, simple or branched, up to 50 cm. high, subquadrangular, the tips and nodes pubescent

with curved hairs, the internodes (especially the lower) glabrate; petioles 1 to 3 cm. long, channelled, sparingly puberulous with curved hairs; leaf blades oblong-ovate or oblong-elliptic, 6 to 15 cm. long, 2 to 4.5 cm. wide, acuminate (the tip blunt), narrowed at base and decurrent, firm, entire or undulate, glabrous or the costa and lateral veins (5 or 6 pairs) puberulous with curved hairs, both surfaces bearing numerous cystoliths; flowers numerous, borne in sessile or subsessile axillary fascicles; bracts oblanceolate, about 1 cm. long, 8 mm. wide; bractlets triangular, 2 mm. long, 1 mm. wide at base, sparingly pubescent; calyx 5 to 6 mm. long, puberulous, the tube 1 mm. long, the segments lanceolate, 0.75 mm. wide at base; corolla 3 to 3.5 cm. long, light purple, sparingly pubescent, the tube ventricose, the narrow basal portion 1 to 1.5 cm. long and 1.5 mm. in diameter, the upper portion obconic, 6 to 7 mm. wide at mouth, the limb 0.5 to 2 cm. broad, the lobes suborbicular, about 6 mm. broad; stamens didynamous, the shorter of each pair 6 mm. long, the longer 10 mm., glabrous or bearing a few minute hairs near the base; anthers about 2 mm. long, and 0.5 mm. broad, the tip and basal lobes minutely apiculate; ovary puberulous; style 2.5 to 3 cm. long, sparingly pubescent, the hairs ascending, the stigma lobes very unequal, one linear-lanceolate, 2 mm. long, and 0.25 mm. wide, the other vestigial; capsule about 1 cm. long and 2 mm. broad, pointed at apex, narrowed to a solid basal portion about 3 mm. long and wide, puberulous, 10- to 12-seeded; retinacula 1 mm. long, flat and often forked at apex; seed (immature) flat, orbicular, about 1.5 mm. in diameter, the flat surface glabrous, the margins puberulous, mucilaginous when moistened.

Type in the U.S. National Herbarium, no. 907,989, collected on the road between Pochutla and Pluma, Oaxaca, Mexico, March 16, 1895, by E. W. Nelson (no. 2463).

Additional specimens examined.—NAYARIT: Arroyo del Salitre, Ortega 26. MEXICO: Ixtapan, Distr. Temascaltepec, Hinton 3922. OAXACA: Distr. Pochutla, Conzatti, Reko, and Makrinius 3150; Cafetal Concordia, Morton and Makrinius 2377; Cerro Concordia, Morton and Makrinius 2650.

Apparently not closely related to any other Mexican member of the genus.

***Ruellia spissa* Leonard**, sp. nov.; herba, radicibus crassis; caules bifariam pubescentes; folia subsessilia, ovata vel oblongo-ovata, apice acuta vel obtusa, basi angustata vel rotundata, utrinque pilosa; flores subsessiles, terminales vel subterminales; bracteae oblongae, pilosae, ciliatae; calycis laciniae subulatae, pilosae, ciliatae; corolla purpurea, puberula, hypocrateriformis; capsula glabra, callis parce pubescentibus.

Herb; roots thick-fibrous; stem erect or ascending, long-pilose, also pubescent in 2 lines of minute curved hairs; cystoliths parallel,

Small acaulescent *herb*; *rootstock* 1 to 2 cm. long; *petioles* slender, 1 to 6 cm. long, pubescent, the hairs spreading or retrorsely curved, 0.25 to 0.5 mm. long; *leaf blades* oval to elliptic or broadly ovate, 2 to 6 cm. long, 1.5 to 3 cm. wide, rounded at apex, obtuse or

Shrub up to 3 metres high; *stems* terete, glabrous, or the tips strigillose; *petioles* slender, up to 2.5 cm. long, glabrous or strigillose; *leaf blades* oblong-ovate, up to 12 cm. long and 5 cm. wide, acuminate at apex, narrowed at base and decurrent, entire, firm, both surfaces sparingly hirtellous or glabrate, the hairs of the lower surface confined chiefly to the costa and lateral nerves (8 to 10 pairs);

flowers borne in terminal or subterminal spikes up to 30 cm. long and 2 cm. in diameter, the rachis finely glandular-pubescent; bracts obovate, 15 to 17 mm. long, 8 to 10 mm. wide, obtuse to acute at apex, ending in a mucro 0.5 mm. long, often purplish, ascending, imbricate, obscurely 3-nerved, both surfaces finely glandular-pubescent; bractlets lanceolate, 12 to 13 mm. long, 3 mm. wide near base, gradually narrowed to a slender tip, veiny, both surfaces finely glandular, the costa prominent; calyx segments subequal, lanceolate, 14 to 15 mm. long, 3 to 4.5 mm. wide near base, finely glandular-pubescent without, glabrous within; corolla 3 cm. long, purple (?), glandular-puberulous, the tube gradually enlarged from 2.5 mm. at base to 5 mm. at mouth, the lips 1 cm. long, the posterior ovate, 7 mm. wide at base, emarginate at apex, the anterior 3-lobed, the middle lobe linear-lanceolate, 1.75 mm. wide, the lateral lobes linear, 1.25 mm. wide; stamens reaching throat of corolla, the shorter filament of each pair glabrous or bearing a few hairs near the base, the longer bearing a line of spreading hairs up to 0.5 mm. long; capsule ovoid, about 17 mm. long, 7 mm. wide, obtuse at apex, densely brownish-puberulous, 4-seeded; retinacula 2 mm. long, cucullate at apex; seed flat, suborbicular, 3.5 mm. in diameter, densely hirtellous with white spreading hairs.

Type in the Kew Herbarium, collected at Villaneda, District of Temascaltepec, Mexico, February 22, 1935, by G. B. Hinton (no. 7412). Hinton's no. 3156 collected at Acatitlan, Temascaltepec, is also of this species.

In general appearance *A. lineariloba* resembles *A. madrensis* Lindau, described from the Sierra Madre of Mexico, but the bracts are mucronate, instead of merely acute as in *A. madrensis*, and the lobes of the lower lip of the corolla are narrowly linear instead of oval.

The name of this new species was suggested by the extremely narrow lobes of the anterior lip of the corolla. Inasmuch as only the uppermost leaves are present in the specimens examined, the dimensions above stated will probably prove too small if applied to more complete specimens or to growing plants.

Aphelandra verticillata Nees ex Hemsl. Biol. Centr. Amer. Bot. 2, 513 (1882); Nees in DC. Prodr. 11, 281 (1847), as synonym. *Crossandra Haenkeana* Nees, l.c., not *Aphelandra Haenkeana* Nees, l.c. 298.

MEXICO: Ypericones, District of Temascaltepec, Hinton 2971.

This species is not represented otherwise in the U.S. National Herbarium. It is well marked by its quaternate leaves.

Berginia Hintonii Leonard, sp. nov.; frutex; caules teretes, glabrati; folia ignota; spicae breves, rhachi tomentosa, pilis albis; pedunculi breves, bracteis adpressis ovatis acuminatis imbricatis instructi; bracteae late ovatae mucronatae glabrae, marginibus tomentosis; bracteolae ovato-lanceolatae pubescentes; calycis laciniae aequales obtusae, subtiliter pubescentes, lacinia superiore

ovata, ceteris oblongo-lanceolatis; corolla pubescens, labio superiore bilobo, lobis oblongo-ovatis, inferiore trilobo, lobis orbicularibus; capsula ovoidea, apice obtusa, subtiliter pubescens; semina tomentosa.

Shrub; stem terete, glabrous, branched, bearing scattered whitish round or oval lenticels up to 1 mm. long, the ultimate branches very slender; leaves deciduous; flowers borne in short peduncled spikes up to 8 mm. long, the peduncles 3 to 4 mm. long covered by 5 to 7 closely imbricate pairs of bracts, these ovate, 0.75 to 1.5 mm. long, mucronate, pubescent, ciliate, subcoriaceous; rachis densely white-tomentose; bracts subtending the flowers broadly ovate, about 1.5 mm. in diameter, mucronate, tomentose; bractlets ovate-lanceolate, tomentose; calyx 4 mm. long, the segments equal, obtuse, finely pubescent, the hairs white, some of them glandular, the posterior segment ovate, the others oblong-lanceolate, all 1-1.5 mm. wide, striate; corolla about 8 mm. long, pubescent, purple (?), veiny, the tube 1.5 mm. in diameter near base, narrowed to 1 mm. about 2 mm. above base, thence gradually enlarged to 3 mm. at throat, the upper lip 3.5 mm. long, 2-lobed, the lobes oblong-ovate, the lower lip 3-lobed, the lobes orbicular, the middle about 3.5 mm. wide, the lateral 3 mm. wide; filaments 1.5 mm. long, long-pilose; style 4 mm. long, sparingly hirtellous toward base, the stigma 2-lobed; capsule ovoid, about 1 cm. long, 4 mm. wide, obtuse at apex, finely and minutely pubescent; retinacula 2 mm. long; seed (immature) tomentose.

Type in the Kew Herbarium, collected at Coyuca, Guerrero, Mexico, April 26, 1934, by G. B. Hinton (no. 5956).

Very distinct from all other Mexican species in its short bract-covered peduncles and short tomentose spikes. The branches of the specimen at hand are entirely devoid of leaves, but in a pocket attached to the sheet is a fragment of a leaf blade, this probably ovate when intact, about 3 cm. long and 2 cm. wide, sparingly hirtellous (the costa and veins densely so), with a slender petiole 1 cm. long.

Chalarothyrsus amplexicaulis Lindau in Bull. Herb. Boiss. sér. 2, 4, 327 (1904).

MEXICO: Nanchititla, District of Temascaltepec, Hinton 7384, 7624. Known also from Michoacan and Guerrero.

This specimen agrees very well with the type collection (Langlassé 698), except that the stems of the Hinton plants are more densely pilose. As Langlassé's specimen bore no fruit, the following description of the capsules from Hinton's no. 7624 may be added.

Capsule clavate, about 12 mm. long, abruptly narrowed from about the middle to a slender curved stipe, glabrous, 1-seeded (?), the two valves very dissimilar, the posterior clavate, 1.5 mm. wide, the anterior lute-shaped, 3 mm. wide, both rounded at tip; seed flat, bearing a small spinelike projection on the edge, papillose.

Carlownrightia lanceolata Leonard, sp. nov.; suffrutescens; caules teretes, glabri vel apice bifariam hirtelli; folia anguste lanceolata, saepe falcata, utrinque acuta, hirtella vel subglabra, scaberula, petiolis brevibus; inflorescentia paniculata, spicis multis gracilibus; flores sessiles distantes; bractae et bracteolae minutae, subulatae, puberulae vel glabrae; calycis laciniae subulatae, puberulae, pilis glanduliferis; corolla purpurea, parce pubescens, tubo brevi, lobis oblongo-obovatis; capsula stipitata, hirtella; semina plana, muricata.

Suffrutescent, up to 40 cm. high or more; *stems* terete, hirtellous in two lines, the hairs retrorsely curved, up to 0.5 mm. long; *petioles* up to 5 mm. long; *leaf blades* narrowly lanceolate, often falcate, up to 10 cm. long and 1.5 cm. wide, gradually narrowed to a slender apex, acute at base, entire, rather thin, sparingly hirtellous or subglabrous, scaberulous; *flowers* borne in numerous interrupted paniced spikes up to 9 cm. long, the branches of the inflorescence glandular-puberulous; *bracts* subtending the spikes and flowers subulate, about 5 mm. long and 0.5 mm. wide at base, puberulous or glabrate, those subtending the branches of the inflorescence larger and intergrading into the stem leaves, bractlets subulate, up to 2.5 mm. long; *calyx* about 4 mm. long, the segments subulate, 0.5 mm. wide at base, glandular-puberulous; *corolla* 7 to 8 mm. long, purple, minutely and sparingly pubescent, the tube narrow, 2.5 mm. long, 1 mm. in diameter at base, narrowed 1 mm. above base to 0.75 mm., thence gradually enlarged to 1.5 mm. at throat, the lobes oblong-obovate, up to 5 mm. long and 2.5 mm. wide; *filaments* slender, 5.5 mm. long, glabrous, the anthers 1 mm. long, their lobes parallel, subequally attached; *style* about 9 mm. long, glabrous; *capsule* about 7 mm. long, 4 mm. broad, abruptly narrowed to a slender stipe (3 mm. long), pointed at tip, rather densely hirtellous; *seeds* suborbicular, flat, the margins thickened, obliquely cordate, white or purplish, muricate, the projections of the inner side longer than those of the outer.

Type in the Kew Herbarium, collected in water at Tejupilco, District of Tamasaltepec, Mexico, altitude 1340 metres, November 21, 1932, by G. B. Hinton (no. 2672). Hinton's no. 2990, collected at Plaza de Gallos, Tamasaltepec, altitude 1200 metres, December 21, 1932, is also of this species.

Closely related to *C. pectinata* Brandege, but recognizable by its strongly glandular-puberulous inflorescence. In *C. pectinata* the branches of the panicle, at least in the type material (Brandegee no. 452, from Lower California), are glabrous or at most sparingly pilosulous in two lines. In its non-striate stems and rather densely hirtellous capsules *C. lanceolata* differs notably from *C. Lindauiana* Standl., in which the capsules are as much as 9 mm. long and mostly glabrous.

Carlownrightia mucronata Leonard, sp. nov.; suffrutescens; caules teretes minute puberuli vel glabrati; folia ovalia vel ovata vel

oblongo-ovata, apice acuta vel rotundata, mucronulata, basi rotundata, puberula; inflorescentia paniculata, spicis multis gracilibus flores sessiles distantes; bractae et bracteolae minutae, subulatae minute pubescentes; calycis laciniae anguste lanceolatae, minut pubescentes, pilis eglandulosis quam glandulosis duplo longioribus corolla parce pubescens vel glabrata, labio superiore ovato, apice emarginato, basi unguiculato, inferiore trilobo, lobis oblongis capsula stipitata, glabra; semina plana, muricata.

Suffrutescent; *stems* slender, branched, terete, minutely puberulous (the hairs retrorsely curved) or glabrate; *petioles* up to 10 mm. long, minutely puberulous with curved hairs; *leaf blades* oval, or ovate to oblong-ovate, the largest 6.5 cm. long and 4 cm. wide, acute to rounded at apex (at least the uppermost tipped by a short mucro), rounded at base, thin, entire, both surfaces puberulous, the costa and lateral veins (5 or 6 pairs) slender, whitish or purplish; *flowers* sessile, solitary or fasciculate, borne in panicles of slender interrupted spikes, the internodes of the spikes 5 to 25 mm. long; *bracts* subtending the flowers subulate, about 2.5 mm. long, 0.5 mm. wide, those subtending the spikes and branches of the inflorescence resembling the stem leaves but smaller, all minutely pubescent, bractlets minute and subulate; *corolla* 12 mm. long, minutely and sparingly pubescent, or glabrate, purple (?), the tube 2.5 mm. long, 1.5 mm. in diameter, the lips equal, 1 cm. long, 3.5 mm. wide, the posterior lip ovate, emarginate, narrowed at base to a slender claw, the anterior lip 3-lobed, the lobes oblong, the middle 2.5 mm. wide, the lateral 4.5 mm. wide; *filaments* about 6 mm. long, sparingly and minutely pubescent; *anthers* barely 1 mm. long, the lobes parallel, slightly unequal; *capsule* 12 mm. long, 4 mm. broad, pointed at apex, narrowed at base to a slender stipe (6 mm. long), glabrous; *seed* flat, 4.5 mm. long, 4 mm. wide, obliquely cordate, both surfaces rather minutely and evenly muricate, white or brown.

Type in the Kew Herbarium, collected on a dry hill at Coyuca, Guerrero, Mexico, January 24, 1934, by G. B. Hinton (no. 5533).

A plant with the facies of *C. glabrata*, but differing from that species in the relative length of the glandular and eglandular hairs of the calyx segments and in the size of the capsule and seed. In *C. mucronata* the eglandular hairs of the calyx are at least twice as long as the glandular ones; in *C. glabrata* the reverse is true. The capsules of *C. glabrata* are only 10 mm. long, with seeds 3 mm. in diameter, but in this new species they are as much as 12 mm. long, with seeds 4.5 mm. long and 4 mm. wide.

Carlownrightia coyucana Leonard, sp. nov.; suffrutescens; caules teretes, glabri, apice hirtelli, minute striati; folia breviter petiolata, ovato-lanceolata, apice obtusa, basi rotundata, minute pilosa; spicae multae, graciles; flores sessiles, distantes; bractae et bracteolae triangulares, minute pubescentes; calycis laciniae triangulares, pubescentes, pilis clavatis minutissimis cum alteris

intermixtis; corolla pubescens, tubo brevi, labio superiore oblongo-obovato, ungue lato, inferiore trilobo, lobis oblongo-ellipticis apice rotundatis vel obtusis; capsula stipitata, glabra; semina plana, minute muricata.

Suffrutescent; stems arising from thick ligneous tap-roots, terete, glabrous below, the upper portions finely striate and densely hirtellous, the hairs white, retrorsely curved, about 0.5 mm. long; petioles up to 2 mm. long; leaf blades ovate-lanceolate, the largest 15 mm. long and 5 mm. wide, obtusish at apex, rounded at base, both surfaces minutely pilosulous; flowers borne in slender interrupted spikes up to 7 cm. long, the flowers sessile, solitary or fasciculate, 2 to 15 mm. distant, the rachis hirtellous with retrorsely curved white hairs about 0.5 mm. long; bracts triangular, barely 2 mm. long, 0.5 mm. wide, minutely pubescent; bractlets about 1 mm. long; calyx 2.25 mm. long, the segments triangular, 1.25 mm. long, less than 0.5 mm. wide, finely pubescent with a mixture of visible slender hairs and microscopic clavate ones; corolla (immature) 7 mm. long, finely pubescent, the tube 2 mm. long, 1 mm. in diameter at base, slightly constricted 1 mm. above base, the lips equal, the posterior lip oblong-obovate, 1.75 mm. wide, minutely bidentate at tip, narrowed at base to a claw 1 mm. wide, the lower lip 3-lobed, the lobes nearly similar, oblong-elliptic, 4 mm. long and about 2 mm. wide, rounded or obtuse at apex; capsule 1 cm. long, 4 mm. broad, pointed at apex, abruptly narrowed to a slender stipitate base (4 mm. long), glabrous; seeds flat, 4 mm. long, 3.5 mm. wide, obliquely cordate, white or purplish, minutely and rather sparingly muricate.

Type in the Kew Herbarium, collected on a plain at Pungarabato, District of Coyuca, Guerrero, Mexico, June 7, 1934, by G. B. Hinton (no. 6129).

In both pubescence and shape of the leaves this new species suggests *C. pubens* Gray, but the inflorescence of the two plants is decidedly different. The flowers of *C. coyucana* are borne in slender interrupted spikes; in *C. pubens* they are axillary.

From the type material it is impossible to state the height accurately, as the specimens seem to have been gathered from plants grazed over or otherwise injured. The short broken stubs of stems, from which numerous branches arise to a height of 5 to 9 cm. seem to indicate that the original perfect plant may have reached a considerable height. It is possible, also, that mature stem leaves may exceed the dimensions given in description.

***Pseuderanthemum axillare* Leonard, sp. nov.**; herba; caules erecti, teretes vel compressi, bifariam puberuli vel glabrati; folia oblongo-ovata, apice acuminata, basi rotundata, utrinque parce puberula vel glabrata, ciliata, petiolis brevibus alatis; flores fasciculati axillares, breviter pedunculati vel sessiles; bracteae oblongo-ovatae vel anguste lanceolatae, ciliatae, basi connatae; bracteolae

lineares, ciliatae, pilosae, pilis brevibus cum alteris intermixtis; corolla glabra, tubo longo gracili, lobis subaequalibus ovatis; capsula ovoidea, glabra, basi stipitata.

Herb; stem erect, up to 60 cm. high or more, simple or sparingly branched, terete, or compressed at nodes, puberulous in 2 lines or glabrate, the internodes up to 12 cm. long; leaves soon deciduous, the petioles 3 or 4 mm. long, winged; leaf blades oblong-ovate, 4 cm. long, 1.8 cm. wide, sharply acuminate at apex, rounded at base, firm, sometimes purplish, slightly puberulous or glabrate, ciliate, the hairs up to 0.5 mm. long, the costa and veins (5 or 6 pairs) prominent; flowers borne in short peduncled or sessile axillary fascicles consisting of several clusters of 2 or 3 flowers each, these clusters as well as the fascicles each subtended by a pair of bracts connate anteriorly at base; peduncles up to 3 mm. long; bracts subtending the fascicles leaflike, up to 2.5 cm. long and 1 cm. wide, the uppermost narrowly lanceolate and much smaller; bracts subtending the flowers linear, the lower 11 mm. long and 1 mm. wide, the upper 4 mm. long, all acuminate, sparingly pilose or glabrate, ciliate; calyx segments linear, 8 mm. long, pilose (the longer hairs eglandular and mixed with minute glandular ones), ciliate, delicately 3- to 7-nerved; corolla 2 to 3 cm. long, glabrous, the tube 1 to 2 cm. long, slender, 1 mm. in diameter, slightly enlarged near mouth, the limb up to 2 cm. broad, the lobes subequal, ovate, up to 11 mm. long and 7 mm. wide, rounded at tip; stamens included, inserted above the middle of the tube, the filaments 1.5 mm. long, glabrous, each with a staminode about 1 mm. long decurrent on its base (one of the staminodes occasionally fertile or partly so) and a third minute free staminode attached to corolla tube between the 2 stamens; style about 2 cm. long, glabrous; capsule ovoid, about 12 mm. long and 5 mm. broad, glabrous, acutish at apex, narrowed to a basal stipe about 3 mm. long; seed (immature) densely covered by irregular projections.

Type in the Kew Herbarium, collected on a prairie at Luvianos, District of Temascaltepec, Mexico, January 24, 1933, by G. B. Hinton (no. 3200).

Pseuderanthemum axillare may be compared with *P. fasciculatum* (Oerst.) Leonard.* It differs from that species in several respects, however. The bracts of *P. fasciculatum* are minute, not more than 3 or 4 mm. long and, like the calyx segments, minutely pubescent or puberulous, with only the hairs at the base of the bracts as much as 0.5 mm. long, whereas in *P. axillare* the lower bracts (except the leaflike outermost ones) are as much as 11 mm. long and both calyx and bracts are more or less hirsute with white spreading hairs up to 0.5 mm. long. Furthermore the leaves of *P. fasciculatum* are much more densely pilose and the seeds are smooth, instead of roughened as in *P. axillare*.

* *Pseuderanthemum fasciculatum* (Oerst.) Leonard, comb. nov.—*Eranthum fasciculatum* Oerst. in Nat. For. Kjöbenhavn Vid. Medd. 1854, 166 (1854).

Dicliptera aquatica Leonard, sp. nov.; herba vel suffrutex; caules hexagoni, striati, dense pubescentes; folia petiolata, ovata, apice acuta vel acuminata, basi acuta vel obtusa, utrinque sparse puberula; inflorescentia e cymis axillaribus sessilibus vel pedunculatis composita; bracteae exteriores breves, ellipticae, apice aristatae, subcoriaceae, interiores anguste lanceolatae, inaequales, externae dense pubescentes, intus puberulae; bracteolae lineares, ciliatae; calycis laciniae anguste triangulares, subhyalinae, puberulae; corolla parce pubescens, labio superiore breviter trilobo, inferiore oblongo minute emarginato.

Stem herbaceous or suffrutescent, up to 2 meters high, green, hexagonal, the angles marked by whitish striae, densely gray-pubescent, the hairs spreading, about 0.25 mm. long, or a few scattered ones on the angles reaching 1.5 mm., the internodes up to 10 cm. long; *petioles* about 1 cm. long, pubescent; leaf blades ovate, up to 4 cm. long and 2.5 cm. wide, acute or acuminate at apex, acute or obtuse at base, both surfaces sparingly puberulous, the hairs about 0.5 mm. long, curved, those of the lower surface confined chiefly to the costa and lateral veins (5 or 6 pairs); *flowers* sessile or nearly so, borne in clusters of 4 to 6 each, these axillary, sessile or pedunculate; *bracts* subtending the verticillasters elliptic, about 4 mm. long and 2.5 mm. wide, subcoriaceous, ending in a spreading awned tip 1.5 mm. long, the costa and lateral nerves (2 pairs) prominent, the secondary bracts linear-lanceolate, unequal, one of each pair about 1.5 cm. long and 2.5 mm. wide, the other 2 cm. long and 2.5 mm. wide, both densely pubescent without and puberulous within, the costa prominent, the lateral nerves (1 pair) obscure, the bracts subtending the flowers linear, 10 to 11 mm. long, 1.5 mm. wide, subequal, pubescent without, subglabrous within, ciliate; *calyx* 9 mm. long, the segments narrowly triangular-subulate, 7 mm. long, 1.5 mm. wide at base, thin, semitransparent, 3-nerved, puberulous; *corolla* 3 cm. long, sparingly pubescent, the tube 2 to 2.5 mm. in diameter at base, narrowed just above base, thence gradually enlarged to 5 mm. at mouth, the lips subequal, 1.5 cm. long, the lower narrowly emarginate, the upper 3-lobed, the lobes rounded, about 0.75 mm. long; *stamens* barely exerted, the filaments about 14 mm. long, flat, the inner margin ciliate, the anther lobes about 1.5 mm. long; *ovary* glabrous; *style* about 3 cm. long, glabrous or with a few minute hairs near base; *capsule* not seen.

Type in the Kew Herbarium, collected in water, at San Lucas del Maiz, District of Temascaltepec, Mexico, February 4, 1933, by G. B. Hinton (no. 3337).

This new species more nearly approaches *D. peduncularis* Nees than any other, but differs in the character of the flowers and pubescence. The corollas of *D. peduncularis* are described as scarcely twice as long as the involucre, whereas in *D. aquatica* they are sometimes three times as long. *D. aquatica* is further marked by

its dense gray pubescence. In *D. peduncularis* the stems and bracts are said to be hirsute or glabrous.

The color of the flower is not apparent in the dried material of the type. Since this consists of the tips of plants, the leaf measurements above stated may have to be increased with the collection of more adequate material.

Bucерagenia hirsuta Leonard, sp. nov.; herba; caules subteretes, bifariam minute puberuli; folia oblongo-ovata vel late lanceolata, apice acuminata, basi angustata, in petiolum longe decurrentia utrinque parce et minute puberula; bracteae bracteolaeque subulatae, terminales, rhachi parce hirsuta; bracteae bracteolaeque subulatae, carinatae, subglabrae, marginibus subhyalinis minute ciliolatis; calycis laciniae subulatae, minute pubescentes; corolla minuta; capsula hirsuta; semina 4, muricata.

Herb up to 50 cm. high; *stem* branched, subterete, minutely puberulous in two lines, the glabrous portion with numerous small parallel cystoliths; *leaf blades* oblong-ovate to broadly lanceolate, up to 10 cm. long and 3.5 cm. wide, acuminate at apex, narrowed into a slender winged petiole at base, thin, both surfaces sparingly and minutely puberulous, the costa and lateral veins (6 to 7 pairs) prominent, whitish; *flowers* borne in interrupted spikes or spicate racemes up to 10 cm. long terminating the stem and branches, the rachis flattened at the nodes, minutely and sparingly puberulous with curved hairs; *bracts* and *bractlets* subulate, about 3.5 mm. long and 0.5 mm. wide at base, carinate, subglabrous, the subhyaline margins minutely ciliate, the costa prominent; *calyx segments* subulate, 4.5 mm. long, 0.5 mm. wide at base, minutely but rather sparingly pubescent; *corolla* about 3 mm. long, tubular, slightly enlarged below, the lobes rounded, bearing several erect or spreading hairs on the outer surface; *stamens* included, the filaments less than 1 mm. long; *staminodes* very minute; *capsule* 15 mm. long, 4 mm. broad, acute at tip, narrowed to a solid stipitate base about 6 mm. long, minutely but rather sparingly hirsute; *retinacula* subulate about 2 mm. long; *seeds* 4, flat, suborbicular, strongly muricate, brownish.

Type in the Kew Herbarium, collected in a wet barranca at Nanchititla, District of Temascaltepec, Mexico, altitude 1100 metres, December 8, 1933, by G. B. Hinton (no. 5318).

Bucерagenia hirsuta may be separated from *B. minutiflora* Greenm. by its narrower leaf blades and hirsute capsules. In *B. minutiflora* the leaves are broadly ovate and the capsules glabrous.

Jacobinia capitata Leonard, sp. nov.; herba vel suffrutex; caules subteretes, glabri vel apice subtomentosi; folia ovata vel elliptica, apice obtusa, basi angustata, integra, supra parce strigosa, subtus parce pilosula, petiolis tenuibus; spicae breves, terminales, floribus congestis; bracteae ovatae vel obovatae, obtusae vel rotundatae, strigosae, ciliatae, basi albidae; bracteolae oblongae,

acutae, subhyalinae, ciliatae; calycis lacinae oblongae, subhyalinae; corolla pubescens, labio superiore minute bilobo, inferiore apice trilobo.

Herbaceous or suffrutescent, height unknown; *stems* subterete, glabrous or the upper portions subtomentose; *petioles* slender, 1 to 2 cm. long, sparingly pilose or tomentose; *leaf blades* ovate or elliptic, up to 11 cm. long and 6.5 cm. wide, obtusish or rounded at apex, narrowed at base, entire, sparingly strigose above, the hairs about 0.5 mm. long, sparingly pilosulous beneath, the hairs confined chiefly to the costa and lateral veins (6 or 7 pairs); *flowers* borne in a short terminal capitate spike about 2 cm. long (exclusive of corollas); lower pairs of *bracts* up to 4 cm. long and 2.5 cm. wide, leaflike, the upper obovate, 1 to 2 cm. long, 0.5 to 1 cm. wide, rounded at apex, narrowed at base, strigose, ciliate, the marginal hairs up to 1.5 mm. long, the lower portion of all the bracts whitish; *bractlets* oblong, 7 to 9 mm. long, acute, thin, subhyaline, ciliate; *calyx* up to 7 mm. long, the segments subhyaline, acute, glabrous or with a few hairs on the costa; *corolla* up to 4.5 cm. long, pubescent, the hairs up to 0.5 mm. long, the tube 2 mm. in diameter at base, slightly narrowed above base, thence gradually enlarged to 5 mm. at throat, the lips oblong, the upper 2.7 cm. long, about 5 mm. wide, minutely bidentate at apex, the lower oblong-obovate, 2.2 cm. long, 8 mm. wide, 3-lobed, the lateral lobes 1 mm. long and 0.5 mm. wide, rounded, oblique, the middle lobe 0.5 mm. long and about 2 mm. wide, cucullate; *stamens* reaching the tip of the upper lip; *anthers* about 3 mm. long and 1 mm. broad, the sacs unequally attached; upper portion of *style* enclosed (or partially so) by thin transparent wings of the median pair of nerves of the corolla, the stigma discoid, sometimes embedded in the tissue of the upper lip; *capsule* not seen.

Type in the Kew Herbarium, collected at Cerro Muñeca, District of Temascaltepec, Mexico, altitude about 2300 metres, August 13, 1932, by G. B. Hinton (no. 1354).

Apparently unrelated to any other Mexican member of the genus. The colour of the corolla is not apparent in the dried material.

***Beloperone longibracteata* Leonard, sp. nov.**; herba; caules teretes, striati, apice parce puberuli; folia lanceolata, utrinque acuminata, hirsuta; verticillastri approximati vel infimus distans; bracteae erectae, spathulatae, apice obtusae vel rotundatae, parce hirsutae vel glabratae; calycis lacinae subaequales, lanceolatae, margine albae, parce pubescentes vel glabratae; corolla bilabiata, labio superiore erecto lineari apice bilobo, lobis parvis acuminatis, inferiore patente trilobo, lobis magnis oblongo-ovatis vel obovatis, apice rotundatis.

Herb; *stems* terete, finely striate, puberulous, the hairs scattered, minute, retrorsely appressed except at the nodes, here long and spreading; *internodes* up to 12 cm. long; *petioles* about 1 cm. long, slender, pilosulous; *leaf blades* lanceolate, up to 10 cm. long and

2.2 cm. wide, acuminate at both ends, rather densely hirsute above and beneath (hairs spreading, 0.5 to 0.75 mm. long), the costa and lateral nerves (6 or 7 pairs) prominent; *flowers* borne in dense approximate verticillasters, these forming a terminal spikelike inflorescence up to 10 cm. long and 2 cm. in diameter, the lowermost verticillaster sometimes distant; *bracts* erect, spatulate, up to 16 mm. long, 1.5 to 2.5 mm. wide near tip, rounded or obtuse at apex, gradually narrowed to base, firm, sparingly hirsute or glabrate, ciliate; *calyx segments* subequal, lanceolate, about 12 mm. long, 1.75 mm. to 2 mm. wide, sparingly pubescent or glabrate, white-margined; *corolla* purple when dry, sparingly pubescent, about 4 cm. long, the tube 1.5 cm. long, 3 mm. broad at base, slightly constricted above base, 4.5 mm. wide at throat, the upper lip erect, linear, 4 mm. wide at base, gradually narrowed to a slender acuminate 2-lobed tip, the lobes about 1.3 mm. long, the lower lip spreading, slightly shorter than the upper, 3-lobed, the lobes about 12 mm. long, the middle lobe oblong-ovate, 6.6 mm. wide, the lateral narrowly obovate, about 5 mm. wide, all rounded at apex; *stamens* reaching tip of upper lip; *anthers* 2.5 to 3 mm. long, unequally attached, the lower lobe calcarate, the spur white, about 0.5 mm. long; *ovary* glabrous.

Type in the Kew Herbarium, collected at Tenayac, District of Temascaltepec, Mexico, altitude 1480 metres, October 20, 1932, by G. B. Hinton (no. 2159).

Beloperone longibracteata and *B. violacea* Planch. et Lind. are closely allied. They differ, however, in the size of the bracts and in leaf-shape. The bracts of *B. violacea* rarely exceed 12 mm. and the leaves are of an ovate type, rather than lanceolate as in *B. longibracteata*.

XI—A NOTE ON CERTAIN MALAYAN SPECIES OF *SINDORA*. C. F. SYMINGTON (Kepong, Federated Malay States).

An attempt to discover what exactly was *Sindora intermedia* has necessitated reference to the earliest descriptions and types of Peninsular species of the genus *Sindora*, and has revealed a state of very considerable confusion existing with respect to the botanical conception of four of our species. The species concerned are *Sindora Wallichii* Benth. emend. Prain, *S. Echinocalyx* Prain, *S. velutina* Baker, and *S. parvisoliola* Sym. In this note I shall recount the botanical history of these species and endeavour to enumerate the diagnostic characters through which future confusion may be avoided.

The earliest Malay Peninsula collection of *Sindora* with which we are here concerned is *Wallich* 5805. This was a fruiting collection named *Guilandina Wallichiana* by Graham in Wall. Cat. Herb. Ind. In 1867 Bentham described and figured his *Sindora Wallichii* in Hook. Icon. Plant. tt. 1017 and 1018, basing his description on

Wallich 5805 and a flowering collection of Griffith from Malacca (K.D. 1848). This Griffithian collection actually represents another species which, as we shall see, later formed the basis of *S. Echinocalyx* Prain.

In the preparation of the account in Hook. fil. Fl. Brit. Ind. 2: 268 (1878), Baker described in addition to *S. Wallichii* Benth. two varieties, var. *siamensis* (reducing *S. siamensis* Teysm. ex Miq. to varietal rank) and var. *intermedia*, and a new species *S. velutina*. He was, however, responsible for considerable confusion. Not only did he accept Bentham's citations under *S. Wallichii* as one species but he cited also a collection of Maingay's from Malacca (presumably 1189 (K.D. 561), frt.) which represents yet another species, namely *S. parvisoliola* Sym. His *S. Wallichii* var. *intermedia* was based on a flowering collection by Maingay from Malacca (No. 3142, K.D. 562) which is actually the flower of *S. Wallichii* Benth. emend. Prain.* This specimen had been given the manuscript name of *S. Wallichii* var. *ovalifolia* by Maingay as also had Maing. 1624 (K.D. 562/1), a flowering collection of the same species.

In 1897 Prain (Journ. Asiat. Soc. Bengal 66, 2: 203 & 481) endeavoured to correct the confusion under *S. Wallichii* by removing the Griffithian collection (K.D. 1848) and on it founding a new species *S. Echinocalyx*. Under *S. Wallichiana* (he reverted to Graham's rendering of the specific epithet!) he cited Wall. Cat. 5805, T. Anderson 41 (sterile) and another Griffithian collection from Malacca (fl.) which exhibited the large foliaceous stipules which he considered a good diagnostic character. This last specimen is *S. Echinocalyx*, although it has much larger leaves than the type on which the species was founded. Under *S. Echinocalyx* Prain cited, in addition to Griffith (K.D. 1848), Maingay 1624 (K.D. 562/1) which is actually a flowering collection of *S. Wallichii* Benth. emend. Prain, thus confusing under *S. Echinocalyx* precisely the same two species confused by Bentham under *S. Wallichii*. Prain elevated Baker's two varieties to specific rank, citing under *S. intermedia* (Baker) Prain Maingay 3142 (K.D. 562), the type, Curtis 1630 (frt.), Scortechini s.n., Perak (fl.), and Scortechini 1064.† The last, which is represented only in the Calcutta herbarium, is *S. Echinocalyx*, but the others are all conspecific with *S. Wallichii* Benth. emend. Prain.

In the Fl. Mal. Penins. 1: 637, *S. Echinocalyx* Prain is reduced to *S. Wallichii* Benth., but *S. intermedia* is recognized as a distinct species "near *S. Wallichii*, but more tomentose, with stouter panicle and fewer and thicker spines on calyx." It would appear that the author had *S. Wallichii* Benth. emend. Prain mainly in mind as *S. intermedia*, but from a consideration of the specimens

* In the Kew herbarium another sheet of Maingay's, no. 1189 (K.D. 561/2), flower, appears also to have been named var. *intermedia* by Baker, but this is *S. parvisoliola* Sym.

† I presume this must be the specimen named by Scortechini *S. Wallichii* (vide Prain in l.c. 205 and 482).

cited it is evident that the species *S. Wallichii* Benth. emend. Prain and *S. Echinocalyx* Prain were inextricably mixed. Under *S. Wallichii* is cited "Singapore, Gardens" which is *S. siamensis* Teysm. ex Miq., and "Dindings (Fox)" and "Tanjong Agas (Foxworthy)" which are *S. Echinocalyx* Prain. Under *S. intermedia* are cited "B'akang Mati (Murton)" and "Province Wellesley (Fox)" which are *S. Wallichii* Benth. emend. Prain, and "Singapore, Changi," "Johor, Gunong Pantai," and "Dindings, Lumut" which are *S. Echinocalyx* Prain.

The synonymy of these two species is as follows:—

Sindora Wallichii Benth. emend. Prain (sub *S. Wallichiana*) in Journ. Asiat. Soc. Bengal, 66, 2: 203 et 481 (1897).—*Guilandina Wallichiana* Grah. in Wall. Cat. *Sindora Wallichii* Benth. in Hook. Icon. Plant. (1867) quoad Wallich 5805, non quoad Griffith (K.D. 1848); Baker in Hook. f. Fl. Brit. Ind. 2, 268 (1878) quoad Wallich 5805 et var. *intermedia*, non quoad Griffith (K.D. 1848) et Maingay 5805 et var. *intermedia*, et excl. var. *siamensis*; Ridley, Fl. Mal. Penins. 1, 1189 (K.D. 561) et excl. var. *siamensis*; Ridley, Fl. Mal. Penins. 1, 637 (1922), partim. *Galedupa Wallichiana* Prain MS., fide King. *Galedupa intermedia* Prain MS., fide King. *Sindora Wallichii* var. *ovalifolia* Maingay MS. *Sindora Echinocalyx* Prain in l.c. 204 et 481 quoad Maingay 1624 (K.D. 562/1), non quoad Griffith (K.D. 1848). *Sindora intermedia* Prain in l.c. 204 et 482; Ridley, op. cit. 638, partim.

Sindora Echinocalyx Prain in l.c. 204 et 481 quoad Griffith (K.D. 1848), excl. syn. *S. Wallichii* var. *ovalifolia* Maing. (MS.).—*Echinocalyx* (gen.) Benth. in Benth. et Hook. f. Gen. Pl. 1, 584 (1865). *Sindora Wallichii* Benth. in l.c. quoad Griffith (K.D. 1848); Baker in l.c. quoad Griffith (K.D. 1848), excl. Wallich 5805 et Maingay 1189 (K.D. 561); Ridley, op. cit. 637, partim. *Galedupa Echinocalyx* Prain MS., fide King. *Sindora intermedia* Ridley, op. cit. 638, partim.

DIFFERENTIATION BETWEEN *S. WALlichii* AND *S. ECHINOCALYX*. Having studied, to the best of my knowledge, all the existing Peninsular material of *S. Wallichii* and *S. Echinocalyx*, I find little difficulty in distinguishing these species, but it must be admitted that they are extremely alike, indeed indistinguishable, in many respects. I find that the diagnostic characters of previous authors as a rule do not hold, but the following characters are reliable. In *S. Wallichii* the main nerves and reticulations of the leaflets are evident on the lower surface only, the upper surface being smooth and shining; in *S. Echinocalyx* they are evident on both surfaces. In *S. Wallichii* the rhachis of the inflorescence is rather stout and zig-zag; in *S. Echinocalyx* it is more delicate and straight. In the flower of *S. Wallichii* no ovarian spines are evident while in *S. Echinocalyx* they appear as small white maggots.

Prain has stated that his *S. intermedia* is at once distinguished by its oblique transverse pods from both of the species placed under *S. Wallichii* by Bentham, but examination of the relevant material



A = *Sindora Wallichii* Benth. emend. Prain, B = *Sindora Echinocalyx* Prain. 1, flowering twig; 2, flower bud; 3, flower with sepals and petal removed; 4, calyx segments; 5, petal; 6, twigs with persistent stipules; 7, fruits. (Drawings of A 1-5 based mainly on C.F. 4793; A 6 on *Holtum* 15345; A 7 on C.F. 17235; B 1-5 on C.F. 6692; B 6 on C.F. 29782; B 7 on C.F. 27773. Scale applies to 1, 6, and 7 only.)

does not entirely bear this out. We now have a few fragmentary fruiting collections of *S. Echinocalyx* and the pods are markedly oblique as opposed to sub-equal in most specimens of *S. Wallichii* Benth. emend. Prain.

Prain also credits *S. Echinocalyx* with "inconspicuous" stipules as opposed to the "large foliaceous" stipules of "*S. Wallichiana*." Recent collections, however, show that both species have caducous foliaceous stipules.

Collections of *S. Wallichii* and *S. Echinocalyx* examined (all are from the Malay Peninsula):—

***Sindora Wallichii*.**—*Wallich* 5805 (Kew and Calcutta; auth. spec. of *S. Wallichii* Benth. emend. Prain); *Maingay* 1624 (K.D. 562/1—Kew and Calcutta); *Maingay* 3142 (K.D. 562—Kew and Calcutta); *Maingay* 3143A (K.D. 562—Kew); *Scortechini* s.n. (Kew and Calcutta); *Kurz* s.n. (Calcutta); *T. Anderson* 41 (Kew and Calcutta); *Curtis* 1630 (S'pore); *Murton* s.n. (S'pore); *Holtum* 15345 (S'pore); *S'pore Field No.* 1303 (Calcutta and S'pore); C.F. 4793 and 13775 (S'pore and Kepong); C.F. 10430, 10466, 17235, 23379, 24924, 25213, and 29388 (Kepong).

***Sindora Echinocalyx*.**—*Griffith* s.n. (K.D. 1848—Kew and Calcutta; auth. spec. of *S. Echinocalyx* Prain); *Griffith* s.n. (Calcutta); *Scortechini* s.n. and 1064 (Calcutta); *Fox* s.n., *Alvins* 1189, *Ridley* s.n. Gunong Panti, *Ridley* s.n. Lumut, *Baker* s.n. Changi, *Burkill* 896, and *Holtum* 9350 (S'pore); C.F. 557, 18283, and 27773 (S'pore and Kepong); C.F. 6692, 6834, 14175, 14378, 16712, 18284, 18297, 25261, 28538, 28605, 29658, 29727, 29871, 30094, 30693, 32669, 32743, 32803, and 32875 (Kepong).

***SINDORA PARVIFOLIOLA* Sym.**—To complete this note I am giving a description of a third species I have had occasion to mention, namely *S. parvifoliola*. This species occurs in Sumatra and Borneo, as well as in the Malay Peninsula. Collections from Sumatra and Borneo were named *S. parvifolia* by C. A. Backer, but the name was never validly published, although it appears as a *nomen semi-nudum* in Heyne, Nutt. Plant. Ned. Ind. (1927 edit.): 729. Several collections of the same species have been made in the Malay Peninsula, the earliest being those of Maingay [No. 1189 (K.D. 561 and 561/2)] already mentioned. I have chosen to re-name the species *S. parvifoliola* in preference to validating Backer's less appropriate epithet.

***Sindora parvifoliola* Symington, sp. nov.** *Sindora Wallichii* sensu Baker in Hook. f., Fl. Brit. Ind. 2: 268 (1878), quoad Maing. 1189 (K.D. 561), non *S. Wallichii* auct. ? *Sindora velutina* sensu Merrill, Pl. Elmer. Born. 99 (1929), non *S. velutina* Baker. *Sindora parvifolia* Backer ex Heyne, Nutt. Plant. Ned. Ind. ed. 2, 1, 729 (1927), *nomen semi-nudum*.—*S. velutinae* Baker valde affinis, sed omnibus partibus minoribus differt.

Branchlets densely tawny tomentose when young, later becoming glabrous and dark. *Leaves* paripinnate, rhachis about 6-12 cm. long, tawny tomentose to glabrescent and dark; stipules not seen; leaflets 4-6 pairs, elliptical to oblong or oblong-lanceolate, acute or acuminate at the apex, rounded or subacute at the base, margins slightly raised, about 3×1.25 cm. to 7.5×3 cm., the lower pairs being slightly smaller than the upper, glabrous and shining on the upper surface, densely golden tomentose to sparsely hairy beneath, midrib sunk above, strongly elevate beneath, main nerves hardly visible above, faintly visible numerous and irregular beneath; minute reticulations visible above and beneath except in densely tomentose specimens; petiolules 1.5 mm. long, densely tomentose to glabrous. *Panicles* axillary or terminal, solitary or 2 or 3 together, usually as long as or shorter than the leaves, racemose, densely fulvous-golden tomentose; branchlets solitary or in pairs, up to 5 cm. long, each with about 3-15 (the lower usually fall immaturesly) subdistichous flowers; bracts ovate-acute, about 5 mm. long, densely sericeous-golden tomentose, early caducous. *Flowers* 3-5 mm. apart, ellipsoid-obovoid in bud, about 7-12 mm. long including the pedicel; pedicel about 2 mm. long, densely tomentose; bracteoles minute, lanceolate, tomentose, caducous. *Calyx*-tube very short, lobes 4, elliptical, obtuse or subacute, concave, the posterior lobe broader than the others, golden tomentose outside and inside. *Petal* 1 (rudimentary petals not seen), oblong, obtuse, as long as the calyx lobes, hairy outside, glabrous within. *Stamens* 10; the posterior one free with short glabrous filament and no anther; the remainder monadelphous, tubular portion densely hairy, free portions glabrous, declinate, exceeding the sepals, the lateral stamens longer than the anterior ones; anthers oblong, versatile. *Ovary* oblique, densely hirsute; style filiform, spirally twisted; stigma small, capitate. *Fruit* rotundate or oblong-rotundate, subequally rounded at base, beaked at far end of long axis, up to 12×8 cm. but usually smaller, sparsely tawny hairy to puberulous and dark, minutely warty and furnished with strong sharp spines about 3 mm. long; beak stout, up to 1 cm. long or rudimentary, curved in the opposite direction from the insertion of the stalk; stalk fairly stout, inserted at an acute angle to the long axis of the fruit; seeds 1 or 2 (in pods examined); funicle thick arillate.

The similarity between *S. parvifoliola* and *S. velutina* is so marked that the former might quite reasonably be considered as a variety of *S. velutina*. I am inclined to consider, however, that specific differentiation is justified.

The specimen cited by Merrill under *S. velutina* in his enumeration of Elmer's Bornean plants is probably *S. parvifoliola*, but the leaves are slightly larger and less tomentose than usual.

The following collections have been examined:—

MALAY PENINSULA. Kedah: C.F. 20795. Kelantan: C.F. 32807 & 33423. Pahang: C.F. 4192 (type of *Sindora parvifoliola*

Sym.); Forester Bidin, Kuala Rompin, 25th Sept. 1921. Also C.F. 3554, 4058, 4187, 15436 & 29559. Selangor: C.F. 1200 & 38140. Malacca: Maingay 1189 (K.D. 561 & K.D. 561/2); C.F. 4378. SUMATRA. Grashoff 1057; Lambak 1359; John (?) 850. BORNEO. Proefst. bb. 9473, 13039 & 14172; ? Elmer 21363.

ACKNOWLEDGMENT.

I have pleasure in thanking the authorities of the herbaria at Kew, Buitenzorg, Calcutta, and Singapore, for affording me the opportunity of studying the specimens concerned in this paper. I am also indebted to Mr. H. K. Airy-Shaw for many helpful suggestions.

XII—THE BOTANICAL NAME OF THE DOUGLAS FIR. T. A. SPRAGUE AND M. L. GREEN.

The case of the Douglas Fir illustrates the great importance of bibliographical research in stabilizing plant nomenclature. All who have seriously studied the subject realize that compliance with International Rules is the only way of obtaining relative consistency and uniformity in plant names. The principle of priority of publication is used in order to choose between two or more alternative names for the same plant, and the application of this principle depends on the data supplied by the bibliographer. The position as regards the Flowering Plants is peculiarly favourable owing to the existence of the monumental "Index Kewensis." The exhaustive character and high standard of accuracy of the original Index will always compel admiration, but from time to time omissions are detected, and one of these, just discovered by Professor Rehder, is the earliest legitimate name for the Douglas Fir, namely, *Abies taxifolia* Poir. This bibliographical discovery now enables us to retain the well-known name *Pseudotsuga taxifolia* for the Douglas Fir.

Prior to the Vienna Congress two names were in use for the Douglas Fir, namely, *Pseudotsuga Douglasii* under the so-called "Kew Rule" and *Ps. taxifolia* under the Paris "Lois" (1867). In 1905 the principle of the acceptance of the earliest specific epithet for each species (except where the resulting combination was already in use for another species) was embodied in the International Rules of Botanical Nomenclature, according to which the Douglas Fir was known as *Ps. taxifolia* (Lamb.) Britt.

The twenty-five years that elapsed between the Vienna and Cambridge Congresses gave ample opportunity for studying the effects of the Rules on plant nomenclature, and it was found that certain changes were desirable. Among these was the rejection of later homonyms, that is, when a particular name was validly published for one type it could not subsequently be used for a different type even when the first use had been discarded. Under this provision a great deal of uncertainty and disagreement regarding

homonyms was removed, but certain well-known names had unfortunately to be altered, amongst them apparently that of the Douglas Fir. As will be seen later, this change has proved to be unnecessary owing to Professor Rehder's discovery.

Under Art. 61 of the International Rules the name *Pinus taxifolia* Lamb. is illegitimate because it is a later homonym of *P. taxifolia* Salisb. Under Art. 45 only epithets published in legitimate combinations are taken into account for purposes of priority, and the combination *Pseudotsuga taxifolia* (Lamb.) Britt. accordingly cannot stand since it was based on an illegitimate name. If in the meantime the Douglas Fir had received no legitimate epithet, Britton's new combination would have been retained under Art. 69 as a new name dating from 1889. It is, however, antedated by the names *Abies mucronata* Rafin. (1832) and *Abies Douglasii* Lindl. (1833). It therefore appeared that the correct name for the Douglas Fir was *Pseudotsuga mucronata* (Rafin.) Sudw. (1895).

Now, however, Professor Rehder has traced the name *Abies taxifolia* Poir. in Lam. Encycl. Méth. 6, 523 (1804), which had been overlooked in the compilation of the Index Kewensis. *Abies taxifolia* Poir. was actually a new combination for *Pinus taxifolia* Lamb. (1803) non Salisb. (1796), and as such was invalid, but as a new name it is valid under Art. 69, since Poir. was at liberty to adopt the epithet *taxifolia* although it had previously been given to the species in an illegitimate combination. Of the three epithets bestowed on the Douglas Fir, *taxifolia* as the earliest must be retained, and the Douglas Fir must accordingly be known as *Pseudotsuga taxifolia* (Poir.) Rehder. This name is not rejected as a later homonym of *Ps. taxifolia* (Lamb.) Britton, as both names were based on the same type. "A later homonym is one which duplicates a name previously and validly published for a group of the same rank based on a different type (Art. 61). The type of both names is the specimen collected by Menzies on the north-west coast of America.

The synonymy of *Ps. taxifolia* is as follows:—

Pseudotsuga taxifolia (Poir.) Rehder, comb. nov.

Pinus taxifolia Lamb. *Pinus*, 1, 51, t. 33 (1803), non Salisb. (1796)—illegitimate name under Art. 61.

Abies taxifolia [(Lamb.)] Poir. in Lam. Encycl. 6, 523 (1804)—legitimate name under Art. 69.

Abies mucronata Rafin. in Atlant. Journ. 1, 120 (1832).

Abies Douglasii Lindl. in Penny Cycl. 1, 32 (1833).

Pseudotsuga Douglasii (Lindl.) Carr. Traité Conif. ed. 2, 256 (1867).

Pseudotsuga taxifolia (Lamb.) Britton in Trans. N.Y. Acad. Sc. 8, 74 (1889).

Pseudotsuga mucronata (Rafin.) Sudw. in Contrib. U.S. Nat. Herb. 3, 266 (1895).

XIII—MISCELLANEOUS NOTES.

ALFRED BARTON RENDLE.—The death of Dr. A. B. Rendle at his home at Leatherhead on January 11th, only eight days before his seventy-third birthday, will be regretted by the wide circle of those who knew him personally or were acquainted with his many sided activities, scientific and social. Born in London on January 19th, 1865, he was educated at St. Olave's School, Southwark, and St. John's College, Cambridge, and in 1888 was appointed Assistant in the Department of Botany at the British Museum (Natural History), becoming Keeper in 1906, in succession to George Murray, and retiring in 1930 under the age limit. He was elected a Fellow of the Royal Society in 1909.

Rendle's first scientific communication, written while still at Cambridge, was a note on the occurrence of starch in the onion (Ann. Bot. 2, 224: 1888). His name appears as a contributor to the "Journal of Botany" in every annual volume from 1889 to 1937 inclusive, and he edited the "Journal" from 1924 till his death. He had charge of the Monocotyledons and Apetalae at the British Museum, and one of his early pieces of work was the re-arrangement of the *Bromeliaceae* according to Baker's "Handbook" (vide Journ. Bot. 1890, 27). He also worked on certain families of *Gamopetalae*, such as the *Asclepiadaceae*, *Convolvulaceae* and *Acanthaceae*.

Two families of Monocotyledons to which Rendle paid special attention, without doing monographic work on either, were the *Gramineae* and the *Orchidaceae*. He was responsible for the enumeration of the *Gramineae* in the "Index Florae Sinensis" (Journ. Linn. Soc., Bot. 36, 319-449: 1904), and for the Monocotyledons and Gymnosperms in the Catalogue of Welwitsch's African Plants (1899). In the latter work alone he described 116 new species and varieties of *Gramineae*, including 29 of *Eragrostis*. In addition to working out the *Orchidaceae* of various African expeditions, Rendle collaborated with the late William Fawcett in the description of the *Orchidaceae* for the "Flora of Jamaica" and in the preparation of volumes 3-5 (1914-1926) of that work (Dicotyledons, pts. 1-3). After his retirement he completed vol. 6 (Dicotyledons, pt. 5: 1936) which had been begun by the late Spencer Le Marchant Moore, and he was engaged on the remaining volume of Dicotyledons at the time of his death.

Rendle's "Classification of Flowering Plants" is a scholarly work in which the systematic descriptions of families are accompanied by interesting notes on morphology, anatomy, pollination, etc., and an account of the tendencies and various types found in each family. The first volume, comprising the Gymnosperms and Monocotyledons, appeared in 1904, and the second one, covering the Dicotyledons, nearly twenty-one years later. A second edition of vol. 1 was issued in 1930.

Among other subjects which claimed his attention were Nomenclature and Bibliography. He published bibliographical notes on

Swartz's "Prodromus" (Journ. Bot. 1897, 20), Steudel's "Synopsis Plantarum Glumacearum" (*op. cit.* 1899, 33), and Browne's "Natural History of Jamaica" (*op. cit.* 1912, 129), and edited the second edition of Britten and Boulger's useful "Biographical Index of deceased British and Irish Botanists."

Rendle fully realized the basic importance of botanical nomenclature, although the subject was one which did not appeal very strongly to him. He attended the discussions on Nomenclature at the International Botanical Congress held at Vienna in 1905, and was appointed a member of the Editorial Committee of the International Rules, a position which he retained until his resignation in 1935. In this capacity he was responsible for the English text of the third edition of the Rules.

In 1888, just after his appointment to the British Museum, Rendle became a Fellow of the Linnean Society of London, and served on the Council for four periods. He was elected Botanical Secretary in 1916, retaining this office till his election as President in 1923. Rendle was a regular attendant at the Society's Meetings, and contributed numerous papers to its Journal (Botany) in addition to one or two which appeared in the Transactions, such as his "Systematic Revision of the Genus *Najas*" (Trans. Linn. Soc., Ser. 2, Bot. 5, 379-436: 1899). This was followed by his account of the family *Najadaceae* for Engler's *Pflanzenreich* (1901).

Rendle regularly attended the annual meetings of the British Association for the Advancement of Science, and was President of Section K (Botany) at Newcastle in 1916. He was President of the South London Botanical Institute from its foundation in 1911 till the date of his death, and was Chairman of the Botanical Section of the South-Eastern Union of Scientific Societies. For many years he was Lecturer in Botany at the Birkbeck Institute, and he took a prominent part in the scientific activities of the Royal Horticultural Society.

Always dignified and courteous, though not suffering fools gladly, Rendle made an admirable Chairman. His life was very full, and he will be greatly missed, not only in botanical circles.

T. A. SPRAGUE.

WILLIAM BYWATER GROVE.—By the death of Mr. W. B. Grove, M.A., M.Sc. which took place on January 6th, in his 90th year, Britain has lost one of its most outstanding mycologists of the past fifty years.

William Bywater Grove was born in Birmingham in 1848, and was educated at King Edward's Grammar School. His strong subjects were classics and mathematics, and he obtained an Exhibition and a Scholarship to St. Catharine's College, Cambridge. He took his degree in 1871 in Mathematics, ranking *senior optime* in the mathematical Tripos part II. At that time there was no botanical teaching at Cambridge, but he had begun the study of

botany privately about 1868. After leaving Cambridge he taught first in private schools, and then in the Birmingham High School for Boys, of which in 1887 he became Head Master. When the Boys' School was closed in 1900 he became lecturer in botany and chemistry at Studley Horticultural College, where he remained until 1908. From 1905 to 1927 he was lecturer in botany at the Birmingham Municipal Technical School, and for some years he was Honorary Keeper of the Herbarium at Birmingham University. In 1936 he was granted the honorary degree of M.Sc. in recognition of his services to science and to Birmingham University.

Grove took up the study of fungi in 1881. His first mycological paper was written in 1882 and dealt with the classification of the Uredineae, a group on which he later became an authority. In 1884 he published in the *Midland Naturalist* a monograph of the *Pilobolidae*, which fifty years later (in Buller, *Researches on Fungi*, VI, 1934) he revised and brought up to date. A long series of miscellaneous papers and notes followed, of which may be mentioned the records of "New or Noteworthy Fungi" which appeared in the *Journal of Botany* from 1884 onwards, and a series of critical monographs on certain genera of the *Fungi Imperfecti*, which were the outcome of his studies in the Kew Herbarium and appeared in the *Kew Bulletin* between 1917 and 1923. His book on the British Rust Fungi was published in 1913 and is still a standard work of reference. His many years of work on the *Fungi Imperfecti* culminated in the two volumes entitled "British Stem and Leaf Fungi (Coelomycetes)," the first of which appeared in 1935 and the second in 1937. This work is a critical compilation of all British records of *Sphaeropsidales* and *Melanconiales* known to Grove, based on his long experience of these fungi in the field and in herbaria, and it is no exaggeration to say that Grove was the only person in this country who could have produced it. Within its limits it is most valuable to mycologists and plant pathologists alike.

Some years ago, through the instrumentality of Professor A. H. R. Buller, Grove was persuaded to use his classical knowledge in the preparation of a translation from the Latin of the three quarto volumes of the *Selecta Fungorum Carpologia* of the brothers Tulasne. This was produced, with collotype reproductions of the original beautiful copperplate engravings, by the Oxford University Press in 1931. The preparation of this work occupied five years of Mr. Grove's leisure time, during which his own mycological work had to remain in abeyance.

Mr. Grove was essentially a field naturalist and a keen observer, of a type now unfortunately rare. Although interested especially in microfungi, he had a good field knowledge of the larger fungi, as well as of flowering plants, mosses and ferns. He was in great demand during collecting expeditions made by the students at Birmingham. Being a born teacher, he was able to impart to his students some of his own enthusiasm, which he kept to the last.

He will be greatly missed by his many friends and students whom he helped over their first mycological difficulties. Kew is fortunate in having his collection of Coelomycetes, which was the basis of his last book.

E. M. WAKEFIELD.

CHARLES GILBERT ROGERS.—We greatly regret to have to record the death of Mr. Gilbert Rogers, which occurred at Woking on the 25th November. After a distinguished course at the Royal Indian Engineering College, Coopers' Hill, of which institute he became a Fellow, Rogers joined the Indian Imperial Forest Service in 1888, being posted as Assistant Conservator in the Bengal Presidency. In 1890 he was selected to be an Instructor at the Indian Forestry School at Dehra Dun, and later was placed in charge of the important Andamans Islands Division. In 1906 he was transferred as Conservator of Forests to the Central Provinces, and in 1910 in a similar capacity to Burma, where he filled the post of Chief Conservator from 1913 until he retired from the Forest Service in 1919. In 1920 he was appointed as Director of Forest Studies in the United States of America, to be in control of certain probationers to the Indian Forest Service who had been deputed to learn the American methods of lumbering. Some years earlier he had written a Manual of Forest Engineering in India. On retirement his services were recognised by the award of C.I.E.

He was a keen naturalist, particularly on the botanical side. During the period of his Indian service he had carried out considerable plant collecting and he eagerly embraced the opportunity offered by a visit to his brother, Canon Rogers, of Nairobi, to collect plants and seeds in the high mountains of Kenya Colony. He sent many herbarium specimens, seeds and living plants to Kew, and raised and cultivated the "giant" lobelias very successfully in his garden in East Sussex. His name is commemorated in *Kniphofia Rogersii* E. A. Bruce, a new species discovered by him in Kenya. A man of a particularly modest and unselfish disposition, his loss is deplored by a large number of friends.

C. E. C. FISCHER.

GEORGE ALBERT BOULENGER.—Dr. G. A. Boulenger, F.R.S., a distinguished zoologist, died at St. Malo on November 23rd, 1937, at the age of 79. For a considerable period he was head of the Department of Reptiles, Batrachians, and Fishes at the British Museum (Natural History). When he left South Kensington Dr. Boulenger went to the Botanic Garden at Brussels and took up the study of roses in the Crépín Herbarium. His work entitled "Les roses d'Europe de l'Herbier Crépín" occupied two volumes of the Bulletin du Jardin Botanique de l'État between 1924 and 1931. He also published a Revision of certain sections of Asiatic roses in the same periodical. Boulenger's conception of the species of *Rosa* was a broad one, but it has much agreement with the views of Miss Erlanson, based on cytological investigations. He was in

regular correspondence with Kew and ever ready to assist in the identification of material.

New Conifer Names.—The following new names and combinations were found to be necessary during the preparation of the new edition of the *Handlist of Coniferae* which will appear shortly.

Picea Abies var. *acrocona* (Th. M. Fries) Dallimore, comb. nov.
P. excelsa forma *acrocona* Th. M. Fries in Bot. Notiser, 1890, 256.

Picea Abies var. *brevifolia* (Cripps ex Gordon) Dallimore, comb. nov.
Abies excelsa var. *brevifolia* Cripps ex Gordon, Pinetum, ed. 2, 8 (1875). *Picea excelsa* var. *brevifolia* (Cripps ex Gordon) Hornibrook, Dwarf and Slow-growing Conifers, 88 (1923).

Picea Abies var. *brevifolia* forma *albida* Dallimore, nom. nov.
P. excelsa var. *brevifolia* forma *argentea* Hornibrook, Dwarf and Slow-growing Conifers, 89 (1923)—non *P. Abies* forma *argentea* Rehd.

Pinus Wallichiana A. B. Jackson, nom. nov. *P. excelsa* Wall. ex Lamb. *Pinus*, 2, t. 3 (1824)—non Lam. (1778). *P. Chylla* Lodd. Cat. 1836, 50, *nomen nudum*. *P. nepalensis* De Chambr. Trait. Arbr. Résin. Conif. 342 (1845)—non Forbes (1839). *P. Griffithii* McClelland in Griffith, Notul. 4, 17 (1854), *nomen nudum*—non Parl. (1868). *P. Dicksonii* Hort. ex Carrière, Conif. 300 (1855), *pro syn.*

forma *zebrina* (Croux ex Bailly) A. B. Jackson, comb. nov.
P. Strobilus excelsa zebrina Croux ex Bailly in Rev. Hort. 61, 393, fig. 101 (1889). *P. excelsa zebrina* (Croux ex Bailly) Beissner, Handb. Nadelholzk. 286 (1891). *P. nepalensis* var. *zebrina* (Croux ex Bailly) L. H. Bailey, Cult. Conif. N. Amer. 76 (1933).

For many years the Bhutan Pine was known as *P. excelsa* Wall. ex Lamb., but the rule adopted at Cambridge in 1930 rejecting all later homonyms necessitated a change of name owing to the existence of the earlier *P. excelsa* Lam. (= *Picea Abies* (L.) Karst.). The name *Pinus nepalensis* De Chambr. was then taken up, but it was overlooked that this name is itself a later homonym of *P. nepalensis* Forbes (Pinetum Woburnense, 34 : 1839)—a name of doubtful application.

P. Griffithii McClelland appeared only as a provisional name in the text, while the analyses on the plate cannot validate the name as McClelland himself says they belong to a different species. The epithet *Griffithii* cannot now be employed for the Bhutan Pine as Parlatores (in DC. Prodr. 16, pt. 2, 411 : 1868) has validly published the combination *P. Griffithii* based on *Larix Griffithii* Hook. fil. & Thoms. (= *L. Griffithiana* Hort. ex Carrière). A new name for *P. excelsa* Wall. ex Lamb. is therefore required and *P. Wallichiana* is proposed.

Pseudotsuga taxifolia var. *pumila* (Beissner) M. L. Green, comb. nov. *P. Douglasii* var. *pumila* Beissner, Handb. Nadelholzk. 2 Aufl., 110 (1909).

Sequoia Wellingtonia var. *pendula* (Carrière) M. L. Green, comb. nov. *Wellingtonia gigantea* var. *pendula* Carrière in Rev. Hort. 1889, 545, fig. 137. *Sequoia gigantea* var. *pendula* Lavaltee, Arbr. Segrez. 271 (1877), nomen; Beissner, Handb. Nadelholzk. 165 (1891), 2 Aufl. 462 (1909); Bailey, Cult. Conif. N. Amer. 141 (1933).

A New Species of *Delphinium* from Afghanistan.—

Delphinium kabullianum Akhtar, sp. nov.: affine *D. Stocksiano* Boiss., sed floribus multo minoribus facile distinguitur.

Herba annua, erecta, pubescens, 3-1 cm. alta, ramis ascendentibus. *Folia* alterna, segmentis linearibus obtusis circiter 12-5 mm. longis et 1-5 mm. latis. *Racemi* elongati, terminales, laxi, 5-11-flori; pedicelli circiter 6 mm. longi, curvati. *Flores* bracteati, 1 cm. diam. horizontali sepalis patulis inclusis, 7-5 mm. diam. verticali. *Sepala* 5, luteo-alba, longitudinaliter pallide violaceo-striata, valvata, extra breviter patule pubescentia, abaxialia interdum in parte inferiore connata (?), lateralialia patula, 8 mm. longa, 2-5 mm. lata; calcar fere erectum. *Corolla* primo pallide violacea, deinde luteo-alba; petala 4, 2 adaxialia calcarata, calcar 2-6 longo, 2 lateralialia squamiformia. *Stamina* 20-25, inclusa, inaequalia; filamenta alba, basin versus dilatata; antherae leviter acutae, luteae. *Carpellum* solitarium: ovarium pubescens; stylus brevis, pubescens, teres. *Folliculus* cylindricus, 12-5 mm. longus, pubescens; semina 16, biseriata, brunnea, fere triangularia; testa coriacea, regulariter rugulosa.

AFGHANISTAN: near Kabul, about eight yards from the southern gate of "Bagh-a-Babur," on the left side of the road going out through the gate, growing wild on hillsides, flowering at the end of May, S. A. Akhtar, s.n. (typus in Herb. Kew.).

S. A. AKHTAR.

Botanical Magazine.—The fourth part of Vol. 160 was published on January 24th, 1938. The following plants are figured:

Rhododendron Cubittii Hutchinson (t.9502), a rare species from northern Burma; *Berberis chillanensis* var. *hirsutipes* Sprague ex Bean (t.9503), from the Andes of Argentina; *Hippeastrum Blumenavia* (C. Koch et Bouché ex Carr.) Sealy (t.9504), from Sao Paulo, Brazil (figured in Bot. Mag. t.5666 (1867) under the name *Griffinia Blumenavia*); *Camellia saluenensis* forma *macrophylla* Sealy (t.9505), from Yunnan, a large-leaved form raised by Mr. J. C. Williams from Forrest's seed no. 24090; *Allium Akaka* forma *major* Turrill (t.9506), from northern Persia; *Rhododendron aperantum* Balf. f. & Ward (t.9507), a dwarf, spreading shrublet from N.E. Burma; *Calamintha alpina* var. *orontia* (K. Maly) Hayek (t.9508), from Yugoslavia; *Viburnum foetidum* Wall. (t.9509), a shrub found in eastern Bengal, Assam and Upper Burma, also in Yunnan and Szechwan; *Homoglossum merianella* (Thunb.) Baker (t.9510), with flowers varying from brilliant orange to red, from the

Cape Peninsula; *Eucalyptus coccifera* var. *viridifolia* Summerhayes (t.9511), a variety known only in cultivation but presumed to be, like the species, a native of Tasmania; and *Senecio Tabacqn* Turcz. (t.9512), a striking plant from the Andes of Colombia and Venezuela, with brilliant purple flowers.

The volume is dedicated to Mr. W. J. Bean, C.V.O., I.S.O., V.M.H., and the part under review contains a portrait of Mr. Bean and a dedication by the Royal Horticultural Society.

Swahili Plant Names.*—Time and again, knowing the native name for a tree or food-stuff, one has had considerable difficulty in identifying it, and could only do so, somewhat uncertainly, by correlating it with the native name in some other native language and then trying to find someone with sufficient botanical knowledge who knew that language. Those days, happily, have passed, and it is now possible to get plants identified by botanists in the various territories in East Africa. This task is now further simplified by Mr. Greenway's valuable piece of work, and to those of us who are not skilled botanists this book, with its simple descriptions of trees and plants, will prove extremely valuable and interesting.

One's curiosity, too, is excited by many of the native names. What folk-lore or legend, for instance, lies behind some of the names commencing with *Mla*-? One knows that there is a legend behind the name *Kifabakazi* in Ganda, and one can only hope that this review may catch the eye of someone who someday will tell us how many of these trees or plants have got their names. In the same way, if the author at some future date should contemplate a second edition, perhaps he might consider the possibility of including the source from which the native name has come. *Kifabakazi* is a Ganda word, though, of course, it may also be the name for this tree in other Bantu languages, and there are other names which obviously are loan words, some of which we know or can guess; others are more obscure.

There appear to be one or two slips or errors; for example, it is difficult to see how such words as *Msjepasjepa* or *Mtasbihi* could be pronounced, whilst *Mdimu* is preferable to *Mndimu*, and *Mlimau*, which is recognised in F. Johnson's *Kamusi ya Kiswahili*, might have been included. *Mzizi* too is preferable to *Zizi*, a word with quite another meaning. On p. 22 there is a section under *Mc*; it is suggested that *Mch.* is more in conformity with orthodox orthography.

As regards the botany, the reviewer is not competent to speak, but he can say that, judged from the viewpoint of the average layman, he is impressed with the clarity with which the author has dealt with his subject and the general lay-out and arrangement in

* "A Swahili Dictionary of Plant Names," by P. J. Greenway, F.L.S., Government Press, Dar-es-Salaam, 1937. Pp. xvi+112. Price 3s., obtainable from the Government Printer, Dar-es-Salaam.

this very handy little volume. The printing is excellent and the Amani Agricultural Research Station is to be congratulated on making the results of this comprehensive research available for general use.

E. B. HADDON.

Forest Bibliography.*—There are occasions when every scientific worker would fain turn back the wheels of time to that spacious age but a century ago when a man could possess an intimate knowledge of the whole realm of science. But such times are past. We must now contend with an ever-increasing spate of books and periodicals dealing with all branches of pure and applied science and compelling a specialisation, the field of which constantly narrows. The lot of the individual worker trying to keep abreast of new developments in his own branch of study is increasingly difficult. This provides a modern problem, the solution of which would appear to lie in the compilation of bibliographies and the publication of short abstracts of current work. Such undertakings can best be carried out in specialist institutions or departments of Universities.

Until recently British forestry, though similarly placed to other branches of applied science in this matter, was not specially catered for. The publication of a "Forest Bibliography," two parts of which have appeared already, by the Department of Forestry, University of Oxford, is, therefore, an event to be welcomed. The bibliography relates to periodicals, bulletins and other publications contained in the library of the Department of Forestry, where they may be consulted. Literature published prior to January 1934 is classified in chronological order under suitable subject headings such as "Seeds and Seedlings," "Natural Reproduction" and "Silvicultural Systems." Subsequent literature will be arranged under the decimal system recently adopted by the International Union of Forest Research Organisations. A collation of the two systems is given for convenience in the first number. Individual entries include an abbreviated title of the publication or periodical, a volume and page reference and a brief indication of the scope of the article.

The authorities of the Oxford Forestry School have earned the gratitude of British foresters for making available this bibliography, which was intended originally for private use only.

R. MELVILLE.

* Forest Bibliography to 31st December, 1933, Parts I & II. Compiled and published by the Department of Forestry, University of Oxford, Oxford, Hall the Printer, Ltd., 1936 (Part 1) and 1937 (Part 2). Price 5s. (Part 1) and 12s. 6d. (Part 2).

Printed under the authority of His MAJESTY'S STATIONERY OFFICE
By the South Essex Recordors, Ltd., High Road, Ilford.

(98) Wt. 16/32 800 3/3A S.E.R. Ltd. Op. 361

BULLETIN OF MISCELLANEOUS INFORMATION No. 3 1938 ROYAL BOTANIC GARDENS, KEW

XIV—NOTES ON A BOTANICAL JOURNEY IN S. W. GREENLAND, 1937.

NICHOLAS POLUNIN (Department of Botany, Oxford).

At the end of a very full summer of floristic and ecological work in the Julianehaab Distrikt of southwestern Greenland it seems desirable, before publishing in detail in the appropriate journals the results of my various investigations, to give a preliminary report of the more significant or generally interesting observations made.

THE FLORA.

The flora of Greenland has long been of especial interest to scientists in many fields and is now frequently cited in discussions of climatic change, Nordic migration, "continental drift," "persistence" and "land bridges." Opinions as to its origin and relationships have varied from that of Sir J. D. Hooker (1861 p. 252) who called it "purely European," to that of Prof. Eug. Warming (1888 p. 289) who considered it "arktisk-amerikansk." In visiting this climatically most favourable area of the great "continent" it accordingly seemed to me desirable to look out for possible additions to the flora, even if the particular district of my travels is, according to such recent authors as Porsild (1930 p. 5) and Seidenfaden (1933 p. 5) "one of the best botanically explored . . . of Greenland," having been visited by such a "long line of well-trained experts . . . and . . . a still larger number of skilful amateurs" that it "cannot . . . be expected to yield anything surprising in a floristic respect."* Most of these investigators used boats or even ships, traversing large areas and working chiefly at certain fixed points near the shore. It seemed that by taking a small area and studying it more intensively, walking backwards and forwards, alone and living chiefly off the country, it might yet be possible to find new plants. The country and conditions were not always easy, but I was abundantly rewarded for my efforts, finding between or around the heads of the fjords named Agdluitsoq, Igaliko and Tunugdliarfik, all within a radius of 50 kilometres and little more than that distance from

* The late Prof. C. H. Ostenfeld (1928 p. 277) even went so far as to express the opinion that "the floristic part of the research of the vegetation of Greenland has reached its natural conclusion."

Julianehaab itself, no less than nine* species of vascular plants not previously recorded from anywhere in Greenland. These are as follows:—†

Botrychium matricarioides A. Br.
Agrostis tenuis Sibth.
Agrostis gigantea Roth
Danthonia spicata (L.) P. de Beauv.
Carex Mackenziei Krecz ‡
Carex magellanica Lam. (s.l.)
Potamogeton natans L.
Gentiana Amarella L. var. *uliginosa* Wahlenb.
Antennaria compacta Malte

I also know of the discovery this summer, by the Dano-Norwegian Botanical expedition to the same region, of another species new to Greenland.

Five of these new finds belong to well-known major species that are circumboreal or at least widely distributed in more temperate regions on both sides of the Atlantic. But three at least are microspecies that have a restricted distribution, and this is furthermore the case with a greater number of subspecies (varieties) now being studied whose ranges may be of the utmost significance for phytogeographical considerations. If we add to all these some 14 relatively northern species discovered this summer in this most southwesterly region but previously thought to be absent therefrom, although well-known elsewhere in Greenland, we find the known flora of this area, which still stands out as a distinct floristic entity, increased by more than 10%! This should warn "presence and 'absence'" phytogeographers to investigate some of the less known parts of Greenland and elsewhere before theorising further. However, so far as one dare generalise, the present indications are that the flora of southwestern Greenland is, as might be expected from its geographical position, rather more American than European§ in its affinities, and, like the vegetation, subarctic rather than truly arctic in type except perhaps on the exposed ocean coast.

* At first I thought this number would be ten, having found a non-viviparous, open-panicked *Deschampsia* which seemed nearer to *D. caespitosa* s. str. (not yet recorded from Greenland except as a recent introduction) than to the usual *D. alpina*. But now reference to early works has made me doubt the validity of the present-day conception of the latter (there does not appear to be any "type" specimen of the original *Aira alpina* L. in preservation) as necessarily viviparous, so that, the *D. caespitosa* complex being moreover quite imperfectly understood, I prefer not to found a new record on my few rather doubtful specimens, but to refer them tentatively to *D. alpina*.

† The determinations have all been checked by specialists in or near the Museum, who generously supported the expedition. (Some other acts of my species, will soon be available for distribution.)

‡ This is *C. norvegica* Willd. ex Schk. 1801, non Retz. 1779 and 1795.
 § cf. Nathorst (1890 & 1891).

THE MOUNTAINS.

My original plan for the extensive botanical exploration of the alpine regions of the district, in answer to the plea of Porsild (1930 p. 7), proved to be too ambitious, bad weather, including a heavy fall of new snow that extended down to an altitude of about 700 m. (2000 ft.), putting an end to such operations before the middle of August. However, two climbs of about 1400 m. (4500 ft.)* and 1500 m. (4800 ft.) and a number of minor ascents were made under fairly good conditions. As far as one dare draw conclusions from such scanty data it would appear that, in accordance with the subarctic nature of the lowland, the conditions and attendant flora and vegetation of the uplands of southwestern-most Greenland are alpine rather than truly arctic in type. Thus a number of species apparently absent from the lowland but characterising all truly arctic countries, and which it was expected would be found at higher altitudes, failed to appear, while several even of the most ubiquitous plants and chief dominants of higher latitudes which were to be found here and there in the lowlands, where they appeared to be strangers, were of rare occurrence or restricted habitat in the mountains, or even absent therefrom. Again other, relatively southern species, attained quite considerable altitudes here—near or perhaps even at their northern limit.

A remarkable difference in the size of the flora and luxuriance of the vegetation was noted between the only two major mountains climbed under conditions which allowed the taking of botanical observations. On the one no less than 66 species of vascular plants were found between 800 and 1000 m. and 47 between 1000 and 1200 m., while at least 36 species and patches of closed heathy or grassy vegetation extended even above 1200 m. (cf. Polunin 1937a). On the other mountain, similarly situated at the head of a fjord and only about 40 km. away, just 12 species could be found between 800 and 1000 m., 9 between 1000 and 1100 m., and only a single one, *Luzula confusa*, above 1100 m., while no closed communities of any extent were seen above 600 m.!

Important as may be the variations in exposure to "foehn" and other local winds and particularly in the chemical nature and relative stability of surface of the two mountains, they can scarcely account for such extraordinary discrepancies. Some other factor must be called in, and all things considered it is thought most likely that the floristic and vegetational differences noted are due primarily to the very different glacial histories of the two mountains; for while the upper part of the first was (to all appearances and as affirmed by the experienced glaciologist and geologist Dr. C. E. Wegmann of Schaffhausen) an ice-free "nunatak" throughout the last glacial maximum, the second was isolated and covered with relatively recent morainic material of a type which, even where it exhibits active

* As already reported in detail in a special number (August 1937) of the native journal "Sujumut."

solifluction and other conditions inimical to colonisation, normally becomes vegetated within a very much shorter period than the time which must have elapsed since the final retreat of Pleistocene ice hereabouts. To my great regret it was not possible to make further observations on these most interesting and controversial questions; indeed the area would seem well worth revisiting even for this alone; but it should be pointed out that the above suggestion that vegetational luxuriance as well as floristic composition may perhaps be directly affected by glacial history follows as a corollary to the well-known observations of Fernald (1925), Lynge (1933), Gelting (1934), Nordhagen (1935), Steere (1937) and many others on the "persistence" of certain species of plants on unglaciated areas. Moreover, colonisation in the North is largely a cumulative process; thus the only vascular plants, the best cryptogam vegetation, and significantly enough the only sign of visitation by birds found in several kilometres of mostly gentle slopes traversed above 1100 m. on the second mountain, were all at the very summit (c. 1500 m.), which from the first had with little doubt constituted the only attractive perching place for miles around.

OLD NORSE RELICS.

The principal ruins of the Eystribygd—the more southern, larger and longer lasting of the two centres of the 10–11th century Nordic colonisation of Greenland—being situated in the region traversed, the opportunity was taken of studying the present-day botanical aspects of such interesting sites as Eric the Red's house and estate "Brattahlíð" (now Qagssiarssuk), the cathedral and bishop's palace at Gardar (now Igaliko), and some of the larger farms.

Although the community flourished chiefly during the first two or three hundred years after colonisation and with little doubt died out completely before the end of the sixteenth century (cf. Jónsson 1928 pp. 346–51), its effect on the vegetation is still very obvious in this region of rather slow growth and small vegetable turnover. Thus the ruins, most of which are now reduced to slight mounds, are almost all overgrown with a grassy sward up to a metre in height and so thick and luxuriant that the birches and willows which dominate most surrounding areas have been unable to attain ecesis in it. The region being one of high precipitation, including heavy summer rains, it seems probable that nitrates are scarce and that this grassy community, which often includes rank herbs, owes its persistence to a high concentration of the less soluble phosphates accumulated from decomposed refuse.

From the surrounding stretches of country all larger birches were liable to be cut for firewood by the Norsemen and where considerable areas were thus cleared the "forest" has generally failed to return. Even further afield, and sometimes many kilometres from any known ruins, the effect is still noticeable of what must have been long-continued pasturing by very considerable herds of domestic animals

—which resulted in the production of a peculiarly equilibrated patchwork of willow or birch scrub alternating with areas of grass-land or herb-mat (cf. Polunin 1937b p. 940).

By a careful investigation of peat deposits near ruins, Iversen (1934 p. 349) has shown that in the Vestribygd (the other centre of Nordic colonisation of Greenland) there has been a great increase in the grassiness of the vegetation since the advent of the Norsemen; there was also a marked increase which, however, has not been maintained since the Norsemen died out, in the amount of *Rumex* (all *R. acetosella*) and *Lycopodium* (almost all *L. annotinum*). My observations in the Eystribygd directly confirm these studies, for not only are true grasses dominant in many places around the ruins to this day, and to a degree unknown in unpastured terrain elsewhere in the Arctic or Subarctic, but in the more limited areas which have been sufficiently grazed during the past few years by the sheep of the modern Greenlanders, it is just the grasses, *Rumex* and *Lycopodium* mentioned by Iversen (1934 cf. figs. on p. 349) which have increased most noticeably in abundance in some at least of the plots investigated.

In the same interesting paper Iversen (pp. 356–8) has propounded the theory, I think with good reason, that a plague of larvae of the moth *Agrotis ocula* was indirectly responsible for the dying out of the Vestribygd population. It is unfortunate that I did not come to hear of this work (which was published in a geological periodical) until after leaving the Eystribygd where, however, during an attempted investigation of the bogs with a piece of broken spade (of such obvious antiquity that the natives said it must be "Old Norse"!) I did not notice any "Puppenschicht." Indeed it seems likely that some entirely different cause or causes may have been behind the disappearance of the Norsemen from the Eystribygd (cf. Nørlund 1924 pp. 252–9, but see also Nansen 1926 and Polunin 1937b p. 940), where conditions are in many ways different and where the people certainly lived long after the Vestribygd had died out (cf. Jónsson 1928 p. 348). In one bog, with the aid also of my saucepan, a depth of 170 cm. was reached without finding any bottom. The samples brought home for pollen analysis, etc., have not yet been examined, but a feature already noticeable in the field was a great preponderance below 110 cm. of the remains of *Menyanthes trifoliata*, which still grows abundantly around the margins of present-day lakes nearby.

As I have already pointed out elsewhere (1937b p. 940), there seems to be no real evidence for the drastic climatic change which is popularly supposed to have been responsible for the dying out of the Nordic colonies, but many indications that the climate has remained relatively stable since well before their advent, even if there was a "postglacial warm period" lasting until perhaps 2000 years ago.

On the absorbing question of which plants were introduced by the Norsemen from Europe, Ostenfeld (1926 pp. 13 *et seq.*) and Porsild

(1932 pp. 37 *et seq.*) have recently written at considerable length. The former put the "Old Norse" element of the flora at 13%, which altogether seems quite untenable and includes for example *Betula pubescens* s.l. which has since been *proved* to be indigenous (cf. Polunin 1937b p. 940), while Porsild, with his much greater field experience, reduced this quota forthwith to 1.5%. With this I am in much closer agreement; but I would even go a step farther and say that, while it would indeed be remarkable if the old Vikings, during their centuries of lively communication with Iceland, had failed to bring in either accidentally or intentionally at least a few plants therefrom,* it still seems unnecessary to *presume* such artificial introduction for more than two or three of the six species postulated by Porsild (l.c. p. 79). To these two or three plants which may with a fair degree of confidence be assumed to have been introduced from Iceland by the Norsemen it seems necessary to add *Agrostis tenuis*, which I found in 1937 growing in the former home-field (tún) at Igaliko, well away from the present settlement and the ruins of the cathedral but near the famous plants of *Vicia Cracca* and looking similarly well-established in a now heavily pastured area.

Perhaps most fascinating of all is a question which does not appear to have been considered at all seriously before, viz., were any plants introduced to Greenland *from America* by the Norsemen who with little doubt made voyages thereto around the year 1000? It seems probable that they even established colonies on the other side, for we are told that one Erik, a "Greenlander Bishop," went over to "Vinland" as a missionary about the year 1121† (but never returned?); yet all attempts at locating ruins or other relics which would bring us nearer the truth as to who discovered America and where they went have so far failed, even if speculation on the subject has long been rife.

* Once when crossing a wide fjord with some Greenlandish families, stroking a huge rowboat propelled by 8 or 10 oars, I noticed that we were carrying not only several plants of rhubarb, complete with attached soil and weeds "for our friends who have gone to live thereover" but also two whole plants of *Epilobium latifolium*. These were not in flower but the natives nevertheless told me they had brought them "just for decoration" and "because they are rare," doubtless remembering also their gaudy blooms and intending to plant them on the other side of the fjord. These modern Greenlanders, unlike most Eskimos, were living just the life of the old Norsemen, dwelling in stone-and-earth houses and farming cows and sheep, and we were swinging along in true Viking style at a good four knots; does it not then seem reasonable to suppose that the Norsemen frequently brought living plants (as well as seeds and fruits in hay or on clothes) with them, especially when coming from a strange country? All Scandinavians, living as they do close to nature, tend to take more interest in plants than most other people—with the result that there is to-day in Norway, Sweden and Denmark, in spite of the comparative paucity of the flora, probably a greater percentage of botanists than in any other land.

† cf. Jónsson 1928, p. 346.

Since the points even now advocated range from Labrador southwards over the greater portion of the Atlantic coast of North America, it is to be assumed that the indications of the sagas are insufficient even as their botanical information is imprecise (cf. Fernald 1910); but it occurred to me that if it were possible to find on or near the ruins in S. W. Greenland any exclusively New World plants having a very restricted distribution on some part of the east coast of America, I might have the best clue of all, especially if several such plants were discovered growing together. As far as species are concerned I may have failed in my quest, most of the major taxonomic entities that could be considered in this connexion having far too widespread a distribution; but fortunately I was from the beginning able to give special attention to several minor forms and variations. And while much closer study of critical material on both sides of the Atlantic and perhaps even further expeditions will be necessary before a definite pronouncement can be made, I rather think that it will in time be possible to offer at least weighty suggestions as to whereabouts the Norsemen went and where their relics should accordingly be searched for on the American Continent.

THE VEGETATION.

Like the flora, the land vegetation of most of the area investigated is essentially subarctic in type, as became evident long ago from the well-known observations of Rosenvinge (1896 cf. p. 109). Even if the vegetation of the mountains is alpine, as was emphasised above, and that of the outermost skerries and exposed ocean coast shows affinities rather with the arctic regions (for it is continually swept by the East Greenland Polar Current which is generally heavily loaded with pack ice), we have only to penetrate a few miles into the sheltered fjords to find almost everywhere closed plant communities of an intricacy and luxuriance quite unknown in the Far North. The chief of these are birch "forest," willow scrub, mixed heath, grassy pastures, and marshes, while various interesting aquatic and saltmarsh formations cover more limited areas; the ecology of each outstanding community was investigated and quadrats of typical examples listed.

The birch "forest" is developed only in sheltered valleys around the heads of the fjords, being moreover limited (as I have seen in northern Lapland) to substrata in which the roots of the dominant *Betula pubescens* s.l. can extend well below the 50 or 60 cm. to which the soil is liable to freeze in these most favourable areas in winter (cf. Polunin 1937b p. 939). The "trees" are bushy and gnarled, almost invariably having the lower part of the trunk prostrate or obliquely ascending. They rarely exceed a height of 3-4 metres, even though they may be much longer; however, a few examples reached 5½ m. in height and had a maximum trunk diameter of 25

cm.* But although these birches rarely grow in closed canopy for more than a few square metres without interruption, and altogether cast rather poor shade, the vegetation which stands between them and the relatively luxuriant terricolous cryptogam investment is generally meagre, consisting of either a straggly lower shrub or a predominantly grassy herbaceous layer.

These areas of apparently climax "forest," even far away from any signs of biotic disturbance, are generally much interrupted by patches of heath or low willow scrub or, on well-drained sandy flats far inland, of lichens and xeric mosses—the local formation being here to a large extent edaphically determined as in the western Great Plains region of North America and some other areas of predominantly dry conditions and more or less extreme continental climate. That lichens instead of dwarf-shrubs dominate the ground layer in many of these areas is with little doubt due to the fact that *Empetrum* and the other "heaths" which characteristically cover large areas farther out towards the sea are killed or persistently "cut back" by *foehn* winds near the ice-cap (cf. also Rosenvinge 1896); the persisting cryptogams alone among the local array of chamaephytes are able to withstand desiccation on substrata which do not allow contemporaneous absorption.

Away from the ice-cap and the very heads of the longer fjords the climate rapidly (and quite noticeably) becomes more oceanic, with a heavy rainfall and less extreme temperature fluctuations. Birches of fair size may persist in places, but the chief dominant is *Salix glauca* s.l., which in sheltered areas forms a thick scrub generally from $\frac{1}{2}$ –2 metres in height, mixed with some lower *Juniperus communis* L. and *Betula glandulosa* Michx. and supporting, at least where not too thick (cf. Rosenvinge 1896 p. 127), a large and variable ground flora. It is here that the best sheep country lies, and it is here that the animals of the Norsemen were responsible for the peculiar patchwork of scrub alternating with areas of grassland or herb-mat which has already been considered above, the whole being comparable rather with the eastern part of the Great Plains region of North America, where the local communities are biotically determined (cf. Clements 1920 p. 131).

Thus three main vegetation zones depending upon local climatic conditions are to be seen in the Julianehaab Distrikt as in places further north and most notably in the Franz Joseph Fjord region where, however, the flora and vegetation are very different (cf. Gelting 1934). These zones are:

(1) A limited INNER FJORD ZONE of relatively continental climate whose climax is a birch "forest" at least $2\frac{1}{2}$ m. high.

* Some of these "forested" valleys at the heads of the longer fjords afford the most perfect wintering conditions of pasturage and shelter for reindeer that I have ever seen, and it is to be hoped that some domesticated strain will soon be introduced into this region from which the wild caribou has long since disappeared.

(2) A very broad MIDDLE FJORD ZONE having a damper climate and dominated in favourable and undisturbed areas by willow or mixed scrub from $\frac{1}{2}$ to $2\frac{1}{2}$ m. high. To this belong also most areas between the longer fjords.

(3) An OUTER COAST ZONE of extreme exposure and cool oceanic climate dominated by dwarf shrubs and herbs of chiefly arctic distribution.

REFERENCES.

1. CLEMENTS, F. E. 1920, "Plant Indicators." *Carnegie Institution of Washington*, publication nr. 290, pp. 1–388.
2. FERNALD, M. L. 1910, "Notes on the plants of Wineland the Good." *Rhodora*, 12, 17–38.
3. FERNALD, M. L. 1925, "Persistence of plants in unglaciated areas of boreal America." *Mem. Amer. Acad. of Arts and Sciences*, 15, pt. 3, 239–342.
4. GELTING, PAUL. 1934, "Studies on the vascular plants of East Greenland between Franz Joseph Fjord and Dove Bay." *Medd. om Grønland*, 101, 1–340.
5. HOOKER, J. D. 1861, "Outlines of the distribution of arctic plants." *Trans. Linn. Soc. Lond.*, 23, 251–348.
6. IVERSON, JOHS. 1934, "Moorgeologische Untersuchungen auf Grönland." *Medd. fra Dansk Geol. Forening*, 8, pt. 4, 341–358.
7. JÓNSSON, FINNUR. 1928, "On the Icelandic colonisation of Greenland." *Greenland*, 2, 333–361.
8. LYNGE, BERNT. 1933, "On *Dufourea* and *Dactylina*, three arctic lichens." *Skrifter om Svalbard og Ishavet*, nr. 59 (pamphlet), 1–62.
9. NANSEN, F. 1926, "Klima-vekslinger i historisk og post-glacial tid." *Avh. utgitt av det Norske Vidensk.-Akad. i Oslo*, 3, pp. 1–26.
10. NATHORST, A. G. 1890, "Kritiska anmärkningar om den grönländska vegetationens historia." *Bih. till K. Svenska Vet.-Akad. Handl.*, 16, pt. 3, no. 6, 1–50.
11. NATHORST, A. G. 1891, "Forsatta anmärkningar om den grönländska vegetationens historia." *Ofvers. af K. Svenska Vet.-Akad. Förhandl.* 48, pt. 4, 197–239.
12. NORDHAGEN, ROLF. 1935, "Om *Arenaria humifusa* Wg. og dens betydning for utforskningen av Skandinavias eldste flora-element." *Bergens Museums Arbok*, 1–183 (1936).
13. NØRLUND, P. 1924, "Buried Norsemen at Herjolfsnes." *Medd. om Grønland*, 67, pt. 1, 1–270.
14. OSTENFELD, C. H. 1926, "The flora of Greenland and its origin." *Kgl. Danske Vidensk. Selsk. Biol. Medd.* 6, pt. 3, 1–71.
15. OSTENFELD, C. H. 1928, "The flora of Greenland." *Greenland*, 1, 277–290.
16. POLUNIN, NICHOLAS. 1937a, "Akuliaruserssuaq." *Sujumut: special number*, August 1937.

17. POLUNIN, NICHOLAS. 1937b, "The birch 'forests' of Greenland." *Nature*, 140, 939-940.

18. PORSILD, M. P. 1930, "Stray contributions to the flora of Greenland, I." *Medd. om Grønland*, 77, pt. 1, 1-24.

19. PORSILD, M. P. 1932, "Alien plants and apophytes of Greenland." *Medd. om Grønland*, 92, pt. 1, 1-85.

20. ROSENVINGE, L. K. 1896, "Det sydligste Grønlands Vegetation." *Medd. om Grønland*, 15, pt. 3, 73-250 (1898).

21. SEIDENFADEN, GUNNAR. 1933, "The vascular plants of South-East Greenland 60°04' to 64°30' N. Lat." *Medd. om Grønland*, 106, pt. 3, 1-129.

22. STEERE, W. C. 1937, "Critical bryophytes from the Keweenaw Peninsula, Michigan." *Rhodora*, 39, 1-14 & 33-46.

23. WARMING, EUG. 1888, "Tabellarisk Oversigt over Grønlands, Islands og Faerøernes Flora." *Vidensk. Medd. fra den Naturhistoriske Forening i Kjøbenhavn*, 10, 236-293.

XV—CONTRIBUTIONS TO THE FLORA OF SIAM. ADDITAMENTUM XLVII.*

Quercus lenticellata Barnett, sp. nov.; *Q. oidocarpae* Korth. affinis, sed foliorum costa supra impressa, cupulae lamellis superioribus dentatis, pericarpio tenui intus glabro distincta.

Arbor 15-20 m. alta (ex Kerr). *Ramuli* juniores graciles, rubido-brunnei, glabri, serius conspicue lenticellati; hibernacula globosa, rubido-brunnea, glabra vel puberula. *Folia* tenuiter coriacea, ovato-lanceolata, apice acuminata vel caudata, ipso apice acuto, basi angustata vel acuta vel subrotundata, margine integra vel triente usque dimidio superiore leviter serrata, utraque pagina glabra, supra cinereo-viridia, infra pallide brunnea, 6.1-11.5 cm. longa, 2.1-4.4 cm. lata, costa supra impressa subtus prominente, nervis lateralibus 9-13-jugis supra impressis sed manifestis subtus gracilibus prominentibus marginem versus obscurioribus; petiolus 1.5-2 cm. longus, gracilis, rubido-brunneus. *Amenta mascula* ignota. *Amenta feminea* gracilia, axillaria, valde rugulosa, glabra, circiter 5 cm. longa; bractea late ovata, acuminata, florem saepe aequans, cupulae squamis perianthioque fulvo-pubescentibus, stigmatibus 3 patentibus ligulatis in apicem valde recurvum leviter ampliatis. *Fructus* in rhachi conspicue lenticellata sessiles; cupula crateriformis, basin versus leviter angustata, dimidiam glandem vel ultra obtegens, fusco-brunnea, pube rubido-brunneo subgranulari oblecta; lamellae circiter 8, 4 inferiores fere integrae, superiorum apicibus squamarum plus minus liberis, intus glabrae vel pallide fulvo-sericeae praecipue os versus; usque 2 cm. diametro, 1.2-1.8 cm. alta (extra). *Glans* ovoidea, glabra, nitens excepto umbone prominente anguste cylindrico vestigiis pubis rubido-brunnei granularis induto, circiter 1.7-2 cm. alta, 1.5-2.1 cm. lata,

cicatrice primum distincte convexa mox fere plana circiter 1.1-1.4 cm. diametro.

PAYAP. Chiangmai, Doi Lang Ka, Put 3775 (type). Doi Angka 700-800 m., in evergreen forest, Kerr 5306.

Quercus wangsaiensis Barnett, sp. nov.; *Q. semiserratae* Roxb. affinis, sed cupula basin versus magis angustata, lamellis valde prominentibus integrisque, glande anguste ovoidea obliqua differt.

Arbor 15 m. alta (ex Kerr). *Ramuli* graciles, demum lenticellati. *Folia* papyracea, elliptico-lanceolata vel suboblanceolata, apice acuminato-acuta, basi sensim angustata acuta, margine triente usque dimidio superiore leviter remote serrata, 10-17 cm. longa, 3.3-5.2 cm. lata, costa subtus robusta supra prominente latiusculaque, nervis lateralibus 10-15-jugis subtus gracilibus sed prominentibus supra elevatis sed subobscuris, utraque pagina glabra; petiolus gracilis, supra plana, 2.2-2.5 cm. longa. *Inflorescentia* mascula haud visa. *Infructescentiae* brevissimae et crassiusculae. *Cupula* lignosa, in basin stipitiformem angustata, leviter pubescens lamellarum quatuor integrarum marginibus crassis exceptis, ore lamellis 3-4 tenuioribus concretis incrassato, intus dense sericeo-brunneo-pubescentis, circiter 2 cm. diametro vel paullo ultra, 1.8 cm. alta. *Glans* glabra, fusco-brunnea, anguste ovoidea, supra medium crassior, manifeste obliqua, umbone elongato annulato incluso 3-6 cm. longa, 1.4 cm. lata, cicatrice subconvexa vel plana 0.8 cm. diametro,

NAKAWN SRITAMARAT. Songkla, Ban Wangsai, c. 50 m., by stream in evergreen forest, Kerr 15862 (type).

Quercus glabricupula Barnett, sp. nov.; *Q. semiserratae* Roxb. affinis, sed foliis minoribus, petiolis brevissimis, nervis e costa angulo acuto ortis, cupula etiam fructuum juniorum intus glabra recedit.

Arbor circiter 15 m. alta (ex Kerr). *Ramuli* graciles, glabri, haud conspicue lenticellati. *Folia* ovato-lanceolata usque obovato-lanceolata, acuminata, basi in petiolum brevem sensim angustata, 7-12.5 cm. longa, 2.25-4.75 cm. lata, margine triente superiore serrata, undulata, costa supra elevata, subtus prominente, nervis lateralibus 10-12-jugis gracilibus prominentibus supra elevatis et manifestis e costa angulo acuto ortis; petioli brevissimi, 0.75-1 cm. longi. *Inflorescentia mascula* haud visa. *Spicae fructiferae* breves, fructus usque 3 gerentes. *Cupula* dura, lignosa, pallide fulvo-pubescentis, in basin leviter angustata, lamellis circiter 8 supremis 2-3 exceptis eroso-dentatis marginibus glabris, intus leviter sericea, mox glabra, 1.75-2 cm. diametro, 1 cm. alta. *Glans* (immatura?) cupula circiter duplo longior, hemisphaerico-globosa, umbonata, glabra, nitida, brunnea, cicatrice convexa, 0.8 cm. diametro. *Glans* quaedam in solo lecta elongata, ovoidea, fere 3-4 cm. longa, 1.7-1.8 cm. lata, cicatrice manifeste convexa 0.8 cm. diametro.

PAYAP. Doi Angka, in evergreen forest, Kerr 5295 (type).

*Continued from K.B. 1938, 32.

Quercus longistyla Barnett, sp. nov.; *Q. semiserratae* Roxb. affinis, sed cupula juniore hypocrateriformi haud turbinata, glande (? immatura) ut videtur magis globosa, foliorum pagina inferiore haud papillosa differt.

Arbor 10 m. alta (ex Kerr). *Ramuli* juniores fulvo-tomentosi, serius glabri, lenticellati. *Folia* juniora fulvo-tomentosa, matura oblongo-lanceolata vel oblanceolata vel ovato-lanceolata, apice acuta vel breviter acuminata, basi angustata acuta, 5-12.5 cm. longa, 1.9-3.4 cm. lata, margine triente superiore serrata, leviter undulata, utrinque glabra (vestigiiis tomenti basi costae subtus exceptis), subpapyracea, costa utrinque prominente subtus robusta, nervis lateralibus 10-12-jugis subtus gracilibus sed prominentibus supra manifestis leviter arcuatis paullo ante marginem incurvis; petioli graciles, supra manifeste plani, usque 2 cm. longi, vestigiis tomenti vestiti. *Amenta mascula* in fasciculis axillaribus disposita, dense tomentosa. *Flores* singuli bractea late ovata suffulti. *Perianthium* scariosum, pilosum, altissime 6-lobum, segmentis linearibus subirregularibus, staminibus circiter 5. *Amenta feminea* circiter 1 cm. longa, dense fulvo-tomentosa, stylis 4-5 longe divergentibus, stigmatibus latis recurvis. *Spicae fructiferae* breves, crassae, circiter 1.5 cm. longae, lenticellatae, fructus 1 vel 2 gerentes. *Cupula* hypocrateriformis, haud turbinata, basi plana, ore lata, glandis apicis umbone longo annulato exserto, lamellis 6-8 obtuse et irregulariter dentatis, dense fulvo-pubescentis, intus fusco-brunneo-sericea, 1.4 cm. diametro, fere 1 cm. alta. *Glans* (? matura) globoso-ovoidea, brunnea, nitida, circa basin umbonis leviter pubescens, circiter 1.7-2 cm. lata, 2.25 cm. longa, cicatrice plana 1-1.1 cm. diametro.

UDAWN. Loi, Kao Krading, c. 1200 m., evergreen forest, Kerr 8708 (type) and in open evergreen on rocky ground, Kerr 20136.

The flowers have been described from Kerr 20136.

Lithocarpus longispinus Barnett, sp. nov.; *L. lappaceo* (Roxb.) Barnett* affinis, sed foliis glabris nec velutino-pubescentibus, squamis cupulinis gracillimis duplo longioribus (ultra 1 cm. longis) differt.

Arbor gracilis, circiter 8 m. alta (ex Kerr). *Ramuli* gracillimi, glabri, conspicue lenticellati. *Folia* tenuia, papyracea, pallide griseo-viridia, oblongo-lanceolata vel lanceolata, apice oblique acuminato-caudata, ipso apice acuta, basi cuneata, 12.2-20 cm. longa, 3-6.6 cm. lata, margine integra, utrinque glabra, costa gracili supra subtusque elevata, nervis lateralibus gracillimis supra indistinctis et subimpressis subtus elevatis et prominentibus 13-16-jugis usque ad marginem secusque eum arcuantibus, nervis transversis tenuissimis regularibus supra subindistinctis subtus manifestis; petioli graciles, 0.8-1 cm. longi. *Spicae floriferae* haud visae. *Spicae fructiferae* axillares, graciles, usque circiter 8 cm. longae, fructus 1-3 terminales gerentes. *Cupula* globoso-hemisphaerico-

* Comb. nov.

conica, glandem omnino obtgens, circiter 2.5 cm. alta, 2 cm. lata, tenuis, spinis longis gracilibus glabris simplicibus apice uncinatis 1.3 cm. longis obsita. *Glans* hemisphaerica, pallide fulvo-sericeo-pubescentis, 1.9 cm. diametro, 1.2 cm. alta, levissime apiculata, cicatrice concava 1.1 cm. diametro.

PATTANI. Kao Kalakiri, c. 300 m., in evergreen forest, Kerr 7755 (type).

Lithocarpus recurvatus Barnett, sp. nov.; *L. Garrettiano* (Craib) A. Camus affinis, sed foliis haud oblanceolatis subtus haud fulvo-pubescentibus pilis magis adpressis differt.

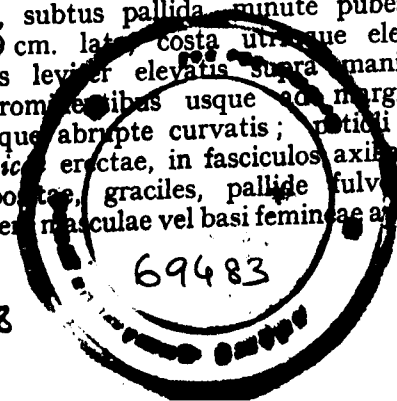
Arbor circiter 15 m. alta (ex Kerr). *Ramuli* juniores graciles, rubido- vel cinereo-brunnei, subglabri, tandem glabri. *Folia* elliptica vel elliptico-lanceolata, saepe obliqua, apice caudata, basi acuta, 10-16 cm. longa et ultra, 2.2-4.7 cm. lata, pergamentacea, supra glabra, brunnea, subtus pilis crebris adpressis pallide argentea, nervis lateralibus gracilibus circiter 15-17-jugis rectis vel leviter arcuatis prope marginem arcuatis subtus prominentibus brunneis supra indistinctis, nervis transversis supra haud visibilibus subtus valde indistinctis, margine integro. *Inflorescentia mascula* non visa. *Spicae fructiferae* (delapsae) ultra 20 cm. longae, robustae, 7.5 mm. diametro. *Cupulae* ternatim sessiles, juniores glandem praeter stylos 3-4 erectos obtgentes; squamae elongate acute spiniformes, 6-7 mm. longae, superiores erectae apice incurvae, inferiores valde recurvae. *Glans* matura hemisphaerica, cupula usque duas partes oblecta, pallide brunnea, glabra, cicatrice basali circiter 1.5 cm. diametro. *Cupula matura* ore circiter 1.5 cm. diametro, 1.3 cm. alta.

PAYAP. Doi Angka, c. 1400 m., in open evergreen forest, Kerr 5340 (type).

Lithocarpus intermedius Barnett, sp. nov.; *L. spicato* (Smith) Rehd. et Wils. atque *L. fenestrato* (Roxb.) Rehd. affinis, a priore foliis subtus breviter pubescentibus, nervis lateralibus a costa angulo acutius ortis, squamis cupulinis vix lamellatis haud umbonatis apicibus acutius liberis, a posteriore stylis brevibus, glandis cicatrice lata manifeste concava, cupulae squamarum apicibus brevibus haud reflexis distinguenda.

Arbor 15-20 m. alta (ex Kerr). *Ramuli* fusco-cano-puberuli, serius minute lenticellati. *Folia* coriacea, elliptico-lanceolata vel ovato-lanceolata, apice acuminato-caudata, basi cuneato-acuta, margine integra, undulata, supra glabra, juniora cinereo-viridia, serius magis brunnea, subtus pallida, minute pubescentia, 8-24 cm. longa, 2.4-6.9 cm. lata, costa utrinque elevata, nervis lateralibus 11-17-jugis leviter elevatis supra manifestis usque indistinctis subtus prominentibus usque ad marginem leviter arcuatis vel rectis ibique abrupte curvatis; petioli supra plani, 1.3-1.8 cm. longi. *Spicae* erectae, in fasciculos axillares vel paniculas terminales dispositae, graciles, pallide fulvo-pubescentes, usque 11 cm. longae, meris masculae vel basi feminae apice masculae.

3L
Im 56, N38
N38



Flores masculi in fasciculos densos dispositi, bractea longe acuminata; perianthii segmenta 3 + 3; stamina 12, 6 exteriora perianthio adnata, interiora jugo infra pistillodium magnum hirsutum sito adnata; staminum juniorum filamenta crassa, serius gracilia. *Flores feminei* in fasciculos 3-floros subremotos ut masculi bracteatos dispositi; styli erecti, breves, haud 1 mm. longi; stamina parva suppetentia. *Spicae fructiferae* usque circiter 18 cm. longae; robustae, minute lenticellatae, crebre fructiferae; fructus abortu singuli vel binatim ternatimve plus minus concreti. *Cupula* junior glandem glabrum nitentem usque duas partes vel ultra obtegens, matura hypocrateriformis circiter 0.7 cm. alta, ore tenuis circiter 2 cm. diametro, squamis imbricatis late ovato-triangularibus basi concretis arcte adpressis apicibus acutis liberis. *Glans* hemisphaericoglobosa, minute apiculata, circiter 2-2.5 cm. diametro, 1.5 cm. alta, cicatrice altiuscule concava circiter 1.5-1.6 cm. diametro.

PAYAP. Chiangmai, Doi Sutep, 900 m., in evergreen jungle, *Kerr* 3439; Me Teng, 700 m., mixed deciduous forest, *Kerr* 6483 (type).

PUKET. Ao Luk (Krabi), 50 m., evergreen forest, *Kerr* 18560. Talang, 200 m., evergreen forest, *Kerr* 17452. Takuapa, Bangwan, c. 10 m., scrub, *Kerr* 17084.

King refers specimens of this species from Maymyo, Burma, to *Quercus fenestrata* Roxb. He says, "In a few (i.e., specimens of *Q. fenestrata*) the upper third, and in an extremely small number the upper half, of the glans is naked. The latter somewhat resemble the fruit of *Q. spicata* Smith."

For the reasons given above I think this is definitely a distinct species, although it has undoubtedly affinities with both *fenestrata* and *spicata*.

***Lithocarpus rufescens* Barnett**, sp. nov.; *L. Falconeri* (Kurz) Barnett* affinis, sed foliis multo minoribus, nervis lateralibus gracilibus supra indistinctis, glande magis globosa apice depressa manifeste rubro-granulari-pubescente nec glabra differt.

Arbor circiter 15 m. alta (ex *Kerr*). *Ramuli* juniores graciles, costati, rubro-brunneo- et cinereo-pubescentes, serius glabri lenticellati. *Folia* anguste elliptica vel leviter oblanceolata, interdum obliqua, apice acuta vel leviter acuminata, in basin acutam angustata, papyracea, margine integra, 9.9-16.2 cm. longa, 3.2-4.4 cm. lata, supra pallida glabra, subtus vestigiis sparsis pubescentiae rubrae fere lepidotae induta, demum glabrescentia, nervis lateralibus gracilibus, circiter 13-jugis, manifeste ante marginem arcuantibus eique parallelis percurrentibus, apicalibus arcuatim anastomosantibus, subtus prominentibus, supra indistinctis, nervis transversis utrinque indistinctis; petioli usque 0.9 cm. longi, sicut ramuli rubido- et cinereo-pubescentes. *Spicae masculae* in ramulis junioribus axillares, graciles, ramosae, griseo-pubescentes, foliis breviores. *Flores* ternatim crebre aggregati; bractea triangularis, basi crassa, in acumen tenue attenuata, apice brunnea, extra pubescens;

bracteolae 2, parvae, scariosae, triangulares, breviter apiculatae perianthii segmenta 6, crassiuscula, extra hirsuta; stamina 12 antheris parvis rotundis rubro-brunneis; pistillodium magnum hirsutum. *Flores feminei* haud visi. *Fructus* in rhachi robusti simplici sessiles, plerumque singuli, interdum fructus immaturus cum cupula matura concretus; cupula junior glandem (praeter stylos divergentes) obtegens, circiter 1 mm. longa; cupula matura hemisphaerica, circiter tertiam partem glandis obtegens, rubido-granulari-pubescentis, squamis late ovatis acutis griseo-pubescentibus ore tenui circiter 1.8-1.9 cm. diametro, circiter 1 cm. alta. *Glans* rubido-brunneo-puberula, globoso-ovoidea, 2.1 cm. alta, 2.2 cm. lata, apice leviter depressa, brevissime apiculata, cicatrice plana circiter 1.2 cm. diametro.

PATTANI. Bachaw, c. 50 m., in evergreen forest, *Kerr*, 7218 (type).

***Lithocarpus Craibianus* Barnett**, sp. nov.; *L. fenestrato* (Roxb.) Rehd. et *L. truncato* (King) Rehd. et Wils. similis, a priore foliis densius pubescentibus, cupula crassiore, glande pubescente et cicatrice multo majore, a posteriore fructu globoso magis quam turbinato, glande conica apice haud applanata, cicatrice pro rata minore, differt.

Arbor parva vel mediocris, 6-10 m. alta (ex *Kerr*). *Ramuli* robusti, costati, fusco-griseo-pubescentes, serius glabri lenticellis conspicuis irregulariter aggregatis. *Folia* coriacea, elliptica vel elliptico-lanceolata vel ovato-lanceolata, apice acuminata vel caudata, basi angustata acuta vel subrotundata, 12-16.5 cm. longa, 3.6-5.3 cm. lata, margine integra, supra glabra plus minus nitida siccitate plus minus rubido-brunnea, subtus pallida dense sed breviter pubescentia, costa utrinque elevata prominente, nervis lateralibus 11-14-jugis supra leviter elevatis vel impressis subtus rubido-brunneis prominentibus marginem versus arcuatis ibique procurvis apicem folii versus arcuatim anastomosantibus; petioli 1.3-2 cm. longi. *Spicae masculae* fulvo-pubescentes, graciles, axillares, breviusculae; flores plerumque ternatim aggregati, bractea triangulari longe acuminata, perianthio 6-lobo extra pubescente intus sparse hirsuto, staminibus circiter 12 filamentis pubescentibus, pistillodio magno villosa. *Spicae femineae* robustae, fulvo-pubescentes, axillares vel in paniculas terminales pauciramosas dispositae, interdum flores paucos masculos cum glomerulis femineis interspersos gerentes. *Flores* ternatim aggregati, bractea late ovata acuminata, stylis 3 circiter 1 mm. longis divergentibus. *Cupulae juniores* glandem praeter stylos exsertos includentes, singulae vel binatim ternatimve conatae, squamis circa os distinctis acuminatis incurvatis. *Cupula matura* globosa vel globoso-conica, glandem includens, saepe rubida, crassiuscula, intus praecipue apicem versus sericeo-pubescentis, circiter 1.7 cm. alta, 1.4 cm. lata. *Glans* (matura?) conica vel hemisphaerico-conica, cano-puberula, cicatrice dimidia glandis altitudine.

* Comb. nov.

PAYAP. Chiangmai, Doi Suteh, 1500-1700 m., in open grassy jungle, Kerr 140 (type), 708.

Lithocarpus pattaniensis Barnett, sp. nov.; affinis *L. encleisocarpo* (Korth.) A. Camus, sed foliis coriaceis, nervis lateralibus numerosioribus haud arcuatis, nervis transversis distinctis regularibus parallelis, fructibus magis turbinatis in basin angustatis, floribus masculis plerumque singulis differt.

Arbor circiter 20 m. alta (ex Kerr). *Folia* ovato-lanceolata, ovata vel leviter obovata, coriacea, abrupte caudato-acuminata, 9-17 cm. longa, 4.7-7.5 cm. lata, supra glabra, nitida, fusco-rubido-brunnea, subtus pallida, breviter fulvo-pubescentia, costa utrinque elevata, nervis lateralibus 11-12-jugis supra leviter elevatis subtus prominentibus, nervis transversis distinctis arcte parallelis; petioli graciles, usque plus quam 2 cm. longi. *Spicae* in paniculas terminales vel axillares dispositae, pallide fulvo-pubescentes, usque 12 cm. longae; flores masculi singuli vel raro bini ternive; bractaeae 3, centralis lanceolata acuta, laterales ovatae acutae, omnes crassiusculae; perianthium alte cupulare, circiter 0.25 cm. altum, usque circiter tertiam partem 6-lobum, extra leviter cano-pubescentia, intus pilosum; stamina 12, filamentis longissimis circiter 0.9 cm. longis circiter dimidio inferiore applanatis, pistillodio magno fulvo-villoso fere aequae alto ac perianthium. *Spicae femineae* ut masculae pubescentes; flores singuli, bractea minima lineari acuta; perianthium 6-lobum, recurvatum; styli breves, erecti, ultra perianthium circiter 0.6 mm. tantum exserti, plerumque 6. *Spicae fructiferae* puberulae, usque 12 cm. longae, 0.5 cm. diametro, lenticellis brunneis valde inconspicuis. *Fructus* singuli, pedicello circiter 0.5 cm. longo. *Cupula* (?) matura) globoso-turbinata, in basin angustata, glandem praeter umbonem exsertum obtegens, lamellis valde obscuris et irregularibus, tenuis sed haud papyracea, 1.5 cm. alta, 1.8 cm. lata. *Glans* hemisphaerico-conica, distincte apiculata, laete fulvo-sericeo-pubescentia, cicatrice alte concava.

PATTANI. Betong, Gunong Ina, c. 1100 m., in evergreen forest, Kerr 7583 (type).

Lithocarpus aggregatus Barnett, sp. nov.; *L. encleisocarpo* (Korth.) A. Camus var. *aperto* (King) A. Camus affinis, sed foliis coriaceis, nervis lateralibus e costa angulo acutiore exortis ad marginem recte percurrentibus, nervis transversis regularibus parallelis, spicis fructiferis lenticellis magnis albis conspicuis instructis, cupula crassa nec papyracea, glandis cicatrice magna convexa vel fere plana differt.

Arbor sempervirens, 12-30 m. alta (ex Kerr). *Ramuli* juniores graciles, lepidoto-pubescentes vel glabri, serius conspicue lenticellati. *Folia* coriacea, elliptico-lanceolata vel ovato-lanceolata, apice acuminata, basi cuneata, 9.2-12 cm. (et ultra) longa, 3.5-8.1 cm. lata, supra rubido-brunnea plus minus nitida, subtus dense

cano-pubescentia, costa utrinque prominente, nervis lateralibus 9-11-jugis supra elevatis subtus prominentibus ad marginem recte percurrentibus ibique distincte curvatis, nervis transversis distinctis regularibus parallelis; petioli graciles, 1.5-2 cm. longi. *Spicae floriferae* haud visae. *Spicae fructiferae* crassissimae, circiter 0.8 cm. diametro, breves, usque circiter 8 cm. longae, conspicue lenticellatae; fructus stipati, abortu singuli vel saepius bini ternive in pedunculo communi 0.5-1 cm. (et ultra) longo dispositi. *Cupula junior* glandem (praeter umbonem cum stylis 3 brevibus usque 0.5 mm. longis exsertum) obtegens. *Cupula matura* breviter cupularis, dimidiam glandem obtegens, margine super glandis apicem incurvo, lamellis distinctis 5 basin versus subdistantibus compluribus circa os plus minus concretis, crassa, extra cano-pubescentia, intus glabra, circiter 2.2 cm. diametro, 1.1 cm. alta. *Glans* hemisphaerica, apice conica, apiculata, stylis persistentibus brevibus divergentibus, 2.5 cm. diametro, 2 cm. alta, cicatrice convexa vel plana fere 2 cm. diametro.

PAYAP. Doi Angka, c. 2100 m., in evergreen forest, Kerr 5301; Doi Suteh, 1200-1500 m., common in evergreen jungle, Kerr 3364 (type).

Castanopsis purpurea Barnett, sp. nov.; *C. armatae* Roxb. affinis, sed foliis crassius coriaceis subtus breviter pubescentibus, nervis lateralibus numerosioribus (in *C. armata* 6-8, in hac specie 10-12-jugis), cupula subpedicellata spinis longioribus, glandis cicatrice haud ultra tertiam partem glandis maturae expansa differt.

Arbor circiter 20 m. alta (ex Kerr). *Ramuli* glabri, purpurascens, manifeste lenticellati; gemmae hiemales ovoideo-globosae, perulis exterioribus glabris late ovatis rotundatis. *Folia* coriacea, elliptica vel elliptico-lanceolata vel ovato-lanceolata, breviter acuminata ipso apice subrotundata, basi cuneata vel rotundata, margine integra, 12-23 cm. longa, 4.7-5.1 cm. lata, supra glabra, obscure viridia, plus minus nitida, subtus puberula pilis brevissimis fulvis, costa supra leviter elevata subtus prominente, nervis lateralibus gracilibus supra subtusque elevatis circiter 10-12-jugis usque ad marginem sensim curvatis secusque eum ramosis atque arcuatim anastomosantibus, nervis transversis irregularibus supra manifestis subtus subindistinctis. *Spicae masculae* paniculatae, floribus ternatim aggregatis et bractea lata suborbiculari et bracteolis 2 minoribus et squama adaxiali cinctis; perianthium alte 6-7-lobum, lobis obovatis ciliatis, staminibus 12-14, pistillodio parvo alte lobato. *Spicae femineae* simplices, manifeste rugulosae, fulvo-pubescentes, usque 20 cm. longae, floribus dissite ternatim aggregatis, bractea lata ovata acuminato-acuta subtus pilosa, squamis cupulinis et perianthio tomentosis, stylis 3 brevibus circiter 0.5 mm. longis. *Fructus* globosus, obliquus, breviter pedicellatus, pedicello incluso circiter 3.5 cm. altus, circiter 3-4 cinereo-pubescentia, spinis robustis ramosis in verticillos 3-4

regulares dispositis apice pallido glabro excepto pubescentibus -1.5 cm. longis; nuces 1-3, ovoideae vel complanatae, apice rufo-tilosae, inferne glabrescentes, circiter 2.2 cm. diametro, cicatrice magna convexa basali circiter 2.1 cm. diametro.

PUKET. Trang, Sikao, under 50 m., light evergreen forest, Kerr 19011 (type); Satul, under 5 m., Kerr 13675.

Flower description from Kerr 13675.

XVI—NOTES ON CAREX: III.* E. NELMES.

THREE ALLIED PACIFIC SPECIES.

In Flora 58, 123 (1875), Boeckeler described a new species of *Carex* from Fiji as *C. Graeffeana*. His description was based on an undated gathering made by Dr. Graeffe on the island of Ovalau. According to a statement at the end of the description that specimen was then in Herb. Luerissen. The type, or authentic material from the same gathering, was presented to Kew in 1880, when Luerissen's herbarium appears to have been dispersed. The Kew specimen consists of a single culm, in an immature, flowering state, as indicated in Boeckeler's description of the utricles.

Miss L. S. Gibbs, in 1907, and W. Greenwood, in 1920, collected good fruiting material of this sedge in Fiji, and from this a more complete description has been drawn up.

There are two good fruiting specimens of a variety of *C. Graeffeana* from Samoa in the Kew Herbarium. One of these is labelled "Samoa. Rev. S. J. Whitmee. Received May 1876." The other was collected by F. Vaupel at Mataana [Matavanu?] in 1905. It was the excellence of the Vaupel specimen and the fact that it had lain so long unidentified in the Kew Herbarium that led to this investigation. Two further specimens from Samoa, both in a flowering condition, are at Kew, collected by E. Christophersen and E. P. Hume, of the Bernice P. Bishop Museum, Honolulu, in July 1931. Before being presented to Kew these two sheets had been determined by G. Kükenthal as *C. Graeffeana*. Compared with the Fijian material, that from Samoa differs in having broader leaves, larger spikes and utricles, sometimes a larger number of spikes to each culm, and more strongly nerved utricles.

A similar plant was collected by A. Loher in Benguet, Philippine Islands, between 1889 and 1898 (the specimen bears no date, but Loher resided in the Philippines for some years from 1889). This gathering, in ripe fruit, is at Kew, as well as eight others, some of which are also in fruit but others are immature. C. B. Clarke made short descriptive notes on the Loher sheet in 1898, including two suggested epithets. These were heavily scored out at some later date, and Clarke identified the plant in 1902 as *C. Graeffeana* Boeck.

Kükenthal, in his great monograph of the sedges in Das Pflanzenreich, 1909, gave a description, under the name *C. Graeffeana*,

based on Loher's plant from the Philippines. It is not surprising that he rather suspected the Philippine plant to be different from Boeckeler's Fijian *C. Graeffeana*, as the distance between the two groups of islands would indicate. In a note at the foot of his description, after stating that he had not seen Boeckeler's type, he writes:—"Descriptio supra data a planta Loheri n. 699 sumpta non omnino cum diagnosi plantae Graeffei congruit et forsan ad speciem alteram spectat." But he let the matter rest there.

Merrill and Merritt in their "Flora of Mount Pulog" [Luzon] (Philipp. Journ. Sci. 5, 335: 1910) under *C. Graeffeana* Boeck. state: "In the mossy forest, alt. about 2400 m. Widely distributed on the higher mountains of the Philippines; Fiji." However, in his enumeration of Philippine Plants, 1, 138 (1923), Merrill says, after citing a number of gatherings from the Philippines, "On the slopes in open spaces, along streams, and in the mossy forest, altitude 1600 to 2200 m. Samoa." He makes a similar statement in vol. 4: "*Carex Graeffeana* Boeck. is known only in the Philippines and Samoa."

Clarke, in his "Cyperaceae of the Philippines: a list of the species in the Kew Herbarium" (Philipp. Journ. Sci. Bot. 2, 107: 1907), has these references under the name *C. Graeffeana*: "Luzon, Benguet (699 Loher). Mindanao (1250 Copeland). Samoa."

Kükenthal, "Conspectus Cyperacearum insularum philippinensium: Cyperaceae-Caricoideae" (Philipp. Journ. Sci. Bot. 6, 62: 1911), gives additional references and ends: "Area: Fidschi Inseln."

A careful examination of the flowering and fruiting material at Kew and the British Museum has shown that the specimens collected in the Philippines and identified by various botanists as *Carex Graeffeana* Boeck. are those of a distinct but closely allied species. The name *C. philippinensis* is proposed for this, and a more complete description has been drawn up than that given by Kükenthal in Das Pflanzenreich under the name *C. Graeffeana*.

"*Carex Graeffeana* Boeck. is recorded from Fiji and the Philippines (Luzon, Negros, Leyte, Mindanao) and Java (Gedeh) between 1600 and 2200 m. alt. I here refer also Clemens 34297 from Borneo (Kinabalu)." This statement is made by van Steenis in his paper: "On the origin of the Malaysian mountain flora, pt. I," in Bull. Jard. Bot. Buitenzorg, sér. 3, 13, 198 (1934). This Clemens number is in the Kew Herbarium and examination shows it to be distinct from *C. Graeffeana* and *C. philippinensis*, but with them forming a closely interrelated group of the distigmatic *Eucarex*. It is named *C. exploratorium* in honour of Chaplain and Mrs. Clemens who discovered the plant together. I have not seen the plant referred to by van Steenis as occurring in Java.

It is not easy to see why Kükenthal placed *C. Graeffeana*, a species without a beak to the fruit and a native of the Pacific islands, in his section *Fecundae*, the other eleven members of which are all South or Central American, and have shortly beaked

*Continued from K.B. 1937, 473.

and mostly bidentate utricles. A much closer relationship would appear to be with the section *Acutae*, and probably near the subsection *Praelongae*.

Unless otherwise stated the specimens cited are in the Kew Herbarium.

CLAVIS SPECIERUM.

- A. Squamae utriculis sublongiores; folia 10 mm. lata; spicae 14, usque ad 11.5 cm. longae; utriculi 3 mm. longi, oblongo-elliptici, apice obtusi et erostrati.....*C. exploratorum*
- B. Squamae dimidiis utriculis sublongiores:
 - 1. Folia 4-5 mm. lata; spicae 9-18, usque ad 6 cm. longae; utriculi 2.75 mm. longi, obovati, erostrati, marginibus superne scabro-ciliati, apice obtusi.....*C. philippinensis*
 - 2. Folia 6-9 mm. lata; spicae 16-18, usque ad 11 cm. longae, 3.5 mm. latae; utriculi 1.75 mm. longi, ovato-elliptici, tenuiter nervati, in apicem laevem obtusum attenuati.....*C. Graeffeana*
 - 3. Folia usque ad 12 mm. lata; spicae 16-27, usque ad 8.5 cm. longae, 5 mm. latae; utriculi 2.5 mm. longi, elliptici, valde nervati, apice laeves et obtusi.....*C. Graeffeana* var. *samoënsis*

Carex exploratorum Nelm., sp. nov.

Culmi circiter 70 cm. alti, validi, triquetri, angulis praecipue superne scabridis. *Folia* culmos longe superantia, 10 mm. lata, coriacea, plana vel marginibus aliquid recurvata, scabrida. *Spicae* 14, 12 androgynaeceae* et 2 supremae minimae et mere masculae, parte mascula $\frac{1}{2}$ spicae aequante, infima basi spiciis pluribus masculis minimis praedita, aliquid composita, usque ad 11.5 cm. longae (pedunculo excluso) et 6 mm. latae, cylindricae, densiflorae, subapproximatae, superiores pedunculatae, inferiores longipedunculatae, pedunculis usque ad 12 cm. longis, angulis 2-3 scabris. *Bractaeae* evaginantes, inferiores foliaceae, inflorescentiam longe superantes, superiores breves et setaceae, marginibus scabrae, supremae squamiformes. *Squamae femineae* oblongo-trinervi in mucronem durum scabrum, inferiores in aristam planiusculam durum scabram excurrentes, utriculis sublongiores. *Utriculi* leviter oblique patentes, 3 mm. longi, 1.1 mm. lati, plurinerves, oblongo-elliptici, biconvexi (vel saepe abortivi et compresso-biconvexi), glabri vel furfuracei, straminei, basi rubido-brunnei et obtusi, in apicem obtusissimum leviter emarginatum erostratum desinentes. *Nux* obovata, minutissime papillosa, in

* The term *androgynaecea* is used here to denote a spike in which the upper flowers are male and the lower ones female (see footnote in K.B. 1937 355).

utriculo arcte (apice excepto) inclusa, biconvexa, apice minute obtuse mucronulata. *Stigmata* 2.

BRITISH NORTH BORNEO. Mt. Kinabalu; Penataran river, 1200 m., July 28, 1933, J. & M. S. Clemens 34297 (fruiting material).

Carex philippinensis Nelm., sp. nov.

Culmi usque ad 90 cm. alti, validi, angulis triquetris scabridis. *Folia* inflorescentiam longe superantia, 4-5 mm. lata, coriacea, plana vel marginibus scabridis aliquid revoluta. *Spicae* 9-18, androgynoeceae, parte mascula $\frac{1}{2}$ spicae aequante, usque ad 6 cm. longae (pedunculo excluso) et 6 mm. latae, erectae, cylindricae, densiflorae, superiores subapproximatae, breviter pedunculatae, inferiores magis distantes et longius pedunculatae, pedunculi usque ad 2.5 cm. longi, tenaci-flexiles, angulis scabris. *Bractaeae* evaginantes, inferiores foliaceae, inflorescentiam longe superantes, superiores breves et setaceae, marginibus scabrae, supremae squamiformes. *Squamae femineae* oblongo-obovatae, fusco-brunneae, e vitta mediana pallide trinervi in aristam planiusculam durum scabro-marginatam excurrentes, dimidiis utriculis sublongiores. *Utriculi* demum divaricati, 2.75 mm. longi, 1.3 mm. lati, 10-12-costati, obovati, biconvexi, glabri, fusci, in basin obtusam subabrupte contracti, marginibus superne scabro-ciliati, in apicem obtusissimum erostratum desinentes. *Nux* elliptica, minutissime papillosa, in utriculo arcte inclusa, biconvexa, brevissime rostrata. *Stigmata* 2.

PHILIPPINE ISLANDS. Luzon: Benguet, without date, *Loher* 699; Benguet, Baguio, March 1907, *Elmer* 8532; Benguet, May 1914, *Merrill* 9652 (Kew. et Mus. Brit.); Benguet, Pauai, April-June 1918, *Santos* in *Herb. Bur. Sci.* 31,742; Benguet, Mt. Simacoco, Oct. 1921, *Ramos & Edaño* in *Herb. Bur. Sci.* 40,342. Mindanao: Davao, Todaya, river bank, 810 m., Oct. 1904, *Copeland* in *Herb. Bur. Govt. Labs.* 1250; Davao, Todaya, Mt. Apo, Aug. 1909, *Elmer* 11,590 (Kew. et Mus. Brit.); Bukidnon, Mahilucot River, June-July 1920, *Ramos & Edaño* in *Herb. Bur. Sci.* 38,642. Negros: Negros Oriental, Dumaguete, Cuernos Mts., April 1908, *Elmer* 9842 (type, fruiting specimen) (Kew. et Mus. Brit.).

Carex Graeffeana Boeck. in *Flora*, 58, 123 (1875).

Culmi usque ad 1 m. alti, validi, angulis triquetris scabridis. *Folia* inflorescentiam longe superantia, 6-9 mm. lata, coriacea, plana vel marginibus aliquid recurvata, scabrida. *Spicae* 15-18, androgynoeceae (nonnunquam spicae 1 vel 2 supremae minimae et mere masculae), parte mascula $\frac{1}{2}$ spicae aequante, usque ad 11 cm. longae (pedunculo excluso) et 3.5 mm. latae, cylindricae, densiflorae, graciles, superiores subapproximatae et pedunculatae, inferiores magis distantes et longipedunculatae; pedunculi usque ad 9 cm. longi, graciles, tenaci-flexiles, angulis scabris. *Bractaeae* evaginantes, inferiores foliaceae, inflorescentiam longe superantes, superiores breves et setaceae, marginibus scabrae, bractaeae

summae squamiformes. *Squamae femineae* oblongo-ovatae, fusco-brunneae, e vitta mediana pallide trinervi in mucronem durum scabrum ultra apicem truncatum excurrentes, dimidiis utriculis sublongiores. *Utriculi* erecti, 1.75 mm. longi, 1 mm. lati, 10-12-nerves, elliptici, biconvexi, glabri, straminei, basi obtusi, in apicem brevem interdum leviter emarginatum laevem obtusum erostratum rubidum sensim desinentes. *Nux* late elliptica, minutissime papillosa, in utriculo arcte inclusa, compresso-biconvexa, apice minute obtuse mucronulata. *Stigmata* 2.

FIJI ISLANDS. Ovalau: Graeffe 1228 (? type, flowering specimen). Viti Levu: Nandarivatu, forest near the summit of Mt. Victoria, 1200 m., Sept. 1907, Gibbs 796 (Mus. Brit.); Lautoka, Mt. Evans, in wet places on the mountains, in big clumps, height 2-3 ft., Oct. 3, 1920, Greenwood 120.

var. *samoënsis* Nelmes, var. nov.

Folia usque ad 12 mm. lata; *spicae* 16-27, usque ad 8.5 cm. longae, 5 mm. latae; *utriculi* 2.5 mm. longi, elliptici, valde 18-20-nerves. *Nux* breviter stipitata, in rostrum breve desinens.

SAMOA ISLANDS. Samoa: without precise locality, received May 1876, Whitmee 27; without precise locality, received 1876 and 1877, Whitmee (Mus. Brit.). Savaii: Mataana [Matavanu?], 1600 m., Nov. 4, 1905, Vaupel 467 (type, fruiting specimen); above Matavanu, swamp in bottom of crater, c. 1500 m., July 29 & 30, 1931, Christophersen & Hume 2209, 2228 (ex B. P. Bishop Mus. Herb.).

XVII—ADDITIONS TO THE FLORA OF BORNEO AND OTHER MALAY ISLANDS: VI.* H. N. RIDLEY.

FLACOURTIACEAE.

Casearia Stapfiana Ridley, sp. nov., a *C. velutinos*a Ridley, cui affinis, ramis foliisque (nervis subtus exceptis) glabris, racemis longioribus, floribus paullo majoribus differt.

Arbor vel *frutex*. *Folia* chartacea, nervis exceptis glabra, ovata, breviter obtuse acuminata, basibus rotundatis vel breviter attenuatis, 19-20 cm. longa, 9 mm.-3 cm. lata, nervis 6-paribus subtus elevatis puberulis intra margines inarcuantibus supra depressis, nervis secundariis paucis, nervulis transversis parallelis horizontalibus subtus elevatis; petioli crassi, supra canaliculati, 5 mm. longi. *Flores* in racemos crassos 5 mm. longos 4-angulatos in capitulis axillaribus dense congestos dispositi. *Bractae* ovatae, obtusae, densae, persistentes. *Pedicelli* 2 mm. longi. *Sepala* 5, ovata, obtusa, 2 mm. longa. *Stamina* basi connata, 5 exteriora longiora, 5 interiora breviora, filamentis brevibus, antheris oblongis. *Ovarium* ovoideum, hirtum, ovulis pluribus. *Stylus* crassus, stigmatibus subglobosis.

* Continued from K.B. 1936, 21.

SARAWAK. Kuching, Haviland 1669 (type), Haviland & Hose 3581.

This closely resembles *C. latifolia* Ridley, of the Malay Peninsula, but the nerves beneath are pubescent and the nervules are parallel and transverse as they are in *C. velutinos*a Ridley, from which it differs in the absence of the velvety pubescence all over the whole plant.

Casearia Moultonii Ridley, sp. nov., a *C. leucolepis* Turcz., cui affinis, foliis oblongo-lanceolatis, nervis pubescentibus, floribus minoribus, squamis interstaminalibus longioribus pilosis differt.

Frutex vel *arbor*, ramis puberulis. *Folia* chartacea, laevia, subtus lucida (sicca brunnea), nervis exceptis glabra, oblongo-lanceolata, acuminata, basibus rotundatis inaequilateralibus, 12-14 cm. longa, 5.5-6 cm. lata, nervis 7-paribus subtus elevatis pilis albescentibus appressis, nervis secundariis paucis anastomosantibus; petioli 1.5 cm. longi, puberuli. *Flores* glabri, virides vel albi, in capitulis axillaribus congesti. *Bractae* ovatae, acutae. *Pedicelli* graciles, 1 mm. longi. *Sepala* 5, linearia, obtusa, 3 mm. longa, pubescentia. *Stamina* 10, basi connata, filamentis superne attenuatis glabris, antheris suborbicularibus, squamis oblongis hirtis alternantibus. *Ovarium* conicum, pubescens. *Stylus* cylindricus, glaber, stigmatibus discoideo.

SARAWAK. Near Kuching, perianth green, Haviland 3096 (type); summit of Mt. Murud, flowers white, J. C. Moulton 188.

This is allied to *C. leucolepis* Turcz., but differs in the form of the leaf, and the pubescence. The coronal scales alternating with the stamens are longer and the filaments are shorter.

Homalium caryophyllaceum Benth. in Journ. Proc. Linn. Soc. 4, 38 (1860). *H. frutescens* Warb. in Engl. u. Prantl, Nat. Pflanzenf. III. 6A, 36 (1893). *H. Hosei* Merrill in Philipp. Journ. Sci. 11, 98 (1916).

This abundant and widely spread small tree varies to some extent in the form, size and crenation of the foliage: hence it has received several names. *H. obovale* Miq. (Fl. Ind. Bat. Suppl. 334), of which there is a cotype scrap from Sumatra in Herb. Kew., differs so far as I can see only in being more hairy. The leaves are more distinctly obovate and deeply crenate serrate and very hairy beneath, and the hairs of the panicle are also longer. In all the numerous specimens of the typical plant I have seen there is no more than a slight pubescence underneath the leaf. *H. obovale* was obtained by Teysmann in the Lampongs, Sumatra, in which area I found the ordinary form. I imagine it is merely a local hairy variety.

The typical plant ranges from Siam and Cochinchina to the Malay Peninsula; Bangka, Sungei Liat, Teysmann; Sumatra, Batang Mandau, Siak river, Ridley 8971; Java, Zollinger 958; Sarawak, Beccari 705, 1152, 2686, Sarawak river, Haviland 184;

British North Borneo, Labuk Bay, Paku Paku river, *Ridley*, Sandakan, *Elmer* 20014, 20136, 20204, 20353, 20355; Dutch South East Borneo, Kapuas, *Teysmann*, Banjarmasin, *Motley* 211, 253; Celebes, Malili Angkona, *Neth. Ind. For. Service* bb. 19691.

Homalium calciphilum *Ridley*, sp. nov., ab *H. grandifolio* Benth., cui affinis, habitu multo minore, foliis ovatis coriaceis reticulatis, floribus minoribus, staminibus brevioribus, stylis quatuor differt.

Frutex gracilis vel arbor parva, floribus exceptis glabra. *Folia* coriacea, ovata, acuminata, basibus rotundatis, 6-11 cm. longa, 4-5 cm. lata, nervis 6 gracilibus utrinque exaltatis et conspicuis, nervulis transversis et reticulationibus conspicuis; petioli crassi, 4 mm. longi. *Racemi* 5-7 cm. longi, pubescenti-velutini. *Bracteae* 2 mm. longae, lanceolatae, acuminatae, caducae. *Pedicelli* velutini, 4 mm. longi. *Sepala* 8, lineari-lanceolata, velutina, 5 mm. longa. *Petala* 8, breviora, lanceolata, velutina, 2 mm. longa. *Stamina* circiter 32, filamentis gracilibus glabris brevioribus. *Ovarium* conicum, hirtum, stylis 4 brevibus.

SARAWAK. Mt. Braang, 450 m. alt., limestone, slender shrub, *Haviland* 92 (type); Mt. Buang, limestone, small tree, flowers pale, *Haviland* 2037.

This is allied to *H. grandiflorum* Benth. and seems to be a limestone derivative of that species. It differs in the more ovate coriaceous strongly reticulate leaves and smaller flowers with fewer stamens, 4 to each petal, and is a shrub or small tree, while *H. grandiflorum* is a stout tree 60-80 feet or more tall.

PASSIFLORACEAE.

The following species of *Adenia* are not recorded from Borneo in Merrill's list:—

Adenia acuminata (Bl.) Koorders.

SARAWAK, *Beccari* 789; Kuching, climber, flowers yellow, *Haviland* 3743.

DUTCH S.E. BORNEO. Banjarmasin, *Motley* 1167.

Adenia borneensis H. Hallier.

DUTCH S.E. BORNEO. Tikung, *Hallier* 891; Pemblangan, *Amdjah* 881.

Adenia cordifolia Engler.

BRIT. N. BORNEO. Tawao, Elphinstone Province, *Elmer* 21350.

Adenia populifolia (Bl.) Engler.

SARAWAK. *Beccari* 2155.

Adenia smilacina H. Hallier.

DUTCH S.E. BORNEO. Gunong Lebang, *Hallier* 379.

Adenia Clementis Merrill.

I found this British North Borneo plant on Mt. Matang in SARAWAK.

POLYGALACEAE.

Xanthophyllum glabrescens *Ridley*, sp. nov., a *X. puberulum* *Ridley*, cui affinis, inflorescentia ramis foliisque undique glabris, foliis minoribus, ovario glabro, filamentis subglabris differt.

Arbustula? glabra, ramis gracilibus. *Folia* elliptica, obtuse acuminata, basi cuneata, chartacea, glabra, 7-9 cm. longa, 3-5 cm. lata, nervis 5-paribus subtus elevatis inarcuantibus secundariis anastomosantibus; petioli crassi, canaliculati. *Racemi* glabri, subterminales, 9 cm. longi. *Pedicelli* 2 mm. longi. *Sepala* 5, oblonga, obtusa, tenuia, 4 mm. longa. *Petala* alba, elliptica, obtusa, unguiculata, 1 cm. longa, carina latiore brevior appresse sericea. *Stamina* breviora, filamentis linearibus subglabris. *Ovarium* parvum, globosum, glabrum, stipite longo.

SARAWAK. Baram River, *Hose* 38.

Allied closely to *X. puberulum* *Ridley*, of the Malay Peninsula, but quite glabrous, with smaller leaves; even the ovary is glabrous and the stamens have only a very few hairs.

Xanthophyllum pallidum *Ridley*, sp. nov., a *X. discolori* *Chodat*, cui affinis, foliis ovatis acutis laevibus nec subtus discoloribus, petiolis longioribus, floribus minoribus differt.

Frutex? glaber. *Folia* ovata, acuta, basi angustata, marginibus incrassatis, coriacea, glabra, siccitate pallide virescentia, 6-8 cm. longa, 2-5-4-5 cm. lata, nervis 7-paribus subtus elevatis, reticulationibus conspicuis elevatis; petioli 1 cm. longi. *Racemi* axillares et terminales, 4-5 cm. longi, pubescentes. *Flores* albi, remoti. *Pedicelli* 5 mm. longi, pubescentes. *Sepala* pubescentia, oblongo-lanceolata, 2 mm. longa. *Petala* lanceolata, unguiculata, obtusa, 5 mm. longa, carina latiore glabra. *Stamina* non visa. *Ovarium* ovoideum, breviter stipitatum, hirtum. *Stylus* hirtus.

SARAWAK. *Beccari* 729.

Allied to *X. discolor* *Chodat*, but the leaves are different in shape, petioles much longer and flowers smaller.

Xanthophyllum Hosei *Ridley*, sp. nov., a *X. cordato* *Korth.*, cui affinis, foliis ellipticis cuspidatis, basibus angustatis, nervis prominentibus in nervum intramarginalem inarcuantibus, floribus minoribus, calyce et rhachide puberulis nec sericeis, bracteis ovatis obtusis differt.

Arbor floribus exceptis glabra. *Folia* subcoriacea, elliptica vel oblonga, cuspidata (cuspidate obtusa 1 cm. longa 2 mm. lata), basibus obtuse angulatis, 15-20 cm. longa, 7-10 cm. lata, nervis subtus elevatis 6-paribus in nervum intramarginalem inarcuantibus, nervis secundariis paucis, nervulis transversis parallelis copiosis; petioli crassi, supra canaliculati, 5 mm. longi. *Panicula* subterminalis, rhachide puberula, racemis 4 vel 7, rhachidibus crassis angulatis puberulis 5-9 cm. longis. *Flores* 7 mm. longi, pedicellis 2 mm. longis puberulis. *Bracteae* ovatae, obtusae. *Sepala* oblongo-ovata,

obtusa, puberula, 2 mm. longa. *Petala* lanceolata, obtusa, marginibus minute ciliatis, 6 mm. longa, carina latiore. *Stamina* glabra, filamentis linearibus, antheris ellipticis. *Ovarium* glabrum. *Stylus* hirtus. *Drupa* globosa, rostrata, glabra, 5 mm. longa.

SARAWAK. Niah, *Haviland & Hose* 3157; Baram, *Hose* 311 (type).

Certainly allied to *X. cordatum* Korth., but the elliptic cuspidate leaves with narrowed base and very prominent nerves beneath, as well as the puberulous (not silky) calyces and rhachides and the blunt (not acute) bracts, distinguish it readily.

***Xanthophyllum molle* Ridley**, sp. nov., a *X. sulphureo* King, cui affinis, foliis minoribus tenuibus ellipticis basibus rotundatis subtus hirtis nervis paucioribus, racemis brevioribus paucifloris, floribus minoribus, ovariis dense longe hirtis differt.

Arbor, ramis pallide hirtis. *Folia* chartaceo-coriacea, elliptica, acuminata, basibus obtusis, supra glabra, subtus cinnamomea, costa nervisque rufescenti-hirtis, 6-12.2 cm. longa, 3-5 cm. lata, nervis 5-7-paribus; petioli dense rufo-hirti, 5 mm. longi. *Racemi* breves, graciles, pauciflori, axillares, rufo-puberuli, 5 cm. longi; pedicelli 3 mm. longi. *Bracteae* ovatae, acutae. *Sepala* ovato-lanceolata, puberula, 3 mm. longa. *Petala* lineari-spathulata, 1-2 cm. longa, carina spathulata glabra subaequilonga. *Stamina* breviora, glabra. *Ovarium* longe stipitatum, dense hirtum. *Stylus* basi crassus, hirtus, superne attenuatus, glaber, stigmatibus capitato.

SARAWAK. Niah, *Haviland & Hose* 3158.

Allied to *X. sulphureum* King, but a more slender plant with smaller thinner leaves with fewer nerves; the racemes are short and slender, and the flowers appear to be white.

***Xanthophyllum purpureum* Ridley**, sp. nov., a *X. sulphureo* King, cui affinis, foliis chartaceis ovatis vel lanceolatis cordatis, petiolis brevissimis, floribus purpureis differt.

Arbor, ramis dense hirtis. *Folia* ovata vel lanceolata, acuminata, acuta, basibus rotundatis cordatis, chartacea, supra glabra, 12-16 cm. lata, 3.5-8 cm. lata, costa et nervis 5-6-paribus elevatis subtus dense rufo-hirtis, reticulationibus laxis; petioli hirti, 2-5 mm. longi. *Racemi* axillares et subterminales, 4-5-6 cm. longi, pubescentes. *Flores* purpurei, pedicellis pubescentibus 2 mm. longis. *Sepala* 5, ovato-rotundata, 2 mm. longa, puberula. *Petala* lanceolata, unguiculata, obtusa, 1 cm. longa, carina longiore glabra. *Stamina* non visa. *Ovarium* subsessile, dense hirtum. *Stylus* basi hirtus, 1 cm. longus.

SARAWAK. Foot of Mt. Murud, flowers purple, *J. C. Moulton* 174.

Allied to *X. sulphureum* King, but the leaves are thinner and of different shape, red hairy beneath, with very short petioles, and the flowers are purple.

***Securidaca corymbosa* Turcz.**

SARAWAK. *Beccari* 807; Busau, *Haviland* 499; Pengkulu Ampat, *Haviland* 749; Rejang, Sibul, *Haviland* 2824.

GUTTIFERAE.

***Cratoxylon celebicum* Bl.** [*C. floribundum* (Turcz.) F.-Vill.].

SARAWAK. Path to Tegora, *Haviland* 510.

***Cratoxylon cochinchinense* (Lour.) Bl.** [*C. formosum* (Jack) Dyer] var. *calcareum* Ridley, var. nov.

Frutex. *Folia adulta* elliptica, obtusa, coriacea, subtus glauca, nervis inconspicuis, 4 cm. longa, 2 cm. lata. *Capsula* angusta, acuminata, 1 cm. longa.

SARAWAK. Mt. Start, 450 m. alt., limestone, *Haviland* 1463: "Shrub, leaves glaucous beneath. Petals pink."

Apparently this is a very reduced form of this widely distributed tree, due to its habitat on limestone mountains.

***Garcinia vidua* Ridley**, sp. nov., a *G. opaca* King, cui affinis, differt stigmatibus cerebriformi-rugosa, staminodiis in anulum ad basin ovarii connatis.

Arbor parva, ramis crassiusculis subangulatis canaliculatis. *Folia* rigida, coriacea, elliptico-ovata, cuspidata, 7-10 cm. longa, 3.5-5 cm. lata, cuspidate brevi obtusa, costa supra canaliculata subtus elevata, nervis copiosis parallelis supra inconspicuis subtus obscuris; petioli crassi, 5 mm.-1 cm. longi. *Flores masculi* in axillis congesti, subsessiles. *Bracteae* persistentes, ovatae, coriaceae. *Sepala* 4, ovata, coriacea, 2 mm. longa. *Petala* 4, oblongo-ovata, 5 mm. longa. *Androeceum* globosum, sessile, antheris sessilibus oblongis longitudinaliter dehiscentibus. *Flores feminei* in axillis singuli, pedicellis 3 mm. longis. *Sepala* 4, breviter, ovata. *Petala* 4, oblonga, coriacea, 5 mm. longa. *Ovarium* globosum, 4-loculare, stigmatibus cerebriformi-rugosa. *Staminodia* 16, in anulum brevem connata, antheris sterilibus planis. *Bacca* elliptica, 4 cm. longa, stigmatibus cerebriformi coronata.

SARAWAK. *Beccari* 1165 (fruit). Kuching, *Haviland* 2222 (♀ and fruit) (type), 2223 (♂).

***Garcinia calophyllifolia* Ridley**, sp. nov., a *G. picrorrhiza* Pierre, cui affinis, foliis coriaceis oblanceolatis breviter cuspidatis, nervis plurimis tenuibus parallelis differt.

Arbor, ramis superne angulatis. *Folia* elliptico-lanceolata, breviter obtuse cuspidata, basi attenuata, coriacea, 8-9 cm. longa, 3 cm. lata, costa in utraque pagina elevata crassiuscula, nervis tenuibus copiosis parallelis; petioli supra canaliculati, 5 mm. longi. *Cymae* axillares, 3-4-florae. *Pedunculus* quadrangularis, 2 mm. longus, ramis brevibus quadrangulatis. *Bracteae* minutae, ovatae, obtusae, persistentes. *Flores masculi*: *Pedicelli* 5 mm. longi. *Sepala* externa breviter, rotundata, interna majora, coriacea, rotundata, 2 mm. longa.

Petala tenuia, alba, rotundato-oblonga, 3 mm. longa. *Stamina* in fasciculis 4, antheris rotundatis bilocularibus in margine summo superne fissis. *Pistillodium* globosum, stigmate latiore integro sessili pulvinato carnosio. *Flores feminei* et *fructus* non visi.

SARAWAK. Near Kuching, *Haviland* 2341.

Garcinia caudiculata Ridley, sp. nov., a *G. dryobalanoide* Pierre, cui affinis, foliis tenuibus, nervis conspicuis, sepalis majoribus, ovario globoso, fasciculis staminum oblongis basi connatis, antheris in facie interna pluribus, loculis globosis differt.

Arbor parva, 3-metralis. *Folia* elliptica vel lanceolata, cuspidata, cuspidate lineari-obtusa 1.5 cm. longa 1 mm. lata, basi cuneata, chartacea, 9-15 cm. longa, 3-5 cm. lata, nervis plurimis parallelis conspicuis, intramarginali tenui; petioli 5 mm. longi. *Panicula* gracilis, axillaris, pauciflora, 2-2.5 cm. longa. *Bractee* ovatae, acutae, minutae. *Pedicelli* 1 cm. longi. *Alabastra* globosa. *Sepala* 4, majora, rotundato-ovata, 2 mm. longa. *Petala* 4, oblongo-ovata, apice rotundata, flavo-viridia. *Flores masculi*: *Stamina* in fasciculos 4 oblongos latos complanatos truncatos basi connatis, antheris circiter 10 in facie interna, loculis globosis. *Pistillodium* globosum, stigmate magno sessili discoideo-pulvinato laevi. *Flores feminei* similes, staminodiis nullis, ovario majore. *Bacca* fusiformis, elliptica, ad basin et apicem attenuata, 3 cm. longa, 1.5 cm. crassa, stigmate orbiculari 2 mm. lato, in pedicello 2 cm. longo.

SARAWAK. Kuching, small tree 10 feet tall, flowers yellowish green, *Haviland* c.e.b.a., 491 (= 19) (type), 963, 1012, 1696; *Haviland & Hose* " = 1696Z," 3164, 3347K.

BRIT. N. BORNEO. Mount Kalawat, *Clemens* 11141; Labuan, *Molley* 206.

This small tree much resembles *G. stigmacanthe* Pierre in its leaves and female flowers, but that plant (only known from very poor female specimens) has no intramarginal nerve in the leaves, and the stigma is distinctly papillose. The oblong truncate stamen-fascicles, connate at the base, with few anthers on the inner face chiefly at the upper part, and the fusiform fruit, are peculiar.

Garcinia lanceola Ridley, sp. nov., a *G. merguensi* Wight, cui affinis, foliis elliptico-lanceolatis coriaceis, floribus minoribus, fasciculis staminum gracilioribus, pistillodiis cylindricis, stigmatibus discoideis differt.

Arbor parva, ramulis subangulatis. *Folia* elliptico-lanceolata vel lanceolata, acuminata, obtusa, basi angustata, coriacea, 5-10 cm. longa, 1.5-4.5 cm. lata, nervis copiosis parallelis tenuibus inconspicuis, costa subtus elevata; petioli crassiusculi, 5 mm.-1 cm. longi. *Panicula* axillaris, 5-6-flora, 1.7 cm. longa, pedunculis ramisque crassis angulatis. *Bractee* ovatae, acutae, minutae. *Pedicelli* 4-7 mm. longi. *Sepala* 4, brevia, ovato-rotundata, 2 mm. longa. *Petala* 4, ovata, apice rotundata, basi angustata, extra

flava, intus alba. *Flores masculi*: *Stamina* in fasciculis 4, petal breviora, stipitibus linearibus cariosis, antheris circiter 30, locul globosis apice fusis. *Pistillodium* cylindricum, stigmate discoide majusculo. *Flores feminei* et *fructus* non visi.

SARAWAK: Kuching, *Haviland* 2114 (type), 2115: "Small tree. Calyx yellow without, white within."

This is allied to *G. merguensis* Wight, of the Malay Peninsula but the leaves are thicker and more fleshy, lanceolate acuminate. The flowers are rather smaller, and the stipites of the fascicles of the stamens taller and more slender with the anthers at the tips only. The pistillode is as large as the stipites. I suppose *Haviland*' note of the colouring of the flower refers to the corolla rather than the small calyx.

Garcinia memecyloldes Ridley, sp. nov., a *G. sarawhensi* Pierre cui affinis, foliis lanceolatis angustis, floribus minoribus racemosis pedicellis brevibus, staminodiis latis differt.

Frutex? ramis gracilibus. *Folia* lanceolata, longe acuminata obtusa, basi cuneata, sicca pallide virescentia, chartaceo-coriacea 4.5-6 cm. longa, 1-1.5 cm. lata, nervis 7-paribus ferme omnino obscuris; petioli 4 mm. longi. *Flores masculi* non visi. *Flores feminei* pauci, minuti, in racemis brevibus axillaribus 2 mm. longis. *Pedunculi* crassiusculi, 1 mm. longi. *Bractee* ovatae, acutae. *Sepala* 4, rotundata, 1 mm. longa. *Petala* tenuiora, rotundata subaequilonga. *Ovarium* oblongum, stigmate late pulviniformi. *Staminodia* in fasciculis 4, ovario breviora, oblonga, lata, marginibus lobatis.

SARAWAK. Mt. Koum, limestone, *Haviland* 2216/1724.

The narrow, lanceolate, rather thin, almost nerveless leaves and minute axillary racemes of very few minute flowers distinguish this plant from all others in the genus. I can see no anthers on the staminodes but the only flowers are very young.

Garcinia umbellulata Ridley, sp. nov., a *G. sarawhensi* Pierre cui affinis, foliis obovatis, pedicellis longioribus gracilibus, bacca multo majore differt.

Arbor parva. *Folia* obovata, basi attenuata, cuspidata, cuspid lineari obtusa 5 mm. longa 2 mm. lata, coriacea, 6 cm. longa 5-5 cm. lata, costa in utraque pagina elevata, nervis plurimis parallelis inconspicuis. *Flores* in axillis umbellati, pedunculo 1 cm. longo. *Pedicelli* 1 cm. longi. *Sepala* 4, ovata, acuta, 3 mm. longa. *Petala* 4, rotundata. *Stamina* (in masculis) in fasciculis 4, stipitibus linearibus, antheris pluribus in marginibus, loculis divisis apice fissis. *Pistillodium* subcylindricum, stigmate disciformi. *Ovarium* (in femineis) obconicum, 2 mm. longum. *Stigma* planum, in medio transversim profunde fissum. *Bacca* globosa, bilocularis, 2 cm. longa, in pedicello crasso 1 cm. longo.

SARAWAK. Near Kuching, small tree, *Haviland* 2220 (♂ 2221 (♀, type).

Garcinia minimiflora Ridley, sp. nov., a *G. sarawhensi* Pierre, cui affinis, foliis minoribus, nervis copiosis approximatis, floribus minutis, pedicellis longioribus gracilibus differt.

Frutex. Folia elliptica, cuspidata, basi cuneata, cuspidate lineari obtusa 7 mm. longa ferme 2 mm. lata, coriacea, 3.5–5 cm. longa, 1.5–2 cm. lata, nervis copiosis parallelis inconspicuis; petioli 2–5 mm. longi. Flores masculi non visi. Flores feminei virescenti-flavi, minuti, in umbellis axillaribus, pedunculo crassiusculo 3 mm. longo. Pedicelli 5 mm. longi, graciles. Sepala 4, brevia, rotundata. Petala 4, rotundata, 1 mm. longa. Staminodia fasciculata, oblonga, antherarum loculis globosis.

SARAWAK. Beccari 3612; path to Matang, Haviland c.l.l.c. (type): "Shrub; flowers small, greenish yellow."

This is certainly allied to *G. sarawhensis* Pierre in its umbellate flowers on long stalks on a short axillary peduncle, but the flowers are much smaller; indeed, I think the most minute in the genus.

Garcinia Havilandii Stapf.

The male plant of this species was described by Stapf (Trans. Linn. Soc. Bot. 4, 32) from a specimen collected by Haviland at Kiau on Mt. Kinabalu. Haviland also, however, collected what is evidently the female tree at Rejang Belaga in SARAWAK (no. 211). This specimen differs in the leaves possessing slender cusps 2.2 cm. long and 1 mm. wide. The female flowers resemble those of the male but are flatter at the top when in bud. The ovary has a round flat papillose top with minute 6-lobed stigma and it is surrounded at the base with a low androecial annulus with very numerous lobes, the abortive anthers.

Calophyllum pustulatum Ridley, sp. nov., a *C. venusto* King, cui affinis, foliis tenuibus multo longioribus acuminatis cuspidatis, panícula laxa, petalis tenuioribus, filamentis capillaribus, antheris globosis differt.

Arbor, ramis pustulatis. Folia elliptico-lanceolata, acuminato-cuspidata, cuspidate acuta 1 cm. longa, basi cuneata, coriacea, 8–13 cm. longa, 3–5 cm. lata, nervis pluribus tenuibus subtus elevatis; petioli crassi, rugosi, 4 mm. longi. Panícula terminalis, multiflora, laxa, 6–7 cm. longa, 5–6 cm. lata. Flores albi, 2–3 in apicibus ramulorum pustulorum congesti. Pedicelli 2 mm. longi. Sepala 4, rotundata, 4 mm. longa. Petala obovata, apice rotundata, deflexa, 5 mm. longa. Stamina copiosa, 5 mm. longa, filamentis capillaribus, antheris subglobosis. Stylus gracilis, longior.

SARAWAK. Near Kuching, tree, petals white, Haviland 2117.

Calophyllum elegans Ridley, sp. nov., a *C. venusto* King, cui affinis, floribus minoribus, paniculis laxis, sepalis petalisque multo minoribus, pedicellis longioribus tenuibus differt.

Arbor magna, glabra. Perulae breves, triangulares. Folia obovata vel elliptica, obtusa, basi attenuata, decurrentia, 4–6.5 cm.

longa, 2.5–3.5 cm. lata, rigide coriacea, costa utrinque elevata, nervi copiosis subhorizontalibus; petioli 1 cm. longi. Paniculae sub terminales et axillares, laxae, plures, 8–10-florae, 4–5 cm. longae. Flores albi, in paribus oppositis dissitis. Pedicelli graciles, 1.4 cm. longi. Sepala 4, alba, 2 exteriora rotundata, 2 tenuia, oblonga, obtusa, 6 mm. longa. Petala 3, oblongo-subspathulata, obtusa, 9 mm. longa. Stamina breviora, antheris brevibus ellipticis.

SARAWAK. Near Kuching, Haviland 968: "Large tree. Sepals white, petaloid."

This beautiful tree is clearly allied to *C. venustum* King, a small tree of the mountains of the Malay Peninsula, but the panicle is more lax and slender, the flowers much smaller, and the sepals longer and narrower and thin textured.

Calophyllum cuspidatum Ridley, sp. nov., a *C. venusto* King, cui affinis, foliis tenuibus lanceolatis longe cuspidatis, floribus paucioribus, petalis oblongis differt.

Arbor, ramulis gracilibus. Perulae triangulatae, rufo-furfuraceae. Folia elliptico-lanceolata, marginibus sinuatis, cuspidata, cuspidate obtusa 7 mm. longa, basi attenuata, chartacea, 4–6 cm. longa, 2–2.3 cm. lata, nervis copiosis subascendentibus; petioli 5 mm. longi. Paniculae axillares et subterminales, pauciflorae, 4 cm. longae, ramis paucis gracilibus 2 cm. longis. Pedicelli 7 mm. longi. Sepala 2 exteriora ovata, obtusa, 3 mm. longa, interiora oblonga, obtusa, 5 mm. longa. Petala tenuiora, oblonga, obtusa, 7 mm. longa. Stamina 6 mm. longa, antheris ellipticis.

SARAWAK. Baram, Hose 37.

Calophyllum Benjamina Ridley, sp. nov., a *C. venusto* King, cui affinis, foliis lanceolatis acuminatis, nervis ascendentibus nec subhorizontalibus, sepalis 2 rotundato-ovatis 2 latioribus et longioribus differt.

Arbor glabra, ramulis vix angulatis. Folia remota, lanceolata, saepe longe obtuse acuminata, basi longe attenuata, 6–7 cm. longa, 2–3 cm. lata, costa tenui elevata, nervis copiosis ascendentibus tenuissimis; petioli 1 cm. longi. Panícula subterminalis, laxa, patens, 7–10 cm. longa. Pedicelli graciles, 1–2 cm. longi. Flores in paribus remotis oppositi, circiter 7. Sepala 2 exteriora ovata, rotundata, 2 interiora majora, oblonga, obtusa, 5 mm. longa. Petala oblonga, obtusa, 7 mm. longa. Stamina breviora, 4 mm. longa, antheris ellipticis 1 mm. longis.

BRUNEI. Limbang, Haviland 505.

This is clearly allied to *C. venustum* King, but is distinct in the long-petioled long acuminate leaves with ascending nerves rising towards the top at an acute angle, suggesting a resemblance to those of *Ficus Benjamina* L. The panicles are lax with few flowers, about seven, which however are large.

Calophyllum fragrans Ridley, sp. nov., a *C. retuso* Wall., cui affinis, pedicellis multo longioribus, paniculis majoribus glabris, floribus majoribus differt.

Arbor. Folia obovata, apice rotundata, basi angustata, rigide coriacea, 5-6 cm. longa, 3.5-4 cm. lata, nervis subascendentibus; petioli supra canaliculati, 5 mm.-1 cm. longi. Paniculae ex axillis summis congestae, multiflorae, 5 cm. longae. Pedicelli graciles, glabri, 1.5 cm. longi. Sepala exteriora ovata, breviter, interiora oblonga, apicibus rotundatis ciliatis, 5 mm. longa. Petala nulla. Stamina breviora, 4 mm. longa, antheris oblongis truncatis. Ovarium conicum, glabrum.

SARAWAK. 2 miles from Kuching, Haviland 1812; Haviland & Hose 3355K (type): "Flowers sweet-scented. Sepals and petals white, stamens yellow."

This, as Stapf notes on the sheet of specimens, is very near *C. retusum* Wall., of Singapore, but the leaves are rather bigger and the pedicels very much longer, those of *C. retusum* being very short. The flowers are larger and the panicles wider and more spreading. There is almost a complete absence of the scurfiness so characteristic of *C. retusum*, but I can see in the panicle a faint trace of short hairs.

Calophyllum glaucescens Ridley, sp. nov., a *C. saigonensi* Pierre foliis oblongis crassioribus subtus glaucescentibus, nervis subtus ferme omnino obscuris differt.

Arbor parva, glabra, ramis cortice albescente tectis. Folia elliptica, subacuta, basi cuneata, rigide coriacea, supra laevia (sicca brunnea), subtus glaucescentia, 6-11 cm. longa, 4.5-6 cm. lata, costa crassiuscula elevata canaliculata, nervis supra obscuris subtus inconspicuis; petioli crassiusculi, 1 cm. longi. Racemi 3-5-flori, 2 cm. longi, ex axillis inferioribus. Bractae ovatae, 3 mm. longae. Pedicelli 1.5 cm. longi. Alabastra oblonga. Sepala 3, oblongo-ovata, apicibus rotundatis, tenuia, 5 mm. longa. Petala 2, subaequilonga, crassiora. Stamina petalis breviora, antheris lineari-oblongis. Ovarium ovoideo-oblongum. Stylus crassiusculus, stigmatibus rotundato obscure lobato.

SARAWAK. Near Kuching, a small tree, flowers white, Haviland 2058.

Calophyllum Hosel Ridley, sp. nov., a *C. inophylloidi* King, cui affinis, foliis majoribus, floribus glabris, petalis nullis differt.

Arbor glabra. Perulae breves, triangulares, acutae. Folia obovata vel oblanceolata, apice rotundata, emarginata, basi attenuata, rigide coriacea, 4-6 cm. longa, 3-3.5 cm. lata, nervis copiosis tenuibus; petioli supra canaliculati, 1 cm. longi. Racemi validi, 2 cm. longi. Sepala 4, exteriora ovato-rotundata, coriacea, 5 mm. longa, interiora oblongo-rotundata, marginibus ciliatis, 1 cm. longa, 4 mm. lata. Petala nulla. Stamina breviter, 5 mm.

longa, antheris brevibus oblongis truncatis 2 mm. longis. Ovarium subglobosum.

SARAWAK. Baram, Hose 146.

Calophyllum globuliferum Ridley, sp. nov., a *C. oblongifolio* Anders., cui affinis, pedunculis gracilibus, drupis parvis globosis, a *C. pisifero* Planch. pedunculis elongatis et ramulis glabris differt.

Arbor parva, glabra. Perulae breves, triangulatae, furfuraceae. Ramuli vix angulati. Folia obovata vel oblanceolata, obtusa, basi angustata, acuta, marginibus incrassatis, coriacea, 3.5-4.5 cm. longa, 2-5 cm. lata, costa subtus elevata, nervis copiosis paullo ascendentibus; petioli 5 mm.-1 cm. longi. Racemi axillares, oppositi. Pedunculi graciles, 5 mm. longi. Flores pauci, albi, 1 cm. lati. Pedicelli graciles, 5 mm. longi. Sepala 4, oblonga, obtusa. Petala 4, tenuiora. Stamina breviter, 3 mm. longa, antheris ellipticis. Drupae pisiformes, 6 mm. longae.

DUTCH S. E. BORNEO. Banjarmasin, small tree, flowers white, Motley 618 (type); summit of Bukit Besar, 1000 ft. alt., Motley 304.

In habit this plant resembles *C. oblongifolium* Anders., but the flowers are borne on long, slender peduncles and pedicels, and have two petals. The fruits are small and globular like those of *C. pisiferum* Planch., but that is a shrub with hairy shoots.

In the mountain form (Motley 304) the leaves are larger, 7 cm. long, 5.5 cm. wide, and more oblanceolate.

Calophyllum palustre Ridley, sp. nov., a *C. borneënsi* Vesque, cui affinis, foliis floribusque multo majoribus differt.

Arbor magna, ramulis angulatis. Perulae lanceolatae, acuminatae, furfuraceae, 1 cm. longae. Folia lanceolata-oblonga, acuta, basi angustata, 13-15 cm. longa, 4.5-7.5 cm. lata, costa supra ad basin angustata, subtus crasse elevata, nervis copiosis parallelis; canaliculata, subtus crasse elevata, nervis copiosis parallelis; petioli supra canaliculati, 3 cm. longi. Panicula axillaris, valida, 19 cm. longa, ramis paucis remotis crassis 5-7 cm. longis. Pedicelli crassi, furfuracei, 5 mm.-1.5 cm. longi. Sepala 4, oblongo-ovata, furfuracea, apice obtusa vel rotundata, 9 mm. longa. Petala oblonga, rotundata, 1.3 cm. longa. Stamina 9 mm. longa, antheris lineari-oblongis. Stylus longior, crassiusculus, glaber.

DUTCH S. E. BORNEO. Banjarmasin, Motley 1129: "Deep marshes, common. A large tree. The wood is reddish-white, coarse grained but very strong, making excellent flooring planks, for which purpose as well as for hollowing into canoes it is largely used. The bark is exceedingly rough and thick, and when wounded yields a quantity of yellowish gum resin, having a peculiar smell like that of mice; it is used by natives as an application for itch and other skin diseases."

Calophyllum frutescens Ridley, sp. nov., a *C. borneënsi* Vesque, cui affinis, foliis majoribus elliptico-oblongis, floribus glabris majoribus differt.

Frutex arborescens, ramulis velutinis. *Perulae* lanceolatae, acuminatae, velutinae, 1 cm. longae. *Folia* elliptico-oblonga, apice et basi obtusa, rigide coriacea, 8.5-9 cm. longa, 3.5-4.3 cm. lata, nervis copiosis prominulis subhorizontalibus; petioli validi, 1.5 cm. longi. *Paniculae* breves, 2-3 cm. longae, pauciflorae. *Pedicelli* 2 cm. longi. *Sepala* exteriora ovata, obtusa, 5 mm. longa, 5 mm. lata, interiora oblonga, 1.2 cm. longa, 4 mm. lata. *Petala* 2, sub-similia. *Stamina* 5 cm. longa, antheris oblongis. *Ovarium* ovoideum. *Stylus* 6 mm. longus, stigmatibus obscure trilobis. *Drupa* viridis, sphaerica, ferme 2 cm. diametro.

DUTCH S. E. BORNEO. Banjarmasin, Motley 54: "Tree-like shrub. Flowers white, sweet-scented. Fruit green, sphaeroid, $\frac{1}{4}$ inch in diameter."

This is allied to *C. borneense* Vesque, but the flowers are much larger and not furfuraceous and the leaves large and oblong.

Calophyllum Motleyi Ridley, sp. nov., a *C. pisifero* Planch., cui affinis, habitu arborescente, ramulis furfuraceis, foliis lanceolatis acuminatis differt.

Arbor mediocris, glabra, ramulis quadrangulatis furfuraceis. *Folia* lanceolata, apice et basi aequaliter acuminata, obtusa, coriacea, sicca supra atra subtus brunnea, 4-5 cm. longa, 1.2 cm. lata, nervis copiosis tenuibus subhorizontalibus; petioli 5 mm. longi. *Paniculae* ex axillis inferioribus, furfuraceae, densae, 1 cm. longae. *Pedicelli* 2 mm. longi. *Flores* parvi, 4 mm. diametro. *Sepala* exteriora oblonga, furfuracea, interiora oblonga, truncata, paullo longiora. *Petala* nulla. *Stamina* circiter 30, sepalis aequilonga, antheris ellipticis rotundatis.

DUTCH S. E. BORNEO. Banjarmasin, Motley 865: "A second rate tree, bark very thick, yielding plentifully a bright yellow gum soluble in water. Wood red, beautifully waved but rather coarse."

This is allied to *C. pisiferum* Planch., but that is a hairy, not furfuraceous shrub, and the leaves are round-topped, the outer sepals orbicular, the inner ones subspathulate.

Kayea oblongifolia Ridley, sp. nov., a *K. grandis* King, cui affinis, petiolis brevibus et floribus multo minoribus differt.

Arbor glabra, ramulis subangulatis. *Folia* oblonga, acuta, basi rotundata, cordata, coriacea, 15-25 cm. longa, 7-9 cm. lata, nervis transversis 20-paribus, secundariis subaequalibus, omnibus subtus elevatis gracilibus, reticulationibus parvis elevatis; petioli rugosi, crassi, 7 mm. longi. *Paniculae* terminales, 6 cm. longae, pedunculis ramisque angulatis. *Pedicelli* 5 mm. longi. *Alabastra* globosa. *Sepala* 5, ovato-rotundata, coriacea, marginibus tenuioribus, 5 mm. longa. *Petala* 5, oblongo-oblancoolata, obtusa, unguiculata. *Stamina* vix longiora. *Stylus* crassiusculus.

SARAWAK. Near Kuching, Haviland 1833.

BRIT. N. BORNEO. Sandakan (type) and East Coast, Creagh. Sandakan, level land at Kabili, alt. 3 m.s.m., 8 May 1932, Puasa in

Herb. For. Dept. 1865: "Tree 15 ft. [4.5 m.] high, 3 m. [10 cm.] diam., flowering like *bitaog*, white, in a group."

Allied to *K. grandis* King, but the petioles are shorter and the flowers are very much smaller, also the leaves are rounded and cordate at the base.

Kayea paniculata Merrill.

BRIT. N. BORNEO. Labuan, Motley 96: "A small tree, bark smooth, wood reddish, moderately hard."

I cannot distinguish this specimen from the Philippine plant.

Kayea calophylloides Ridley, sp. nov., a *K. parviflora* Ridley, cui affinis, foliis multo majoribus late lanceolatis cuspidatis, floribus pluribus differt.

Arbor glabra. *Folia* lanceolata, cuspidata, cuspidate lineari-obtusata 1 cm. longa 2 mm. lata, basi rotundata vel minute acuta, 9-11 cm. longa, 3.5-4.5 cm. lata, costa utrinque elevata, nervis parallelis copiosissimis; petioli breves, crassi, 7 mm. longi. *Flores* pauci et parvi, in racemis pluribus terminalibus 2.5-10 cm. longis. *Pedicelli* 4 cm. longi. *Alabastra* globosa. *Sepala* 4, ovata, coriacea, 2 mm. longa, interiora tenuiora. *Petala* alba, oblanceolata, obtusa, unguiculata, 3 mm. longa. *Stamina* copiosa, paullo longiora. *Fructus* subsessiles, globosi, sepalis cerebriformiter rugosis 1 cm. longis.

SARAWAK. Near Kuching, Haviland 2342; Haviland & Hose 3201 (type). Tegora, Haviland & Hose 3678. Baram, Haviland & Hose 3178. Marudi, Hose 258. Matang, in fruit, Ridley.

This has the small flowers of *K. parviflora* Ridley, of Perak, but the large, broadly lanceolate, closely transversely ribbed leaves, like those of a *Calophyllum*, make it very distinct. In fruit the sepals are very curiously wrinkled in a meandriform manner.

XVIII—NEW OR LITTLE-KNOWN PLANTS FROM SOUTHERN INDIA: IX.*

Portulaca Wightiana Wall. [Portulacaceae].

Chingleput District, Tambaram, 200 ft., E. Barnes 1510.

Professor Barnes supplies the following notes: "It grows in barren sandy patches in scrub jungle. It has 4 petals only, 5-8 stamens and a 4-5-lobed stigma (generally 8 stamens and 5 stigma-lobes). The root is tuberous. The flowers open only for about 1 hour (1.30-2.30 p.m.) in full exposure to the sun."

Osbeckia truncata D. Don ex Wight et Arn. [Melastomataceae].

Travancore High Range, Kalaar, in evergreen forests, 4750 ft. fls. and frt. May, E. Barnes 1519, 1570, 1579.

In the Fl. Brit. Ind. 2, 514, the calyx-tube as well as its teeth are said to bear "stalked stellate hairs." In all the specimens examined the hairs are more often sessile than stalked and the stellate hairs

* Continued from K.B. 1938, 37.

are intermixed with simple ones, usually from tubercular bases. The flowers in Prof. Barnes' specimens are either 4- or 5-merous.

Osbeckia reticulata Bedd. [Melastomataceae].

This species has been recorded from the Anaimalai and Palni Hills and has now been discovered in Travancore.

Travancore High Range, Kandale Valley from Palaar to Chunduvairai, along streams and edges of evergreen forest, 5500 ft. fls. May *E. Barnes* 1528, 1571, 1572.

In the above mentioned specimens the appendages of the calyx are long-stalked, not short-stalked as in Beddome's collection and as described. The flowers are up to 3.6 inches across.

Medinilla malabarica Bedd. [Melastomataceae].

The published descriptions of this plant appear to have been based on scanty material collected by Beddome. In the Kew Herbarium there are only two sheets, each with a few short twigs with 2 or 3 flowers and detached leaves (2 on one sheet and 6 on the other). The leaves are described as elliptic and narrowed at both ends. Professor Barnes has now furnished better material and notes, from which the following description has been compiled:

Branchlets thick, light chocolate-brown with corky warts. *Leaves* nearly circular, ovate or broadly elliptic, obtuse or retuse, base rounded or slightly narrowed, usually with small auricles, 5.5-9.5 cm. long, 3-5 cm. wide, upper surface uniformly dark-green except the red extreme base, ribs depressed, lower surface pistachio-green, midrib crimson to the apex, lateral ribs crimson nearly to the apex, occasionally another more slender rib is present close to either crimson margin. *Flowers* pendent in 3-flowered cymes in groups of 3 from the naked nodes below the leaves. *Peduncles*, *pedicels* and *calyx* sealing-wax red. *Petals* amber in bud, overlapping clockwise, inequilateral, outer rounded, inner concave with a membranous wing, up to 17 mm. long, becoming flushed with scarlet, but not deep coloured, as the flower expands. *Stamens* in 4 groups of 2 each; filaments fleshy, somewhat flattened and curved, white. *Style* straight, slightly longer than the stamens, white; stigma terminal, minute.

Travancore High Range, Anaimudi slopes, 7,500-8,000 ft., on stream banks, fls. May, *E. Barnes* 1589, 1590, 1600 (spirit specimen in Kew Herb.).

The plant is rooted in the soil, the stem runs up the trunks of trees and its leaves and flowers hang down in bunches from the underside of the branches of the supporting tree.

Ophiorrhiza incarnata C. E. C. Fischer, sp. nov. [Rubiaceae].

O. pectinatae Arn. affinis, sed foliis minoribus anguste ellipticis, nervis lateralibus angulo lato ortis procul a margine manifeste arcuato-anastomosantibus, corolla carminea lobis glabris differt.

A herb 20-30 cm. tall; stem rooting below, more or less brown-pubescent at and below the nodes, internodes 4, 4-9 cm. long,

with a vertical line of brown pubescence. *Leaves* narrowly elliptic, acuminate at both ends, base slightly inequilateral, 5.5-9 cm. long, 1.7-2.5 cm. wide, midrib rather broad, primary nerves 8-10 pairs, arising at a wide angle from the midrib, arching forwards to unite with a distinct loop well within the subundulate margins, midrib below and margins above minutely scabrid, when dry dark-green above, pale-green below; petioles 5-10 mm. long, brown-puberulous; stipules early deciduous, broadly ensiform. *Inflorescence* terminal, dense-flowered. *Bracteoles* ovate-lanceolate, subacute, slightly inequilateral, 5.5-6.5 mm. long, 2.2-2.8 mm. wide, midrib distinct, glabrous, pellucid-dotted. *Pedicels* very short. *Calyx* glabrous; tube 5-ribbed, 1.7 mm. long; lobes broadly ensiform, acute, keeled on the back, 1.4 mm. long. *Corolla* 8.5 mm. long, crimson, 5-winged in bud at the apex; tube slender, very slightly widened at the mouth, glabrous except for a broad belt of suberect hairs around the insertion of the stamens within; lobes broadly triangular, acute, 1.3 mm. long. *Stamens* inserted at about the middle of the corolla-tube; filaments slender, 2.4 mm. long; anthers linear-oblong, 2 mm. long, apices exerted. *Disk* of 2 fleshy oblong-quadrate lobes 0.8 mm. long and about twice as broad. *Style* slender; stigmas linear, finely acuminate, reaching to the base of the filaments. *Fruit* not seen.

Nilgiri Wynaad, near Nadgani, in a Pandanus swamp, 3000 ft., fls. June, *E. Barnes* 1559 (type in Kew Herb.), 1558.

Ophiorrhiza caudata C. E. C. Fischer, sp. nov. [Rubiaceae].

O. pectinatae Arn. affinis, sed foliis angustioribus plerumque caudatis brevius petiolatis, corolla infundibuliformi differt.

An undershrub 38-75 cm. tall; stem erect, woody below, glabrous, internodes 4-7, 3-11 cm. long. *Leaves* elliptic-lanceolate, acuminate or more usually caudate, base acuminate, 7-12 cm. long, 1.6-3.5 cm. wide, glabrous, sometimes minutely scaberulous along the margins above, primary nerves 8-9 pairs, uniting very near the margin, when dry dark olivaceous-green above, pale brownish-green below; petioles 5-15 mm. long; stipules ovate-lanceolate, acuminate, 5 mm. long. *Inflorescence* terminal, flowers crowded. *Bracteoles* lanceolate to ovate-lanceolate, usually acute, 6-9 mm. long, 2-5 mm. wide, glabrous. *Pedicels* rather stout, up to 1.5 mm. long. *Calyx* glabrous; tube cupular, 1.3 mm. long; lobes broadly ensiform, acute, 1.6 mm. long, slightly keeled. *Corolla* white; tube 8 mm. long, cylindric in the lower half, cupular funnel-shaped above, glabrous except for a band 2 mm. broad of villous hairs about the insertion of the stamens within; lobes rotund-ovate, obtuse or subacute, 3-4 mm. long, minutely papillose within. *Stamens* inserted a little below the middle of the corolla-tube; filaments slender, 3.7 mm. long; anthers linear 1.8 mm. long, apices exerted. *Disk* of 2 fleshy, rounded lobes 5 mm. long and about twice as wide. *Style* slender; stigmas rather broader, linear, reaching to above the base of the filament. *Fruit* not seen.

Travancore High Range, Kalaar, in evergreen forest, 4750 ft., fls. May, *E. Barnes* 1560 (type in Kew Herb.), 1603 (spirit specimen in Kew Herb.), 1520, 1599.

Cheirostylis pauciflora Lindl. [Orchidaceae].

A Ceylon plant not previously reported from India.

Tinnevelli District, below Nadugani, 1000 ft., fls. Dec., *E. Barnes* 1427.

Lagenandra toxicaria Dalz. var. *Barnesii* C. E. C. Fischer, var. nov. [Araceae]: spathae maturae limbo aperto tortoque, colore diverso a typo differt.

Stem 2.5 cm. diam. or a little more. *Leaves* up to 27 cm. long and 10 cm. wide; petioles up to 22 cm. long. *Peduncle* 1-11 cm. long, cream-coloured or very pale-brown. *Tube of spathe* cream-coloured or very pale-brown outside, deep crimson with darker vertical ridges within; limb outside somewhat glossy, greenish or flesh-coloured with purplish veins, inner surface spongy, pink to bright-crimson, margins darker. *Ovaries* in a cylindric mass, yellow with a network of reddish lines; a few whitish neuters present above the ovaries and a few bifid neuters on the spadix below the stamens.

Nilgiri Wynaad, near Nadgani, 3000 ft., fls. June, *E. Barnes* 1523 (type in Kew Herb.), 1605 (spirit specimen in Kew Herb.), 1524, 1588.

Arundinaria Walkeriana Munro [Gramineae].

Hitherto this Ceylon species appears only to have been collected once in S. India by Beddome in the Palni Hills, and then not in flower. Professor E. Barnes has found it in flower in Travancore. As the available descriptions are not very complete, I give the details below, taken from Professor Barnes' specimens.

Roots fibrous, apparently short, glabrous. Young *culms* olivaceous, 5 mm. diam. near the base, obtusely angled, glabrescent below, subtomentose upwards, clothed at the base with imbricate, chaffy, smooth, ovate, acute scales, 5 mm. long at the base, lengthening upwards and passing into culm-sheaths; lowest internode 9 cm. long, the next 7 cm. and rapidly diminishing in length upwards. *Culm-sheaths* papery, loose, broadly oblong, 3.2-3.5 cm. long, the edges below overlapping alternately to left and right, incurved and minutely pubescent at the base, apex rounded-truncate and ciliolate, limb of lower sheaths ovate, acute, 2 mm. long, becoming rigid, ensiform, pungent, 8 mm. long towards the apex, back shallowly ribbed, the uppermost densely hispid from tubercular bases, glabrescent lower down the stem. *Flowering culm* woody, 24 cm. long, 5 mm. diam. at the base, glabrous, smooth; fascicles of flowering branchlets from the nodes, the apex breaking up into a dense umbel of flowering branchlets 15-35 cm. long, the lowest branchlet shortest, the apical longest; branchlets concealed

by the overlapping keeled leaf-sheaths. *Floral leaves* 2-4 cm. long, 6-9 mm. wide.

Travancore, summit of Anaimudi, 8,800 ft., fls. May, *E. Barnes* 1591, 1593.

XIX—CONTRIBUTIONS TO THE FLORA OF SIAM. ADDITAMENTUM XLVIII.*

Dimetra Kerr, gen. nov. (Oleaceae-Jasmineae); ab affini genere *Nyctanthe* Linn. habitu herbaceo, staminibus corollae tubi medio affixis, ovario alte bipartito distinguenda.

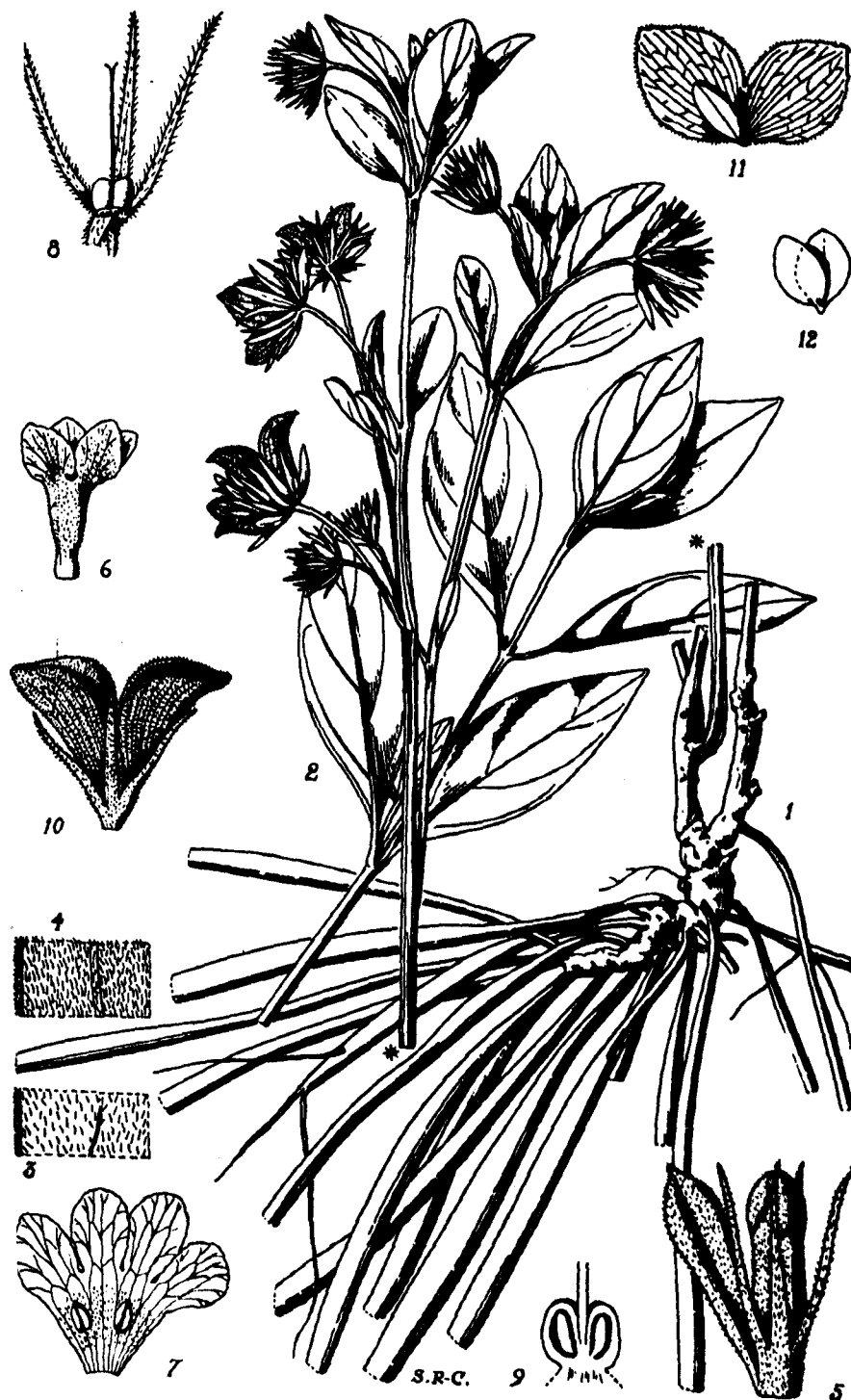
Herba erecta, perennis. *Folia* opposita, simplicia. *Inflorescentia* axillaris, pedunculata, subcapitata. *Calyx* alte partitus, lobis linearibus. *Corollae* lobi alabastro imbricati, dextrorsum obtegentes. *Stamina* 2, corollae tubi medio affixa. *Ovarium* superum, 2-loculare, ad basin 2-partitum; stylus filiformis, inter ovarii lobos positus, stigma bifido; ovula in quoque loculo solitaria, erecta, prope basin affixa. *Fructus* dicoccus, coccis compressis monospermis; dehiscencia ignota; semina exalbuminosa; embryonis radícula infera, exserta.

Species unica.

Dimetra Craibiana Kerr, sp. nov.

Herba perennis, ad 20 cm. alta; caulis erectus, e caudice lignoso radicibus crassis numerosis praedito oriens, simplex vel pauciramosus, ramis ascendentibus, superne compressus, inferne 4-angulatus, angulis rotundatis, minute scabro-pilosus. *Folia* immatura tantum visa, integra, lanceolata vel elliptica, apice obtusa vel subacuta, minute apiculata, basi anguste cuneata in petiolum decurrentia, ad 4 cm. longa et 1.5 cm. lata, chartacea, siccitate supra viridia subtus pallide cinerea, supra breviter scabro-hispida, subtus crebre strigosa, costa supra leviter prominula albidula subtus ut nervi laterales prominente, nervis lateralibus saepius 3-paribus acute ascendentibus fere rectis marginem versus evanescentibus, nervis transversis obscuris; petiolus ad 0.5 cm. longus, strigosus, supra alte canaliculatus. *Inflorescentia* axillaris, longus, strigosus, supra alte canaliculatus. *Bracteae* externae lineari-oblongae vel gracilis, striatus, strigosus; bracteae internae lineari-oblongae vel lineari-oblancoatae, apice acutae vel acute acuminatae, ciliatae et adpresse pilosae, ad 8 mm. longae et 1.5 mm. latae; bracteae internae similes sed minores, circiter 6.5 mm. longae, 0.75 mm. longae; lobi anguste lineares, apice longe attenuati, 5.5-6.5 mm. longi, 0.25 mm. lati. *Corolla* hypocraterimorpha, alba nisi fauce lutea, extra sparse breviterque pilosa; tubus superne sensim ampliatus, intus velutinus, 6 mm. longus; lobi 4-5, rotundati, margine obscure crenulati, 4.5 mm. longi, 4 mm. lati. *Antherae*

* Continued from p. 106.



Dimetra Craibiana Kerr. 1, a fruiting plant, nat. size; 2, branch with older leaves, nat. size; 3, upper surface of leaf, $\times 4$; 4, under surface of leaf, $\times 4$; 5, bud with bract, $\times 4$; 6, corolla, $\times 2$; 7, corolla split open, calyx and gynoecium, $\times 8$; 9, longitudinal section of ovary and style, $\times 8$; 10, fruit, $\times 2$; 11, carpel laid open, $\times 2$; 12, embryo, $\times 8$.

oblongae, breviter apiculatae, 2 mm. longae, lateraliter dehiscentes; filamenta circiter 1 mm. longa. *Ovarium* alte bipartitum, apice plano-convexum, glabrum, circiter 1 mm. altum; stylus 3 mm. longus, stigmatibus lobis 0.4 mm. longis. *Fructus* immaturus tantum visus, bicoccus; cocci compressi, valde recurvati, late elliptici, breviter obtuseque apiculati, crebre striati, molliter pilosi minuteque glandulosi, explanati circiter 9 mm. longi et 6 mm. lati, 0.5 mm. crassi; semen compressum, plano-convexum, 5 mm. longum, 2.5 mm. latum; embryonis cotyledones planae, radícula breviter exserta.

Udawn, Nawng Bua, circiter 200 m., in open deciduous forest, Kerr 8611 (type). Nakawn Panom, Muk Dahan, circiter 200 m., rock crevices in open deciduous forest, Kerr 8411.

The description of the flower has been drawn up from Kerr 8411.

The closest alliance of this proposed genus is clearly with *Nyctanthes*, which it resembles in many points. In *Nyctanthes*, however, the partition of the carpels does not occur till the fruit is ripe, whereas in *Dimetra* it is already present in the flower. In its herbaceous habit and linear calyx lobes *Dimetra* shows some resemblance to *Menodora*, which differs in the number and position of its ovules. The name *Dimetra* has been derived from δι-μήτρα, double uterus, in allusion to the form of the ovary.

Linoclera calcicola Kerr [Oleaceae-Oleinae]; ab affini *L. spicifera* Ridley foliis floribusque multo minoribus recedit.

Arbor parva, circiter 5 m. alta; ramuli hornotini subquadrati, minute velutini, cortice lenticellis parvis papuliformibus copiose obsito obtekti; ramuli annotini teretes, glabrescentes, cortice pallide cinereo lenticellis obscuris obtekti. *Folia* late elliptica, vel ovata, basi cuneata, apice breviter obtuseque acuminata, subcoriacea, siccitate supra viridi-brunnea, subtus parum pallidiora, glabra, costa supra prominula subtus prominente, nervis lateralibus 6-8-paribus supra subtusque obscuris vel parum prominulis; petiolus minute velutinus, supra canaliculatus, 3-4 mm. longus. *Inflorescentia* axillaris, conferta, sessilis, saepius 3-flora, foliis multo brevior; bracteae ovatae, dense cinereo-pubescentes, circiter 1 mm. longae et latae. *Flores* sessiles. *Calyx* 4-partitus, extra dense cinereo-pubescentes; lobi obtusi, 1 mm. longi. *Corolla* glabra; tubus 1.5 mm. longus; segmenta linearia, margine plana, 4 mm. longa et 0.5 mm. lata. *Stamina* basi corollae inserta; antherae obtuse mucronatae, 0.75 mm. longae; filamenta 0.75 mm. longa, basi late complanata. *Ovarium* ovoideum, 2 mm. altum; stigma sessile, bilobum. *Fructus* immaturus ellipsoideus, apiculatus, 4 mm. longus.

Trang, Kaw Libong, 100 m., on rocky limestone hill, Kerr 19077 (type). Krabi, Kaw Pipi-le, 100 m., rocky ground on limestone hill, Kerr 18922.

In its habit this small tree recalls some of the species of *Memecylon*. The description of the fruit, of which only immature states have been seen, has been drawn up from *Kerr* 18922.

***Linociera eriorrhachis* Kerr** [Oleaceae-Oleineae]; *L. caudifoliae* Ridley affinis, sed rhachi dense pubescente facile distinguenda.

Arbor (?) ramulis gracilibus glabris juventute leviter compressis mox teretibus cortice pallide cinereo lenticellis ellipticis sparse obsito obtectis. *Folia* elliptica vel oblongo-elliptica, basi cuneata, apice caudato-acuminata, margine interdum parum recurva, ad 8.3 cm. longa et 2.7 cm. lata, chartacea, glabra, costa supra prominula subtus prominente, nervis lateralibus 6-8-paribus supra obscuris subtus prominulis leviter arcuatis et prope marginem anastomosantibus; petiolus rugulosus, supra canaliculatus, glaber, 3-4 mm. longus. *Inflorescentia* axillaris, foliis multo brevior, simpliciter racemiformis vel interdum e basi bifurcata, 6-12-flora, 7-16 mm. longa; pedunculus communis nullus vel perbrevis; rhachis subquadrata, sicut bracteae dense pubescens; bracteae late ovatae, circiter 1 mm. longae et latae; pedicelli subnulli vel ad 1 mm. longi, pubescentes. *Calyx* pubescens, 4-lobatus; tubus 0.5 mm. longus; lobi triangulares, subacuti, 0.5 mm. longi. *Corolla* glabra; tubus 0.75 mm. longus; segmenta linearia, apice leviter cucullata, 2.25 mm. longa, 0.5 mm. lata. *Stamina* subsessilia, antheris oblongis apice rotundatis 1 mm. longis et 0.75 mm. latis. *Ovarium* ovoideum, glabrum, 1 mm. altum; stigma sessile, inaequaliter bilobum, lobis erectis. *Fructus* ignotus.

Prachaup, Hui Yang, *Pui* 3242.

***Linociera microbotrya* Kerr** [Oleaceae-Oleineae]; ab affini *L. ramiflora* (Roxb.) Wall. inflorescentia multo brevior, fructu duplo majore distinguitur.

Arbor parva, circiter 8-15 m. alta, omnino glabra, ramulis juventute compressis cortice pallide cinereo lenticellis parvis pustulatis crebre obsito obtectis. *Folia* elliptica vel oblanceolata, basi in petiolum sensim attenuata, apice breviter acuminata, ad 20 cm. longa et 8.5 cm. lata, subcoriacea, siccitate supra nitidula viridi-brunnea, subtus opaca paullo pallidiora, costa supra concava subtus valde prominente, nervis lateralibus 12-20-paribus, supra subconspicuis subtus prominulis patulis prope marginem arcuatis anastomosantibusque, nervis transversis obscuris; petiolus ad 5 cm. longus, supra plano-concavus, basin versus siccitate nigrescens. *Inflorescentia* axillaris, vulgo e foliorum delapsorum axillis orta, paniculata, densiflora, petiolo brevior, ad 3 cm. longa et lata; pedunculus communis subnullus vel ad 5 mm. longus, minute lepidotus; bracteae inferae oblongae, ovatae, minutissime ciliatae; pedicelli breves, quadrangulares, ad 0.5 mm. longi. *Calyx* glaber, lobis triangularibus 1 mm. longis. *Corolla* glabra, 2 mm. longa; lobi oblongi, 1.5 mm. longi, margine

involuti. *Stamina* subsessilia; antherae oblongae, apice obtusae, 0.75 mm. longae. *Ovarium* conicum, glabrum, 0.8 mm. altum, stigmate minuto erecto. *Fructus* ellipsoideus, epicarpio minute lepidoto siccitate rugoso, ad 2.5 cm. longus et 1 cm. latus.

Saraburi, Muak Lek, circiter 200 m., evergreen scrub, *Kerr* 9060 (type); Krat, Dan Chumpon, under 50 m., evergreen forest, *Kerr* 17658.

The fruit has been described from *Kerr* 17658.

***Linociera procera* Kerr** [Oleaceae-Oleineae]; ab affini *L. laxiflora* (Bl.) Knobl. foliis majoribus, inflorescentia ampliore et floribus majoribus distinguitur.

Arbor excelsa, circiter 25 m. alta; ramuli juventute teretes vel leviter compressi, glabri, cortice nigro-brunneo lenticellis ellipticis pallide cinereis parce obsito obtecti. *Folia* elliptica, basi cuneata, apice subacuta, interdum leviter acuminata, ad 14.5 cm. longa et 5.2 cm. lata, chartacea, siccitate supra nitida nigro-brunnea, subtus opaca fulvo-brunnea, glabra, pagina utraque minute crebreque verruculosa, costa supra parum impressa subtus prominente, nervis lateralibus utrinque 7-9 supra subconspicuis subtus prominulis patentibus leviter arcuatis et prope marginem obscure anastomosantibus; petiolus supra concavus, glaber, 1.5-3 cm. longus. *Inflorescentia* axillaris, saepius e foliorum delapsorum axillis orta, paniculata, multiflora, floribus sessilibus ad ramulorum apicem confertis, glabra nisi ramulis ultimis minute puberulis, ad 9 cm. longa et 5 cm. lata; bracteae ramos inferos subtendentes subfoliaceae, obovatae, petiolatae, glabrae, ad 7 mm. longae et 2 mm. latae; eae ramos superos subtendentes subulatae, minute puberulae, ad 5 mm. longae; bracteae verae triangulares, obtusae, pubescentes, circiter 1 mm. longae et 0.75 mm. latae. *Calyx* dense pubescens, 4-partitus; lobi ovati, obtusi, 1 mm. longi. *Corolla* glabra; tubus 0.75 mm. longus; segmenta erecta, anguste triangularia, subacuta, margine involuta, 3 mm. longa, basi 1 mm. lata. *Stamina* basi tubi inserta, subsessilia; antherae oblongae, apice truncatae vel emarginatae, 1.75 mm. longae. *Ovarium* ovoideum, glabrum, vel interdum apicem versus pilis paucis praeditum, 2 mm. altum; stigma sessile, minute bilobum. *Fructus* ignotus.

Krat, Kao Kuap, circiter 700 m., evergreen forest, *Kerr* 17767.

***Linociera sutepensis* Kerr** [Oleaceae-Oleineae]; species *L. ramiflorae* (Roxb.) Wall. affinis, a qua foliis majoribus, fructu globoso nec ellipsoideo distinguitur.

Arbor circiter 6-8 m. alta, glabra; ramuli subquadrati, cortice pallide cinereo lenticellis parvis copiose obsito obtecti. *Folia* elliptica, oblongo-elliptica vel oblanceolata, basi anguste cuneata, apice sensim acuminata, ad 25 cm. longa et 9 cm. lata, glabra, siccitate pagina utraque crebre minuteque verruculosa, costa cum nervis lateralibus supra impressa subtus valde prominente, nervis transversis supra obscuris subtus prominulis, nervis lateralibus

utrinque 8-14 subparallelis prope marginem arcuatis anastomosantibusque; petiolus 1.5-3.5 cm. longus, supra concavus. *Inflorescentia* axillaris, paniculata, valde ramosa, divaricata, multiflora, glabra, ad 20 cm. longa et 22 cm. lata; pedunculus communis 3.5-7.5 cm. longus; bracteae patentes, anguste triangulares vel subulatae, minute parceque ciliatae, 2.5-3.5 mm. longae; bracteolae ovatae, minute ciliatae, 1.5 mm. longae et latae. *Calyx* 4-partitus; lobi ovato-triangulares, subacuti, minute ciliati, 1.5 mm. longi et 0.75 mm. lati. *Corolla* alba, glabra; tubus circiter 1.5 mm. longus; segmenta oblonga, apice obtusa et cucullata, margine involuta, patentia vel parum recurva, 2.5 mm. longa et 1 mm. lata. *Antherae* subsessiles, 1 mm. supra basin tubi insertae, 1.2 mm. longae et 0.8 mm. latae. *Ovarium* ampulliforme, glabrum, 2 mm. altum; stigma sessile, obscure bilobum. *Fructus* plus minusve globosus, 1.5-2 cm. diametro, epicarpio siccitate minute rugoso, pericarpio toto 1.5 mm. crasso.

Doi Sutep, 900 m., evergreen forest, Kerr 1584, 1584B (*type*) et 2603.

The impression of the nerves above and their prominence below, well marked on old leaves, is much less so in younger leaves. The description of the fruit has been drawn up from Kerr 2603.

***Linociera velutina* Kerr** [Oleaceae-Oleinae]; species *L. macrocarpa* Bl. affinis, foliis pro rata latioribus subtus velutinis, inflorescentia magis pubescente differt.

Arbor (?) ramulis juventute minute puberulis cortice nigro-brunneo lenticellis parvis pallidis sparse obsito obtectis. *Folia* oblanceolata vel obovata, basi in petiolum sensim attenuata, apice obtusa vel breviter obtuse acuminata, margine leviter revoluta, ad 18 cm. longa et 9 cm. lata, coriacea, supra glabrescentia siccitate fusca, subtus pallide cinerea et minute velutina praesertim secus costam nervosque, costa supra impressa subtus prominente, nervis lateralibus utrinque 7-12 supra impressis subtus prominentibus prope marginem arcuatis et obscure anastomosantibus; petiolus minute puberulus, supra complanatus, 1.5-3 cm. longus. *Inflorescentia* subterminalis vel axillaris, interdum ex axillis foliorum delapsorum orta, paniculata, floribus ad apicem ramulorum confertis, omnino pubescens, ad 8 cm. longa et 5 cm. lata; bracteae ramos subtendentes foliaceae, cito deciduae; bracteae verae anguste triangulares vel lineares, 0.75-1 mm. longae. *Calyx* dense cinereo-pubescent, 4-partitus; lobi triangulares, subacuti, 1.25 mm. longi. *Corolla* glabra; tubus 0.5 mm. longus; segmenta angustissima triangularia, acuta, margine involuta, 5.5 mm. longa, basi 1 mm. lata. *Stamina* basi tubi inserta; antherae oblongae, breviter obtuseque mucronatae, 1.5 mm. longae; filamenta lata, 0.25 mm. longa. *Ovarium* ampulliforme, 0.8 mm. altum, superne ut basis styli parce pilosum; stylus circiter 0.5 mm. longus, in ovarium sensim dilatatus; stigma minutum, bilobum. *Fructus* ignotus.

Korat, Ban Chum Seng, *Put* 2816.

***Myxopyrum confertum* Kerr** [Oleaceae-Oleinae]; *M. smilacifolio* Bl. affine, sed inflorescentia multo brevior, floribus minoribus differt.

Frutex scandens, inflorescentia excepta glaber, ramulis tetragonis. *Folia* elliptica vel oblongo-elliptica, basi cuneata, interdum parum rotundata, apice sensim attenuata, acuta, margine integra vel superne obscure dentata, 10-16 cm. longa, 3-4-5 cm. lata, coriacea, glabra, supra subnitida, trinervia vel plus minusve impariter triplinervia, rarius 5-nervia, nervis subtus prominentibus, siccitate rete venularum supra subtusque manifesto; petiolus 7-10 mm. longus, supra anguste canaliculatus. *Inflorescentia* axillaris, multiflora, conferta, subsessilis, circiter 8-10 mm. longa, rhachi ut ramuli bracteae pedicellique minute puberula; bracteae lanceolatae, acutae, ad 2.5 mm. longae; pedicelli brevissimi. *Flores* virides; calyx 4-partitus, extra minute puberulus, lobis triangularibus acutis 0.5 mm. longis; corollae tubus 0.5 mm. longus, lobis obtusis apice leviter incurvis circiter 0.5 mm. longis. *Stamina* inclusa, antheris subrotundis 0.75 mm. diametro. *Ovarium* globosum, 0.3 mm. altum; stigma minutum. *Fructus* ignotus.

Muang Pan, Doi Duan, circiter 500 m., mixed forest by stream, Kerr 5099.

XX—MISCELLANEOUS NOTES.

Ripon Professorship.—On approaching India the Director was invited to accept the Ripon Professorship of the Indian Association for the Cultivation of Science for the year 1938. This Association is the oldest non-official public institution founded in India with the sole object of promoting the study of science, and the Professorship commemorates the name of the Viceroy, the Marquess of Ripon.

The Director accepted the invitation, and delivered a course of three lectures in Calcutta in January 1938.

Horticultural Appointments in the Sudan.—We learn with interest that Mr. J. ROBBIE, who left Kew in 1927 to take up the appointment of Superintendent of Government Gardens, Khartoum, has been promoted to the newly-created post of Inspector of Horticulture under the Sudan Government, as from 1st January 1938. Mr. W. J. CORKHILL, Assistant Superintendent at the Gardens, is now acting as Superintendent. Mr. Corkhill has held the post of Assistant Superintendent since leaving Kew in 1935.

ERNEST GOULDING.—We regret to announce the death on the 15th February, 1938, of Dr. Ernest Goulding, D.Sc., F.I.C., formerly Vice Principal of the Plant and Animal Products Department of the Imperial Institute. Dr. Goulding retired from this post on reaching the age limit in 1935. His connexion with the

Imperial Institute extended over a long period (39 years) during which time he took an important part in the scientific and technical work on Empire raw materials both as regards laboratory investigations and intelligence service.

Dr. Goulding was a recognised authority on fibres, his work covering a wide diversity of fibrous materials. He played a leading part in the investigations of cotton during the pioneer stages of cotton cultivation in the Colonies, and was author of a useful handbook "Cotton and other Vegetable Fibres." In later years, as Secretary to the Advisory Committee on Vegetable Fibres, a post which he held from the inception of the Committee in 1926, he contributed largely to the success of work which has had a wide influence on the production and the extension of uses of Empire fibres, particularly of sisal in East Africa. In 1936 he gave the Mather Lecture at the Textile Institute, his subject being the investigation of textile fibres of vegetable origin during the last 40 years.

The Present Day Rock Garden.*—This volume is designed as complementary to Reginald Farrer's well-known "English Rock Garden." It not only brings the latter work admirably up-to-date but it goes further and introduces the reader to a somewhat bewildering array of plants of which he has probably never previously heard: indeed, it might be suggested that the "Rock Garden of the Future" would have been a more fitting title! As a compilation it is a very big piece of work and will be of great value to all those concerned with rock gardening.

Where full descriptions are given, these are extremely good, but it is doubtful whether lengthy lists of bare names and synonyms are really desirable in a work of this kind. They are certainly thereby made available within the covers of one book, but it is of doubtful use to anyone taking up the cultivation of, let us say, Gentians, Primulas or Alliums, to be confronted with long lists of names, without descriptions, added as "possibilities," "near synonyms," and "merely useful species."

The author has taken great pains to make the botanical side of his work accurate and up-to-date, and the adoption of his names in trade lists and gardens generally will be a great help in clearing up a number of long-standing errors and confusions, e.g., *Penstemon Roelzii*, *P. rupicola* and *Gentiana Purdomi*.

The illustrations, which are excellent and well chosen, add greatly to the value of the work and will certainly act as a spur to collectors searching for worthy additions to our gardens.

DR. T. A. SPRAGUE adds the following remarks on Dr. Clay's long introduction.

The Introduction to this volume is perhaps more revealing than the author either realized or intended. Dr. Clay seems to be

* By Sampson Clay, M.A., Ph.D. T. C. & E. C. Jack, Ltd., London, 1937. Pp. 681. Illustrated. Price 31s. 6d.

primarily a horticulturist, equipped with a general knowledge of certain branches of botany, but lacking in comprehension of the nature and aims of taxonomy. The result is a curious medley of shrewd remarks, trite observations and ill-informed criticism justifying his statement that "more nonsense has been talked and written about the species by people who should have known better than about any other scientific term." The following is a sample of the author's style:—

"The prime function of a name is to provide a convenient handle for the object to which it is attached. There is no reason why plant names should lose sight of their *raison d'être* in order to be the sport and plaything of controversial and individual opinions. Dispassionately considered, the person who identifies and names plants has a doubtful claim to be called scientist at all (although curiously enough to the man in the street he is *the* botanist); he ought to be less concerned with the pursuit of pure knowledge than with the ordering and labelling of material for the use of scientists and practical men. If a taxonomist happens to read here, I trust that he will not see cause for offence in this point of view—like all technicians he is a quite indispensable person, frequently more clever than the people for whom he works. The point is that taxonomy in the strict sense is, or should be, distinct from nomenclature. If it amuses a man to observe and speculate (and sometimes even experiment, thereby becoming an ecologist or geneticist or cytologist) as to the relationships of families and genera, it hurts no one, and may interest some. If he discusses the features to be considered most important in classifying particular groups of plants, and indicates his opinions, no harm is done. But if he alters names and moves boundaries for the sake of more perfect accord with his own ideas, the *important people*, the *users* of the names, suffer. Our knowledge of the actual descent of plants is very limited indeed, and a mere binomial is in any case incapable of crystallizing such information: there is no reasonable escape from the proper concept of the species as above all a unit of convenience."

If Dr. Clay's remarks are intended to be taken seriously and are not merely "letting-off steam" at the conclusion of a laborious piece of compilation, it is clear that he does not realise that the naming of plants is intimately bound up with their classification and that many changes in the names of plants are due to taxonomic discoveries whose mere publication and verification is sufficient to bring conviction to the unbiassed. The suggestion that such discoveries should be ignored in nomenclature, thus stifling scientific progress, is not what one would have expected from a scientist even if he happens also to be a practical man. Taxonomy covers more than the technical process of identifying and naming plants already classified.

Dr. Clay's view seems to be that the classification of plants, unless phylogenetic considerations are involved, is not a scientific

activity. It would appear that he has been misled by the superficial resemblance between botanical "binomials" and human "names" to the rather common but quite erroneous view that the "naming" of an individual plant is comparable to the "naming" of an individual human being. A little consideration shows, however, that a botanical binomial is a *class* name, whereas a human name is a *proper* name applicable to one particular individual. If a comparison is to be made, the plant's binomial corresponds not to "John Smith" but to such class names as "lawyer," "Polynesian," "brachycephalic," etc. Individual names bear no direct relation to the attributes of the bearer, whereas class names are a convenient method of summarising such attributes. A taxonomist, then, allocates an individual plant to a particular group because of certain attributes of that plant. Now, one of the most characteristic and fundamental activities of science is the grouping into classes of individual objects which have certain attributes in common. The naming of plants by a taxonomist, therefore, must be regarded not only as a "scientific activity," but as an activity fundamental to all other scientific botanical work. Whether or not phylogenetic considerations are taken into account may alter the orientation of the activity, but it in no way affects its scientific status.

How to Grow Roses.*—The experience of the authors of this book, whose names are household words amongst rose growers in America, ensures its value and interest to rose lovers. That it has become necessary to publish an enlarged and entirely rewritten eighteenth edition is evidence of the increasing popularity of the rose in America.

The book consists of one-hundred and ninety-two pages and is divided into twelve chapters, each dealing with a phase in the growing of roses in America, such as "How to Obtain (propagate) Roses," "How to Fight Rose Pests," "How to Prune Roses" etc. For a book of its size and price, "How to Grow Roses" is exceptionally well illustrated with thirty-two coloured plates and thirty-one half-tone illustrations, in addition to numerous black and white sketches of practical work in the garden, including the right and wrong methods of digging the ground, planting, pruning, etc.

Unlike most books dealing with gardening in America, the subject matter of which is almost entirely applicable to the country of origin, there is much of interest and value to rose growers in this country. No keen cultivator of roses in this country would regret the purchase of this very cheap and readable book.

* By J. Horace McFarland and Robert Pyle. Published by The MacMillan Company, New York (eighteenth edition), 1937. Price 4s. 6d.

Printed under the authority of His MAJESTY'S STATIONERY OFFICE
By the South Essex Recorders, Ltd., High Road, Ilford.

(400) Wt. 16/32 800 4/38 S.E.R. Ltd. Gp. 381

BULLETIN OF MISCELLANEOUS INFORMATION No. 4 1938 ROYAL BOTANIC GARDENS, KEW

XXI—THE FORMATION OF INTUMESCENCES CONTAINING FATTY SUBSTANCES ON THE STEM OF *KHAYA IVORENSIS*. ANTONI OSSOWSKI (Warsaw).

When engaged in research work in the Jodrell Laboratory* in 1929, I investigated certain intumescences on the stem of *Khaya ivorensis* A. Chev. (*Meliaceae*). The results of this study, which I have completed later, are given below. Growths of a similar nature are known to occur also on another species of *Khaya*, *K. senegalensis*, and it will be convenient to refer to these first. An account of the out-growths on *K. senegalensis* was given in an official report by Mr. A. E. Collens (1).

The following information is derived from Mr. Collens' report:—

In 1911, several trees of *K. senegalensis*, cultivated at the Experiment Station, St. Clair, Trinidad, were seen to be suffering from bark disease, and "wherever attacked, the bark was noticed to be scaling off in warty squamose pieces, which were greasy to the touch, had a strong fatty acid odour, and ignited readily when kindled, burning with a steady smoky flame."

Chemical examination showed that pieces of bark from a diseased patch (a.), and from six inches above (b.), and six inches below it (c.) showed the following percentage analyses:—

WATER ...	(a.) 4.94; (b.) 40.31; (c.) 53.63.
ORGANIC MATTER ...	(a.) 93.30; (b.) 57.84; (c.) 44.47.
ASH ...	(a.) 1.76; (b.) 1.85; (c.) 1.90.

Of the organic solid matter of the bark, fat amounted to 64.4 per cent. in the diseased portion, as against 0.5 per cent. above and below the latter. A similar scaling eruption on stems of *K. senegalensis*, having been reported from Dominica in July 1916,† a further investigation was conducted with the expressed fat. Samples of the fat were obtained by means of a small screw press, and also by solvents from some freshly gathered bark. An examination of this fat showed that its fatty acid content was high,‡ and analytical data indicated that the fat was akin in character to such solid fats as rambutan tallow from *Nephelium lappaceum*, Chinese vegetable

* For permission to work in the Jodrell Laboratory I was indebted to Sir Arthur Hill, Director of the Royal Botanic Gardens, Kew.

† By Mr. Joseph Jones, Curator of the Botanical Station.

‡ Being equivalent to 82.33 per cent. expressed as Palmitic acid, or 91.43 as stearic acid.

tallow from *Stillingia sebifera*, and mkanyi butter from *Stearodendron Stuhlmannii*.

As it appeared that the anatomical structure, formation, and development of the intumescences had not been studied, and that the cell-contents had not been examined microchemically, I undertook, on the suggestion of Mr. L. A. Boodle, then Assistant Keeper of the Jodrell Laboratory, an investigation with the object of elucidating these points in *K. ivorensis*.

The material available was preserved in alcohol, and consisted of twigs of some years' growth, cut into lengths of several centimetres. In many places the bark showed oval or irregularly oval warts, the smaller ones being white, and the larger ones of a yellow colour. The surface of the small warts was smooth, while that of the larger ones shows secondary protuberances, and was somewhat fissured. Apart from the warts, the bark was smooth, and bore numerous lenticels.

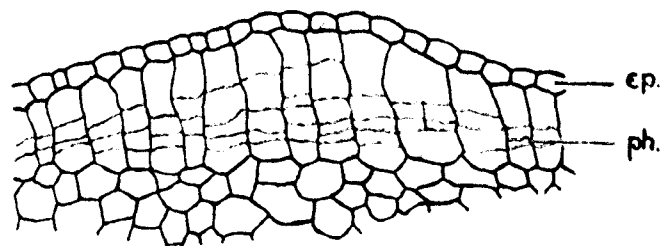


Fig. 1. Cross-section of early stage of intumescence of *Khaya ivorensis*. Ep. epidermis; Ph. phellogen. $\times 225$.

Anatomical investigation of sections of the bark showed that the phellogen arises by subdivision of the layer of cells immediately below the epidermis, both in areas where no warts are present, and also in the warts in their earliest stage of development*. In the case of the warts, the cells formed by the phellogen on its outer side, and morphologically representing cork-tissue, are at first of a normal shape for young cork-cells, but, as development proceeds, they become greatly elongated in the radial direction, differing markedly in this character and in their cell-contents from the normal cork produced in places where there are no warts. The anatomical structure of warts at three different stages of development is shown in figs. 1, 2 and 3, and it is seen that the radial lengthening of the "cork" cells of the warts, and also the production of a greater number of them in the radial direction, distinguish them from the normal cork, and are the cause of the formation of warts in *K. ivorensis*.

As they grow older, the cells constituting the tissue of which the warts are composed increase in their radial and tangential diameters

* The place of origin of the periderm is thus the same as that given by Moeller (5), p. 259, for other members of the *Meliaceae*.

to a greater extent than do normal cork cells. The wart tissue may thus be described as heteroplastic and hyperplastic.* Microchemical examination showed that the cell walls, unlike those of normal cork, are not suberized. When treated with concentrated sulphuric acid they became swollen and then dissolved in the acid. With Sudan III they showed no orange-red coloration, but Lugol's iodine reagent with the addition of 80 per cent. sulphuric acid caused them to become a very distinct blue colour. Neither phloroglucin with hydrochloric acid, nor aniline sulphate, nor Maule's reagent† gave any lignin reaction. It is concluded from the results of these microchemical tests that the cell walls of the layers of "cork" in the wart-like growths consist of cellulose, and that the tissue under consideration is of the nature of phelloid.

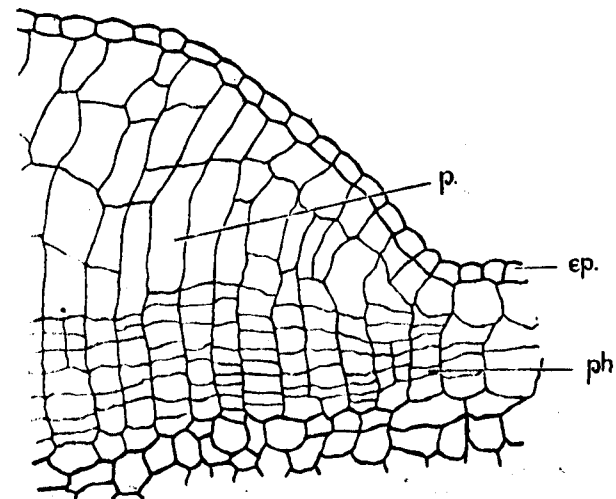


Fig. 2. Cross-section of later stage of intumescence of *K. ivorensis*. Ep. epidermis; Ph. phellogen; P. radially elongated cell of phelloid. $\times 225$.

In the cavities of the elongated cells of the phelloid, yellowish-white masses of a more or less amorphous substance are present, forming a layer of varied thickness between the cell-wall and the remaining cavity of the cell, as shown in fig. 3, but similar cell-contents are not present in the cells of the normal cork. The special solid cell-contents mentioned above, which may have become somewhat altered by the material being preserved in alcohol, were tested as follows. When subjected to heat, they melted and assumed a spherical form. Sudan III gave them an orange colour, alkannin produced a red coloration, and in a solution of osmic acid they turned black. They were found to be insoluble in cold alcohol, but dissolved slowly in cold xylol or chloroform or more rapidly if heat was applied. Saponification gave satisfactory results, and even

* For the use of these terms, see (2) p. 132.

† Successive treatment with a solution of permanganate of potash, dilute hydrochloric acid and ammonia. See (7).

after 24 hours crystals of fatty acid appeared, and myelin shapes were formed. (See (7) fig. 60.)

The results of the above reactions indicate that the solid contents of the phelloid-cells consist of fatty substances, and it appears probable that in *Khaya senegalensis* the fatty acid material obtained from the intumescences in that species also represents the cell-contents of a phelloid tissue. Unfortunately, as suitable material for the purpose was not available, I was unable to determine the manner in which the fatty material originated in the cells of *K. ivorensis*.

A substance, which is formed in the fruit of species of *Rhus*, and is known as Japanese wax, is composed, according to Tassily (6) almost entirely of a glyceride of fatty acid, and may well be very similar in character to the special cell-contents of the phelloid of *Khaya*. The substance referred to above was studied in *Rhus vernicifera* by Möbius (4),* who found that it occurred within the cells of the mesocarp, forming a rather thick coating on the inner surface of the cell-walls, and sometimes nearly obliterating the cell-cavity. It thus occupies the same position in the cells as the fatty material found in *Khaya*. Möbius states that the coating of wax is closely applied to the cell-wall, but that its inner limit has an irregular, granular surface, and that, in the cell-cavity, the protoplasm and nucleus are long retained. Hence it appears probable

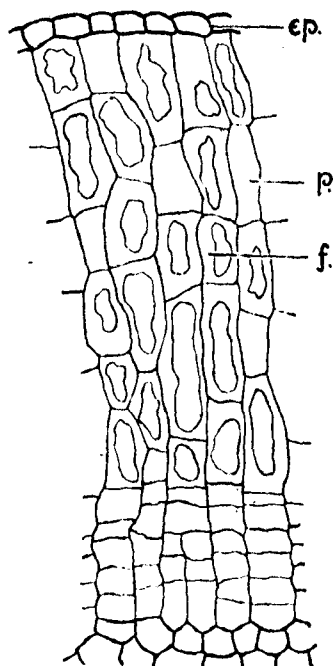


Fig. 3. Cross-section of still later stage of intumescence of *K. ivorensis*. Ep. epidermis; P. radially elongated cell of phelloid; F. layer of fatty substance. $\times 225$.

* See also Meyer (3), and Wiesner (8).

that the wax is elaborated by the protoplasm, and deposited on the cell-wall, and it is suggested that the same applies to the fatty substance of *Khaya*.

SUMMARY.

The intumescences on the bark of *Khaya ivorensis* are due to abnormal growth of tissue belonging to the periderm, and morphologically representing the cork-tissue, but developed as phelloid.

The cells of this tissue differ in shape and size from those of the normal cork. They have cellulose walls, and contain masses of a substance, shown to be of a fatty nature by its characteristic microchemical reactions.

The intumescences and their special fatty contents appear to be quite similar to those previously described by Collens in *K. senegalensis*.

REFERENCES.

1. COLLENS, A. E. "Formation of Fat in the Bark of West African Mahogany, *Khaya senegalensis*." *Bull. Dept. Agric., Trinidad and Tobago*, 17, 105 (1918).
2. KUSTER, E. *Pathologische Pflanzenanatomie*, 132 (1903).
3. MEYER, A. *Archiv. d. Pharmazie*, 215, 600 (1879).
4. MÖBIUS, M. *Berichte d. Deutsch. Bot. Ges.* 15, 435-441 (1897).
5. MOELLER, J. *Anatomie der Baumrinden*, 259 (1882).
6. TASSILY, E. *Bull. Soc. Chim. de France*, 9, 608 (1911).
7. TUNMANN - ROSENTHALER. *Pflanzenmikrochemie*, ed. 2, Berlin (1931).
8. WIESNER, J. *Die Rohstoffe des Pflanzenreiches*, 3 Aufl., 1, 706 and 721 (1914).

XXII—AFRICAN ORCHIDS : X*. V. S. SUMMERHAYES.

The following paper includes the first instalment of new species records, etc., from the very fine collection of Orchids made by M. Georges Le Testu and sent by him to Kew for determination. These orchids are mainly from the Gabon and Oubangui-Chari regions of French Equatorial Africa, those from the latter region also including many collected by the Rev. C. Tisserant. The Gabon collections, in particular, contain many remarkable plants and it is intended to publish accounts of such as are new or interesting in further papers of this series. I should like to express my thanks to M. Le Testu for affording me the opportunity of examining these collections.

Diplacorchis (§ *Brachycorythoides*) *conica* Summerhayes, sp. nov.; a *D. ashantensi* Summerh. habitu multo graciliore, floribus minoribus, petalis apice rotundatis, labello apice minus lobulato, calcar conico acuto differt.

* Continued from K.B. 1937, 466.

Herba terrestris, gracilis, 20-45 cm. alta; radices fasciculatae, breviter pilosae. *Caulis* erectus, glaber, basi vaginis paucis instructus, per totam longitudinem foliatus. *Folia* sessilia, inferiora ovata, late lanceolata vel lanceolata, sursum angustiora et sensim decrescentia, summa in bracteis abeuntia, acuminata, usque ad 4.5 cm. longa et 1.8 cm. lata, internodiis longiora. *Inflorescentia* cylindrica, 4-15 cm. longa, circiter 2 cm. diametro, subdense pluri- vel saepius multiflora; bractee foliis similes sed minores, suberectae, lanceolatae, acuminatae, flores aequantes vel superantes. *Flores* suberecti, rosei vel violacei; pedicelli cum ovariis circiter 1 cm. longi. *Sepalum* intermedium erectum, oblongo-ellipticum vel oblongo-lanceolatum, subacutum vel subobtusum, 7-8 mm. longum, fere 3 mm. latum, valde concavum; sepala lateralibus oblique oblongo-lanceolata, obtusa, 6.5-7.5 mm. longa, circiter 3 mm. lata; sepala omnia extra adpressae pubescentia. *Petala* erecta, oblique oblonga vel lanceolato-oblonga, apice rotundata, margine antico basi dilatata, 7-8 mm. longa, 2.8-3.5 mm. lata, basi columnae breviter adnata, extra praesertim juxta costam adpressae pubescentia. *Labellum* totum 7.5-8 mm. longum; hypochilium calcaratum, 2.7-3.5 mm. diametro, utrinque lamella alta angusta e basi columnae in epichilium breviter et sensim decurrente instructa, calcar conico acuto apice leviter incurvato 5 mm. longo; epichilium ambitu ellipticum, apice truncatum breviter trilobatum, lobis lateralibus triangularibus incurvatis lobo intermedio dentiformi, totum 4.5-5 mm. longum, 3.8-4.8 mm. latum, dense papillato-puberulum. *Columna* erecta, 3.5-4 mm. alta, apice breviter apiculata; antherarum loculi erecti, paralleli; polliniorum viscidia orbicularia, nuda. *Rostellum* valde compressum, cucullatum, 1.3 mm. altum, lobis lateralibus subnullis.

GABON. Region of Upper Ngounyé River, Pangani plain, in the savannahs of the Echiras, Nov. 1924, *Le Testu* 5088 (type); between Mouila and Missonnera, in savannah, Dec. 1924, *Le Testu* 5143.

This is a second species of Sect. *Brachycorythoides*, differing from *D. ashantensis* Summerh., the other known species, by the characters given in the diagnosis. *D. conica* approaches the genus *Phyllomphax* in the general appearance of the flower, particularly the conical acute spur, but differs in column structure, the large cucullate rostellum being characteristic of *Diplacorchis*. So far as I can see no bursicles for the viscidia are developed in this species, the viscidia appearing to be naked. In *D. ashantensis* the bursicles are only partly developed and in this respect the new species approaches more closely *Brachycorythis*. In fact it is a matter of opinion whether the two species should be placed in *Brachycorythis* or in *Diplacorchis* in each of which genera they would form an aberrant group. In view of our relatively scanty knowledge as to which characters are of generic importance in this group it is at present inadvisable to create an additional genus for the two species concerned.

Phyllomphax macrantha (Lindl.) Summerhayes, comb. nov. *Gymnadenia macrantha* Lindl. Gen. & Sp. Orch. 279 (1835). *Eulophia Helleborina* Hook. f. in Bot. Mag. t. 5875 (1870). *Habenaria Helleborina* Nichols. Dict. Gard. 2, 107 (1885). *Platanthera helleborina* Rolfe in Dyer, Fl. Trop. Afr. 7, 204 (1898). *P. macrantha* Kraenzl. Orch. Gen. & Sp. 1, 612 (1899), 939 (1901). *Phyllomphax Helleborina* Schltr. in Fedde, Repert. Beih. 4, 119 (1919); Summerhayes in Hutch. & Dalz. Fl. West Trop. Afr. 2, 407 (1936).

I overlooked the above combination when writing my account of the orchids of West Tropical Africa but it seems to be the correct name for the species. Specimens collected by M. Le Testu extend the known distribution of the species to Gabon.

Cynorchis gabonensis Summerhayes, sp. nov.; ex affinitate *C. Hanningtonii* Rolfe, *C. Johnsoni* Rolfe et *C. Braunii* Kraenzl., a quibus floribus minoribus, labello apice valde dilatato obtuse trilobato, anthera reclinata distinguitur.

Herba terrestris, usque ad 15 cm. alta, radicibus tomentosis exceptis glabra. *Folia* radicalia vel subradicalia, 3-6, lanceolata vel oblongo-lanceolata, breviter acuminata, basi in petiolum 0.5-1 cm. longum angustata, usque ad 6 cm. longa et 1.7 cm. lata, infima ceteris saepius multo minora. *Scapus* erectus, cataphyllis 3-6 lanceolatis acuminatis instructus; racemus usque ad 3.5 cm. longus, densiuscule pauci- vel multiflorus; bractee lanceolatae, acuminatae, usque ad 8 mm. longae, floribus breviores. *Flores* adscendentes vel erecto-patentes, colore ignoto. *Sepalum* intermedium late ovatum, apice late acuminatum, valde concavum, 2-2.5 mm. longum, 1.5 mm. latum, supra antheram incurvatum, sepala lateralibus oblique semi-ovata, leviter acuminata, 2.5 mm. longa, 1.2 mm. lata, uninervia. *Petala* erecta, ambitu obovata, leviter obliqua, 2 mm. longa, 1.3 mm. lata, uninervia, dimidio antico semi-obovato apice breviter acuminato, dimidio postico multo angustiore fere recto medio lobulo rotundato aucto. *Labellum* e basi angusta oblonga subito dilatatum, antice trilobatum, lobis subaequalibus, lobo intermedio late triangulari, lobis lateralibus rotundatis, totum labellum 2.5 mm. longum, fere 2 mm. latum; calcar cylindricum, dependens, superne leviter incurvatum, subacutum, 2.5 mm. longum. *Anthera* reclinata, 0.5 mm. alta, acutum, 2.5 mm. longum. *Pollinia* 1 mm. longis; polliniorum viscidia canalibus porrectis fere 1 mm. longis; polliniorum viscidia elliptica, magna, 0.4 mm. longa. *Rostellum* porrectum, canales aequans, apice tantum lobatum, lobo intermedio carnosio erecto 0.1 mm. alto; stigmata lateralibus, capitato-clavata, 0.4-0.5 mm. longa; ovarium 4-5 mm. longum.

GABON. Upper Ngounyé River, source of the Wano River, at Mfouba, March 26th 1927, *Le Testu* 6454 (type in Herb. Le Testu).

This rather interesting species does not resemble very closely any known Tropical African species but rather has the appearance of *Goodyera* and allied genera. The glandular hairs so characteristic

of many species of *Cynorchis* are quite lacking in *C. gabonensis* but the floral structure places it in the genus. The rostellum projects forwards horizontally and is almost undivided, the middle lobe appearing as a fleshy upwardly directed knob right between the large viscidia of the pollinia. The stigmata are lateral and free in the upper part. *C. gabonensis* differs from the three species mentioned in the diagnosis in its reclinate anther, this being more or less erect in the other species; it also has a differently shaped lip.

Habenaria gabonensis Rechb. f. in Bot. Zeit. 10, 934 (1852). *H. psiloceras* Welw. ex Rechb. f. in Flora, 50, 99 (1867). *H. Milnei* Rechb. f. Otia Bot. Hamburg. 96 (1881). *H. Staudtiana* Kraenzl. Orch. Gen. & Sp. 1, 320 (1898). *H. Staudtii* Kraenzl. ex Rolfe in Dyer, Fl. Trop. Afr. 7, 221 (1898.)

An examination of types or isotypes of the above species shows that they are conspecific. I have also seen a number of other specimens collected in Gabon by G. Le Testu. It is evident that the species exhibits considerable variation in the size and shape of the various floral parts while the leaves may be equally distributed all up the stem or grouped more or less in the lower part. Nevertheless the species may be consistently distinguished from *H. procera* Lindl. and *H. Weileriana* Schltr., its two nearest allies. *H. psiloceras* represents a particularly large-flowered form of the species, the spur being exceptionally long, but shows no essential floristic differences from the other specimens.

Habenaria cornuta Lindl. in Hook. Comp. Bot. Mag. 2, 208 (1837). *H. ceratopetala* A. Rich. in Ann. Sci. Nat. sér. ii, 14, 267, t. 16, fig. 4 (1840). *H. subcornuta* Schltr. in Engl. Bot. Jahrb. 53, 510 (1915).

Examination of type or authentic material, as well as of many other gatherings of these three species, shows without doubt that they are conspecific. There is a certain amount of variation particularly in the lip and in the length of the anterior petal segments. In several specimens from Tropical Africa the lateral lobes of the lip, which are entire in all the type specimens, are variously toothed or almost pectinate in the lower half. There are, however, all gradations between entire lobes and lobes with six lateral teeth or filiform segments. The spur also varies in length from 14-28 mm. but is otherwise similar in structure. The species ranges from the northern Cameroons in the west to Abyssinia and Kenya Colony in the east and southwards through eastern Africa to Griqualand East, but there are still many large areas within this general range from which the species has not yet been recorded. The most extensive of these lies between the Abercorn district of Northern Rhodesia and the Houtbosch Mountains in the northern Transvaal.

Habenaria (§ Ceratopetalae) cornutella Summerhayes, sp. nov.; quoad floris structuram *H. cornutae* Lindl. similis, sed habitu

graciliore, foliis lanceolato-linearibus, floribus multo minoribus, labelli lobis lateralibus semper integris differt.

Herba terrestris, gracilis, usque ad 65 cm. alta; radices numerosae, interdum incrassatae, anguste fusiformes; caulis erectus, 2.5-4 mm. diametro, $\pm$ laxe 7-12-folius. Folia 4-6 inferiora saepius erecta, linearia vel lanceolato-linear, acuta, usque ad 24 cm. longa et 1 cm. lata, superiora decrescentia, lanceolata, bracteiformia. Racemus 8-14 cm. longus, 3-4 cm. diametro, subdense 10-20-florus; bracteae lanceolatae, acuminatae, usque ad 1.5 cm. longae. Flores virides, suberecti; pedicelli cum ovariis 1.5-2 cm. longi. Sepalum intermedium erectum, anguste ellipticum, obtusum, 5-6 mm. longum, 2-3 mm. latum, valde convexum, quinquenervium; sepala lateralia deflexa, oblique elliptico-obovata, lateraliter apiculata, 7-8.2 mm. longa, supra medium 4-5 mm. lata, quinquenervia. Petala e basi bipartita, glabra sed breviter papillosa; partitio postica cum sepalis intermedio agglutinata galeam formans, linearis, obtusa, 5-6 mm. longa, 0.3 mm. lata, uninervia; partitio antica corniformis, dimidio inferiore porrecto, superiore angustato sursum curvatim reflexo, valde compressa, acuta, 12.5-15.5 mm. longa, inferne 1-1.4 mm. lata. Labellum ex ungue circiter 1-1.5 mm. longo columnae adnato tripartitum; partitio intermedia linearis, obtusa, apice incurvata, 11.5-13 mm. longa, circiter 0.6 mm. lata, dimidio inferiore paullo concava; partitiones laterales leviter curvatim divergentes, e basi angusta lanceolato-lineares, superne angustatae, 12-14 mm. longae, basin versus 0.6-0.8 mm. latae; calcar dependens, inferne gracile, triente apicali valde inflatum, medio leviter spiraliter tortum, 12.5-14.5 mm. longum, parte apicali 1.4-1.7 mm. diametro. Anthera erecta, apice rotundata, 2.5 mm. alta; canales porrecti, 5-5.5 mm. longi; staminodia transverse elliptica, breviter bilobata, circiter 0.5 mm. longa. Brachia stigmatifera recta, gracilia, apice abrupte capitata, 5-5.5 mm. longa; rostellum lobis intermediis triangulari-subulatus, acutus, 1.4-1.8 mm. longus, papillosus, lobis laterales lineares, apice subito incurvati.

UGANDA. Kiagwe, Namanve Swamp, in *Saccharum* patches, 1170 m., March 1932, Eggeling 571 (type); Sezibwa River, near Ukoko, 1200 m., Dec. 1915, Dümmer 2686; Entebbe, in swamp, 1170 m., Sept. 1905, Brown 330; Masaka, Lake Nabugabo, in open marsh, 1200 m., April 1935, Synge 1951.

OUBANGUI-CHARI. Upper Kotto River, between Yalinga and Bria, July 1922, Le Testu 4029.

Evidently a widely distributed plant in the marshes in the vicinity of Lake Victoria. The species lies very near the borderline between sections *Ceratopetalae* and *Bilabrellae*. It possesses the slender habit, long narrow leaves, small flowers and laterally apiculate sepals of Sect. *Bilabrellae* but the erect dorsal sepal and relatively fleshy horn-like anterior petal-lobes are characteristic of Sect. *Ceratopetalae*. Among the species of this latter section *H.*

cornutella is in floral structure a small edition of *H. cornuta* Lindl. the resemblances apart from size being really remarkable. Undoubtedly the two sections are very closely allied structurally, but in the great majority of cases there is no difficulty in assigning a species to its correct section.

Habenaria stenorrhynchos Schltr. in Engl. Bot. Jahrb. 20, Beibl. 1, 33 (1895). *H. dactylostigma* Schltr. in Engl. Bot. Jahrb. 53, 509 (1915).

On examination of the type gatherings of these two species I fail to find any distinguishing characters, or indeed any significant differences at all. Here we have a species which, although possessing flowers of about the same size as *H. cornutella* Summerh., has the habit and lateral sepals of Sect. *Ceratopetalae* and is a fairly typical member of that section except for the relatively short anterior petal-lobe.

Habenaria (§ Bilabrellae) Linderi Summerhayes in Kew Bull. 1931, 381. *H. microsaccus* Kraenzl. in Engl. Bot. Jahrb. 43, 393 (1909), nomen rejiciendum (Art. 65).

In describing *H. microsaccus* Kraenzlin mentioned that it was characterised by two special features, namely, the very short spur, from which the trivial name was derived, and the "sonderbaren flügelartigen Anhängsel der Anthere." An examination of the type specimen shows that these so-called appendages, which, incidentally, are practically free from the anther to their base, are two additional anthers. Each one is provided with 2 properly constructed thecae and anther canals, though the latter, on account of the absence of supporting rostellum-arms, tend to curl up towards the anther. There are also the usual staminodes on the outside of each lateral anther. No pollinia were seen. This occurrence of two incomplete and ineffective additional anthers must be considered as an abnormal or teratological phenomenon, as in general habit and floral structure *Keil* 63, the type of *H. microsaccus*, is a typical example of Sect. *Bilabrellae*. In most respects, i.e., habit, sepals, petals, lip (except the spur), column and rostellum it agrees with the type of *H. Linderi* Summerh. Both possess petals which, instead of being bipartite almost to the base, as is usual in Sect. *Bilabrellae*, have a united basal portion which is at least 1 mm. long. It is evident from a comparison with both normal and obviously teratological specimens of other species that the type of *H. microsaccus* Kraenzl. is a monstrosity and the name must be rejected under Art. 65 of the International Rules of Nomenclature. It is probable that the very short spur is also an abnormality since in abnormal specimens of other species belonging to Sect. *Bilabrellae* a somewhat similar reduction in the length of the spur is a frequent occurrence.

H. microsaccus was described from near Usumbura at the north end of Lake Tanganyika. *H. Linderi* was first discovered at Bufundi in the extreme S.W. of Uganda; it has since been found on

in Kenya Colony. The name *H. Linderi* must be accepted as the correct name for this species.

Habenaria (§ Plantagineae) hetaerioides Summerhayes, sp. nov. a ceteris speciebus africanis sectionis floribus haud resupinatis, labelli lobo intermedio reniformi lobis lateralibus lineari-triangularibus pectinatis multo minoribus facile distinguenda.

Herba terrestris, 5-9 cm. alta; caulis inferne $\pm$ repens vel adscendens, radices flexuosas tomentosas emittens, superne erectus, dense foliatus. Folia 5-8, more *Hetaeriae*, basi breviter vaginantia sursum in petiolum falsum 5-7 mm. longum angustata, lamina oblique elliptico-ovata vel elliptico-lanceolata, acuta, usque ad 4.5 cm. longa et 2.3 cm. lata. Inflorescentia 2-3 cm. longa, 3-5-flora; bractae spathiformes, elliptico-obovatae, apice breviter acuminatae; leviter recurvatae, 7-11 mm. longae, 7-9 mm. latae; pedicelli cum ovariis circiter 1 cm. longi. Flores haud resupinati, succedanei, albi, horizontales, glabri. Sepalum intermedium elliptico-lanceolatum, subacutum, valde concavum, 5.5 mm. longum, 2 mm. latum, trinervium; sepala lateralia $\pm$ reflexa, oblique ovato-oblonga, apiculato-acuta, 6.5 mm. longa, inferne 2.5 mm. lata. Petala cum sepalo intermedio galeam formantia, leviter curvata, lineari-ligulata, obtusa, 5.5 mm. longa, 0.5 mm. lata, uninervia. Labellum sessile, trilobum, totum 9.5 mm. longum; lobus intermedium ex ungue angusto reniformis, apice valde emarginatus, 8 mm. longus, 12 mm. latus, ungue callo hemisphaerico instructo; lobi laterales patentes, lineari-triangulares, margine postico breviter pectinati, 2.5 mm. longi, fere 1 mm. lati. Columna brevis, circiter 1 mm. alta; anthera reclinata, canalibus fere 1 mm. longis, polliniorum viscidibus ellipticis 0.5 mm. longis, staminodiis semiorbicularibus; rostellum trilobum, lobis fere aequalibus acutis intermedio dorso basi callo rotundato instructo; stigmata columnaria, obtusa, 1 mm. longa, rostello breviora.

GABON. Between Heudofala and Adanghé, in very damp forest, July 1917, *Le Testu* 2214 (type in Herb. Le Testu); Upper Ogoué River, at the foot of the Badifoulou, March 1931, *Le Testu*, s.n.

This remarkable little species, which bears a strong resemblance vegetatively to the Acrotonous genera *Hetaeria* and *Zeuxina*, is best placed in section *Plantagineae*, the African representatives of this section thus being increased to five. Apart from the creeping and rooting basal part of the stem and the oblique leaves, *H. hetaerioides* is characterised by the relatively large spathe-like broadly obovate bracts and by the single opened flower being horizontally placed with the lip uppermost. The shape of the lip is also remarkable, the reniform middle lobe being many times larger than the basally placed lateral lobes which diverge at right angles and have the dorsal margin broken up into teeth, the longer ones of which are placed apically. The three lobes of the rostellum

all project forwards in the same plane, the middle lobe bearing a sort of mound-like callus on the dorsal surface between the two anther-loculi. This rostellum structure is reminiscent of many species of *Cynorchis* but the stigmata appear to be free from the rostellum and in other respects the plant shows little similarity to that genus; for instance, it is entirely devoid of the glandular hairs so characteristic of *Cynorchis*.

Habenaria parva (Summerh.) Summerhayes, comb. nov. *Cynorchis parva* Summerh. in Kew Bull. 1932, 338.

A re-examination of this species and of a number of species of *Cynorchis* and *Habenaria* has convinced me that it is more correctly placed in the latter genus. The union of the stigmata with the rostellum arms is only in the lower part but I do not now consider this character in itself to be of generic importance. In column structure otherwise *H. parva* differs greatly from the genus *Cynorchis* and approaches much more closely to many *Habenarias*. In *Habenaria* it is perhaps best included in Sect. *Plantagineae* next to *H. Jacobi* Summerh. which it closely resembles (see Kew Bull. 1935, 197).

Habenaria Lelyi Summerh., var. **macroceras** Summerhayes, var. nov.; a typo speciei labelli lobo intermedio lineari-ligulato obtuso, calcaribus plus duplo longiore differt.

FRENCH EQUATORIAL AFRICA. Oubangui-Chari, Bozoum, July 1931, Tisserant 2864 (type in Herb. Le Testu); Jauja Mts., near Bozoum, 900 m., July 1914, Mildbraed 9694.

This new variety is almost identical with the type in vegetative characters and general floral structure. The most obvious difference is in the spur which is 6-8 cm. long in var. *macroceras* whereas in the type it is less than 3 cm. long. The middle lobe of the lip is parallel-sided and obtuse in contrast to the almost lanceolate acute middle lobe of *H. Lelyi* type. It seems probable that the two gatherings cited above come from the same locality. The nearest relative of *H. Lelyi* is the East African *H. vaginata* A. Rich. which has much smaller flowers and a spur about 2 cm. long.

Disa patula Sond., var. **transvaalensis** Summerhayes, var. nov.; a typo foliis longioribus angustioribus, floribus praesertim minoribus, calcaribus pro rata longiore differt.

Recently a series of *Disas* referred to *D. patula* Sond., were received at Kew from the National Herbarium at Pretoria, South Africa, and it was at the same time suggested that there were two forms passing under this name. An investigation of this material has confirmed the suggestion, and the above new variety is here differentiated from *D. patula* type. The specimens of this variety come from the Western Transvaal with the exception of one from Oliviers Hoek, Natal, on the Orange Free State border. The floral structure in general is almost identical with that of the type except

that the spur is on an average relatively longer compared with the dorsal sepal (*D. patula* type, dorsal sepal 10 mm., spur 10.5 mm.; var. *transvaalensis*, dorsal sepal 8 mm., spur 11 mm.). The flowers are distinctly smaller in all parts except the spur and the inflorescence is consequently narrower. The leaves form another obvious distinction between type and variety. In var. *transvaalensis* the longest leaves reach 9-17 cm. but are only 9-15 mm. wide, whereas in the type they are 7-10 cm. long and 12-22 mm. wide. The inflorescence and leaf characters give a very distinct facies to the new variety but as there are no very clear cut floral differences I do not think it can be considered as a different species. *D. patula* type is found in the Eastern Cape Province and in Natal. *D. stenoglossa* Bolus is rightly referred by Rolfe in Flora Capensis (5, sect. 3, 245: 1913) to *D. patula* in which it agrees with the type form. *Monadenia leydenbergensis* Kraenzl. is also cited as a synonym of *D. patula* by Rolfe, but is quite different in structure, and is indeed included by Rolfe elsewhere in Flora Capensis (l.c. p. 189) in the genus *Monadenia*.

The following specimens of the new variety have been examined (K, Kew Herbarium.; P, Nat. Herb. Pretoria):—

TRANSVAAL. Pietersburg Distr.: Woodbush, Jan. 1930, Schweickerdt 20495 (P). Lydenburg Distr.: Dullstroom, Suikerbos Kop, on stony slopes, 2040-2100 m., Jan. 1933, Galpin 11864 (K; P); same locality, Feb. 1933, Galpin 12459 (type of variety; K; P); Graskop, in open veldt, 1425 m., Jan. 1921, Irvine 17 (P); Mac Mac, near Graskop, Mudd (K); near Lydenburg, Dec. 1873-Jan. 1874, Atherstone (K). Barberton Distr.: Nelspruit, Jan. 1921, Maggs 20497 (P); Berlin, near Kaapse Hoop, Jan. 1923, Hofmeyr 15299 (P); Berlin, Godwan River Station, amongst rocks, Jan. 1923, Hofmeyr & Davison 19 (P).

NATAL. Oliviers Hoek, sources of Tugela River, in stony soil, 1500 m., Dec.-Feb., Allison N. (K).

Vanilla heterolopha Summerhayes, sp. nov.; *V. africanae* Lindl. valde similis, sed labelli lobo intermedio quadrato fere rectangulari apice truncato leviter retuso, cristis vel callis valde diversis facile distinguenda.

Herba scandens, glaberrima; caules flexuosi, graciles, usque ad 70 cm. vel ultra longi, siccitate 1-2 mm. diametro, laxae foliati, e nodis radicales. Folia lanceolata vel oblongo-lanceolata, longe acuminata, basi late cuneata vel subrotundata, breviter petiolata, 5-12 cm. longa, 1.3-2.7 cm. lata, 9-13-nervia; petiolus gracilis, 0.5-1 cm. longus. Inflorescentiae simpliciter racemosae, axillares, 1-3 cm. longae, dense multiflorae; bractae ± imbricatae, saepe reflexae vel patentes, ovatae vel triangulari-ovatae, usque ad 4 mm. longae. Flores rosei vel roseo-albidi; pedicelli cum ovario 1-2 cm. longi. Sepalum intermedium oblongo-lanceolatum vel oblongo-oblancheolatum, subacutum vel obtusum, 17-22 mm. longum, circiter 5 mm. latum; sepala lateralia oblique vel curvatim

elliptico-lanceolata vel elliptico-ovata, obtusa vel subacuta, 16-17 mm. longa, 7.5-8.5 mm. lata. *Petala* oblique lanceolata vel oblongo-lanceolata, subacuta, 16-20 mm. longa, 4.5-5.5 mm. lata. *Labellum* columnae per 7-8 mm. adnatum tubum ore apertum formans, distincte trilobatum, in toto circiter 13 mm. longum; lobus intermedius quadratus, fere rectangularis, apice truncatus leviter retusus apiculo brevissimo latissimo interjecto, medio geniculatim recurvatus, 6.5-8.5 mm. longus, 5.5-7.5 mm. latus, lateribus irregulariter dentatis et undulatis; lobi laterales explanati triangulares, apice tantum liberi, obtusi vel rotundati; lobus intermedius antice cristis tribus intermedia humili interrupta vel verrucosa lateralibus antice humilibus integris laevibus in medio lobi intermedii crassis semicircularibus, postice et in labelli disco lamellis multis quadratis vel linearibus transversis deorsum sensim decrescentibus instructus. *Columna* arcuatim incurvata, circiter 10 mm. longa, semiteres, apice leviter ampliata, basi in alas latissimas labelli lobis lateralibus adnatas dilatata; anthera reniformis, rotundata; rostellum breve, truncatum, latum.

GABON. Upper Ogoué River, Matoro, Oct. 1929, *Le Testu* 7494 (type); Lastoursville, Nov. 1929, *Le Testu*, s.n.; Upper Ngounyé River, between M'bigou and Bagui, Nov. 1925, *Le Testu* 5769. (All in Herb. Le Testu, Caen.)

This very interesting species is almost indistinguishable from *V. africana* Lindl. in vegetative and superficial floral characters. The lip is, however, totally different. Instead of the narrow pointed middle-lobe furnished in the centre with a few retrorse and fimbriate scales, characteristic of *V. africana*, we have in *V. heterolopha* a broad rectangular middle-lobe sharply recurved like a knee in the middle. This and the upper part of the disc bears an assemblage of outgrowths and calli which in their diversity go far beyond those of any African species or indeed of any other species known to me. In the front are three parallel keels, the middle one lower and broken up into a series of knobs, the outer smooth in front but forming at the knee-bend of the lip a pair of swollen semicircular calli similar to those found in many species of *Eulophia*, for example, *E. cristata* (Sw.) Steud. Behind this the crests cease but are replaced by a series of relatively narrow but transversely placed lamellae which become shorter and shorter towards the base of the lip, until they are represented merely by transverse raised lines.

Nervilia subintegra Summerhayes, sp. nov.; affinis *N. Fuerstenbergianae* Schltr., a qua scapo longiore, tepalis latioribus, labello ambitu lanceolato indistincte lobato, disco ecalloso facile distinguenda.

Herba terrestris; tuber ellipsoideum, rugosum, circiter 1 cm. longum et 5 mm. diametro, cicatricibus cataphyllorum distincte notatum. *Folia* non visa. *Scapus* erectus, basi leviter flexuosus gracilis, 7-18 cm. longus, vaginis paucis lanceolatis acuminatis instructus, apice uniflorus. *Flos* horizontalis, flavidus, 2.5-4 cm.

diametro; bractea angusta, lanceolata, subulato-acuminata, 1-1.5 cm. longa; pedicellus cum ovario 5 mm. excedens. *Sepalum* intermedium oblanceolatum, acutum, 17-19 mm. longum, 3-4 mm. latum; sepala lateralibus oblique oblanceolata, breviter acuminata, 17-20 mm. longa, 3-4.5 mm. lata; sepala omnia trinervia. *Petala* oblongo-lanceolata, acuta, 16-18 mm. longa, 2.5-3.2 mm. lata, trinervia. *Labellum* ex ungue lato leviter excavato circiter 3 mm. longo columnam amplectente ambitu lanceolatum, medio ita constrictum ut indistincte trilobatum videatur, totum 12.5-15.5 mm. longum, 7 mm. latum, lobis lateralibus rotundatis, lobo intermedio ovato subacuto 7.5 mm. longo 5.5 mm. lato, disco trinervoso, elamellato et ecalloso. *Columna* leviter recurvata, 7.5-9.5 mm. longa, inferne teres, superne valde ampliata.

OUBANGUI-CHARI. Upper Kotto River, Yalinga, March 27th 1923, *Le Testu* 4634 (type in Herb. Le Testu, Caen) "Plante tout entière jaunâtre."

No leaves have as yet been seen but the floral characters easily distinguish the species from all its allies.

Diceratostele Summerhayes, gen. nov. *Sobraliinarum*, *Neobartlettiae* Schltr. similis sed columna apice appendicibus duabus linearibus erectis instructa, labello ambitu oblongo medio constricto differt.

Sepala et petala basi $\pm$ conniventia sursum leviter divergentia; oblanceolata. *Labellum* basi medio columnae breviter adnatum, oblongum, basi leviter angustatum, medio leviter constrictum, dimidio inferiore lamellis duabus integris instructum, columnam paulo superans et inferne $\pm$ amplectens. *Columna* longa, semiteres, apice incurvata appendicibus duabus linearibus erectis vel recurvatis instructa, glabra. *Anthera* terminalis, incumbens, androclinio leviter excavato; pollinia non visa. *Stigma* subtus anthera positum, excavatum, quadratum.

Planta terrestris; caules erecti, rigidi, plurifoliati; folia haud articulata, longe petiolata, elliptico-lanceolata, subchartacea, trinervia; inflorescentiae solitares, ex axillis foliorum superiorum ortae, simpliciter racemosae, pluriflorae, bracteis floribus multo brevioribus; flores verisimiliter succedanei.

D. gabonensis Summerhayes, sp. nov.

Herba terrestris, usque ad 60 cm. alta. *Radices* supra terram e basi caulium exorientes, rigidae, superne simplices, inferne ramosae, superne usque ad 3 mm. diametro. *Caules* erecti, rigidi, inferne basibus vaginarum foliorum delapsorum nodos incrassatos simulantibus praediti, internodiis brevibus, superne 6-8-foliati, pauciramosi, usque ad 3 mm. diametro, glabri. *Folia* longe petiolata, elliptico-lanceolata vel lanceolato-elliptica, acuminata, basi cuneata, petiolo incluso 11-30 cm. longa, 2.5-6 cm. lata, distincte trinervia, nervis subtus prominentibus, interdum ad vaginam et petiolum redacta; petiolus cum vagina brevi 3-8 cm. longus, supra

canaliculatus. *Inflorescentiae* 3-4 cm. longae, 10-15-florae; rhachis sparse pubescens; bracteeae distichae, fere patentes, elongato-cymbiformi-triangulares, acutae, 5-8 mm. longae. *Flores* suberecti, albi. *Sepalum* intermedium ligulato-oblongum, obtusum, fere 2 cm. longum, circiter 3 mm. latum; sepala lateralia oblique oblanceolata, acuta, fere 2 cm. longa, 4-5 mm. lata; sepala omnia extra sparse breviter pilosa. *Petala* oblique oblanceolata, acuta, sepalis paulo breviora, 3.5-4 mm. lata, extra quadrantibus tribus inferioribus carina humili instructa. *Labellum* media basi columnae per 3 mm. adnatum, ambitu oblongum, basi leviter angustatum, medio leviter constrictum, circiter 15 mm. longum, 6 mm. latum, parte antica fere quadrata truncata apice indistincte brevissime tridentata, parte basali utrinque rotundata lamellis duabus integris divergentibus instructa. *Columna* generis, 12-13 mm. longa, appendicibus apicalibus obtusis 3.5 mm. longis 1 mm. latis. *Fructus* immaturi anguste cylindrici, usque ad 3.5 cm. longi.

GABON. Upper Ngounyé River, Mt. Vianga, between Mouila and Kembélé, near the R. Onoy, Feb. 21st 1925, *Le Testu* 5219 (type in Herb. Kew.; paratypes in Herb. Le Testu).

This remarkable new genus seems to be properly placed in the subtribe *Sobraliinae*. Among African orchids it is very similar vegetatively to *Corymborchis* but the anther is placed at the apex of the column and appears to be operculate. Unfortunately no pollinia have been found in the few flowers available for examination. Mansfeld has recently (Notizbl. Bot. Gart. Berl. 13, 666-667: 1937) advocated the transference of the two genera *Rolfea* Zahlbr. and *Neobarlettia* Schltr. from *Tropidiinae* to *Sobraliinae* and from examination of both genera I entirely agree that this should be done. *Diceratostele* is undoubtedly closely related to these two genera but differs from both in the remarkable flattened horn-like appendages at the top of the column as well as in the general structure of the lip. It is, however, interesting to note that many species of the genus *Sobralia* itself possess to a much less extent similar appendages at the apex of the column. *Sobralia* differs from *Diceratostele* in many ways, of which the most obvious are the inflorescence and the size of the flowers. The fundamental structure of the column and anther in the genera mentioned above as well as in *Elleanthus* is relatively constant and quite different from that in *Corymborchis* and *Tropidia*. Since Mansfeld has also placed *Arundina* and *Thunia*, both Asiatic genera, in the *Sobraliinae* the discovery of an African genus belonging to this subtribe is of considerable importance.

Oberonia disticha (Lam.) Schltr. in Fedde Repert. Beih. 33, 132 (1924).

The occurrence of a species of *Oberonia* on the mainland of Africa has long been known but until recently only sterile or fruiting specimens had been collected. Flowering specimens have been

received at Kew from various sources and examination shows them all to be referable to the well-known Mascarene Island species. This has been known generally as *O. brevifolia* Lindl. but that name is illegitimate and in any case is later than Lamarck's *trifolia*.

I have seen flowering and fruiting specimens of *O. disticha* from Gabon, Uganda and Moçambique and in addition sterile or fruiting material from St. Thomas and Tanganyika Territory. The species is evidently widely spread in the forest zones of the African mainland but so far has not been recorded west of the Cameroons. There is no evidence for the occurrence of more than one species in Africa.

XXIII—NOTES ON MESEMBRYANTHEMEAE: II.* THE LECTOTYPES OF NANANTHUS AND ALOINOPSIS.—A. A. BULLOCK.

Although fewer than twenty years have elapsed since the late Dr. N. E. Brown commenced segregating new genera from *Mesembryanthemum* L., many nomenclatural difficulties have arisen, due, chiefly, to the serial method of publication adopted by Brown, and to the fact that the type-method was not explicitly incorporated into the International Rules of Botanical Nomenclature until 1930. Even now, the choice of lectotypes is not governed by definite rules, but a notable contribution in this respect had previously been made by the Botanical Society of America, a committee of which, headed by the late Dr. A. S. Hitchcock, in 1918 submitted a report which was published in *Science*, 49, 333–336 (1919); at the same meeting the committee was enlarged, and empowered to prepare a code of rules. This appeared in *Science*, 53, 312–314 (1921). A series of papers by Dr. T. A. Sprague in the *Journal of Botany* and in the *Kew Bulletin*,† includes various suggestions as to methods of typification based on the study of special cases. The following notes are intended to be a further contribution of this kind, and the writer wishes to record his deep appreciation of the help and criticism afforded by Dr. Sprague.

The generic name *Nananthus* N. E. Br. was published in *Gard. Chron.* 78, 433 (1925) in a key to genera segregated from *Mesembryanthemum*; no description in the ordinary form was given, and no constituent species were mentioned. The interpretation of *Nananthus* N. E. Br. therefore presented an awkward problem, as it was difficult to decide which species should be placed in it without reference to Brown's manuscript, or to the herbarium material and living plants on which he was working at Kew.

Dr. L. Bolus made the first binomial combination under *Nananthus* when she transferred *Mesembryanthemum albinotum* Haw. to *Nananthus*, in *S. Afr. Gard. and Country Life*, 17, 399 (1927). The possible contention that the first species to receive a binomial under a new generic name must be accepted as the lectotype is clearly invalid, since the first binomial might represent a species which

* Continued from K.B. 1937, 497.

† See list of papers by Sprague, p. 160.

the author of the generic name might not even have seen, or which he would have assigned to some other genus. It is thus clear that the case for regarding *M. albinotum* Haw. as the lectotype of *Nananthus* must be considered on its own merits.

The constituent species of *Nananthus* were first listed by Dr. Schwantes in *Gartenflora*, 77, 68 (Febr. 1928), and independently by Dr. Brown in *Journ. Bot.* 66, 78 (March, 1928). These were *N. albinotus* (Haw.) L. Bolus, *N. albipunctus* (Haw.) Schwantes, *N. aloides* (Haw.) Schwantes, *N. cibdelus* (N. E. Br.) Schwantes, *N. rubrolineatus* (N. E. Br.) Schwantes, and *N. vittatus* (N. E. Br.) Schwantes. No mention was made at this stage of a type-species, the generic name being applied equally to all the six species. Dr. Schwantes' list was non-alphabetical, and *N. albinotus* (Haw.) L. Bolus, was placed first. Whether this indicates (by analogy with the case of *Aloinopsis* given below) that he intended to make *N. albinotus* the lectotype, is uncertain.

In *S. Afr. Gard. and Country Life*, 19, 244 (1929), Dr. Bolus wrote, "I should prefer to see *Nananthus* composed of *N. albinotus* L. Bol[us] and *N. albipunctus* N. E. Br. [sic] and the remaining six species enumerated by Schwantes [under *Aloinopsis*: *A. aloides* (Haw.) Schwantes, *A. cibdela* (N. E. Br.) Schwantes, *A. vittata* (N. E. Br.) Schwantes, *A. rubrolineata* (N. E. Br.) Schwantes, *A. transvaalensis* (Rolfe) Schwantes, and *A. rosulata* (Kensit) Schwantes] placed under *Aloinopsis* Schw[antes]." This suggested allocation of species under *Nananthus* and *Aloinopsis* respectively seems to have been due to several causes: (1) Dr. Schwantes, in 1927, had named *Mesembryanthemum rosulatum* Kensit as lectotype of his generic name *Aloinopsis* and this choice appears to have been accepted by Dr. Bolus; (2) *Mesembryanthemum albinotum* was the first species to be given a name under *Nananthus*; (3) *Mesembryanthemum albinotum* and *M. albipunctum* agreed better, in Dr. Bolus's opinion, with the key characters supplied by Dr. Brown. Under certain methods of applying names, such as the so-called principle of residue, the first consideration must be regarded as of primary importance. According to this "principle", which conflicts with a type-method, a name is retained for what is left after the other original elements have been separated under other names, without consideration of whether any of the elements thus separated may not be the type of the original name. The second consideration has been shown to be of minor importance under a type-method. The first consideration is dealt with below. The third point may now be considered.

Dr. N. E. Brown was the first definitely to indicate a lectotype of *Nananthus*, in *Gard. Chron.* 89, 92 (1931), where he stated that the type was *N. vittatus* (N. E. Br.) Schwantes. Since, judging from Brown's published papers, this is the plant which he knew best, it may be assumed that he had it chiefly in mind when he proposed the genus in 1925. There is, however, one argument against the choice of this lectotype:—The key to genera of 1925 says of the

stamens of *Nananthus*, "conspicuous, erect," whereas those of *N. vittatus* are closely packed into a broad cone; they are therefore not strictly erect, but lean slightly inwards. This discrepancy would be of little consequence if all the species originally placed under *Nananthus* were congeneric, but in actual fact a second genus, *Rabiea* N. E. Br., has been segregated from it. These two genera can be distinguished most readily by the stamens, which are strictly erect in *Rabiea*, but collected in a broad cone in *Nananthus* (emend. N. E. Br.). Reading the key literally, the inference might be that Dr. Brown created a new genus, *Rabiea*, for the type element of *Nananthus* N. E. Br. (sens. lat.). It should be remembered, however, that in writing a key, it is essential to emphasize contrasting characters, and the word "erect" in such a place need not be interpreted so strictly as if it occurred in a normal generic description. In the present case, Brown was distinguishing *Nananthus* from *Piquetia* N. E. Br., in which the stamens are "hidden under a dome of inarched staminodes and petals." The word "conspicuous," not the qualifying word "erect" was, therefore, the significant one in the case of *Nananthus*. In these circumstances, to have modified "conspicuous, erect" would have been to complicate still further an already difficult key.

There is thus a strong case in favour of the selection of *Nananthus vittatus* (N. E. Br.) Schwantes as the lectotype of the generic name *Nananthus* N. E. Br.

The case of *Aloinopsis* Schwantes is perhaps more complicated, and as presented here, involves the rejection of a lectotype chosen by the original author of the generic name.

Aloinopsis Schwantes was published in *Zeitschr. Sukk.* 2, 177 (1926), and a description was given, in addition to a list of eight constituent species. After the generic description, Dr. Schwantes states, "Hierher gehören die Arten der Sektion *Aloidea* Haw." This, taken in conjunction with the description, the similarity of the names *Aloinopsis*, *Aloidea* and *aloides*, and the fact that *Mesembryanthemum aloides* Haw. is placed first in the non-alphabetical list of constituent species, implicitly indicates that the type-species was *M. aloides* Haw. In the following year (*Zeitschr. Sukk.* 3, 105: 1927), however, Dr. Schwantes published a list of type-species of some of his segregate genera, including *Aloinopsis*, the type-species of which was given as *M. rosulatum* Kensit. No reasons were supplied for this somewhat surprising choice, but since it was the first choice of a lectotype it would normally be accepted unless cogent reasons could be adduced for its rejection.

Returning to the original description of *Aloinopsis*, it will be observed that *M. rosulatum* is mentioned (though not actually by name) as being *exceptional* in the shape of the leaves, which are not *Aloë*-like. Again after *M. rosulatum* (the last species) in the list of constituent species, "Diese Art leitet, aber nur hinsichtlich der breit spateligen Blätter, hinüber zu *Titanopsis* [Schwantes]." The

choice of an exceptional species as a lectotype is clearly undesirable, and should be avoided where possible. The description of the fruit of *Aloinopsis* does not agree with the fruit structure [where known] of any of the species enumerated by Dr. Schwantes under *Aloinopsis*. Under *Titanopsis* (in Zeitschr. Sukk. 2, 178: 1926), however, he remarks, "Eine Samenkapsel von *Aloinopsis rosulata* wurde mir von einem der namhaftesten Botaniker des Kaplandes irrtümlich als Frucht von *Mesembryanthemum* [sic] *Bolusii* gesandt, der sie in der Tat ungemein ähnlich war. Auch die Samen sind bei *Titanopsis* völlig anders beschaffen als bei *Aloinopsis*." N. E. Brown later (Journ. Bot. 66, 78: 1928) reduced *Aloinopsis* to *Nananthus*, and referred to the above statement as follows:—"The identification of this detached capsule is therefore purely imaginary on the part of the author, for, if the description he gives of it is correct, it bears no resemblance to the fruit of *M. rosulatum*, and would appear to have been the fruit of some species of *Punctillaria*." Dr. Bolus, in S. Afr. Gard. and Country Life 19, 244 (1929) also says, "for the only fruit sent to him [Schwantes] appears to have been a detached capsule wrongly named, and this unfortunately proved to be a 'red herring' in his path." It seems probable that Dr. Schwantes selected *M. rosulatum* as the lectotype of *Aloinopsis* because it was the only species of which he supposed he knew the fruit. This supposition being erroneous, the only reason for selecting *M. rosulatum* as lectotype disappears. On this account, and because *M. rosulatum* is an exceptional species, the writer rejects it as lectotype of *Aloinopsis*, and accepts in its place *M. aloides* Haw., which was implicitly indicated as the type-species by Dr. Schwantes in 1926, and actually chosen as lectotype by N. E. Brown in 1928.

In this discussion, four generic names are involved, and at this point a list of them, with their dates of publication and the type and lectotypes accepted here, will adequately summarize the results obtained.

	TYPE OR ACCEPTED LECTOTYPE.	REJECTED LECTOTYPE.
1. <i>Nananthus</i> N. E. Br., 1925.	<i>N. vittatus</i> (N. E. Br.) N. E. Br.	<i>N. albinotus</i> (Haw.) L. Bolus
2. <i>Aloinopsis</i> Schwantes, 1926.	<i>A. aloides</i> (Haw.) Schwantes	<i>A. rosulata</i> (Kensit) Schwantes.
3. <i>Aistocaulon</i> Poelln., 1935 (= <i>Acaulon</i> N. E. Br., 1928).	<i>A. rosulatum</i> (Kensit) Poelln.	
4. <i>Rabiea</i> N. E. Br., 1931.	<i>R. albinota</i> (Haw.) N. E. Br.	

It follows that if *Mesembryanthemum vittatum* N. E. Br. and *M. aloides* are treated as congeneric, *Aloinopsis* Schwantes becomes a synonym of *Nananthus* N. E. Br., and cannot be applied to any group of species segregated from *Nananthus* not including *M. aloides*

Haw.. This view was evidently held by Dr. Brown when he created the genus *Rabiea*.

The following list indicates the senses in which *Nananthus*, *Aloinopsis*, *Rabiea*, *Acaulon* and *Aistocaulon* have been interpreted by the three authors concerned, at different times. Type-species definitely indicated by them are in clarendon type.

NANANTHUS N. E. Br.

1. Brown, 1925.—No constituent species cited. Generic characters given in a key.
2. Schwantes, 1928.—*Mesembryanthemum albinotum*, *M. albipunctum*, *M. aloides*, *M. cibdelum*, *M. rubrolineatum*, *M. vittatum*.
3. Brown, 1928.—*M. albinotum*, *M. albipunctum*, *M. aloides*, *M. cibdelum*, *M. rubrolineatum*, *M. vittatum*.
4. Bolus, 1929.—*M. albinotum*, *M. albipunctum*.
5. Brown, 1931.—*M. vittatum*, *M. aloides*, *M. rubrolineatum*, *Nananthus Pole-Evansii*.

ALOINOPSIS Schwantes.

1. Schwantes, 1926.—*M. aloides*, *M. albinotum*, *M. albipunctum*, *M. rubrolineatum*, *M. vittatum*, *M. cibdelum*, *M. transvaalense*,* *M. rosulatum*
2. Schwantes, 1927.—*M. rosulatum*.
3. Brown, 1928.—Synonym of *Nananthus*, excluding *M. rosulatum*; *M. aloides* was regarded as the nomenclatural type.
4. Bolus, 1929.—*M. rosulatum*, *M. aloides*, *M. rubrolineatum*, *M. vittatum*, *M. cibdelum*, *M. crassipes*, *Nananthus Dyeri*, *N. Peersii*; Dr. Bolus has added several species since 1929.

AISTOCAULON Poelln. (= *Acaulon* N. E. Br., non C. Müll.)

Brown, 1928.—*M. rosulatum*.

Bolus, 1929.—Tentatively rejected.

von Poellnitz, 1935.—Pointed out that *Acaulon* N. E. Br. was a later homonym of *Acaulon* C. Müll. (1847), and provided the new name *Aistocaulon*—*M. rosulatum*.

RABIEA N. E. Br.

Brown, 1931.—*M. albinotum*, *M. albipunctum*, *M. cibdelum*, *M. carolinense*, *Rabiea tersa*, *R. Lesliei*.

An enumeration of the species mentioned in this discussion, with their synonymy and references to the literature, is appended, together with a supplementary list of additional species described by Dr. Bolus under *Aloinopsis* and *Nananthus*. These I have not seen, and do not, therefore, propose to transfer them. According to the list above, Dr. Bolus' interpretations of 1929 indicate that her '*Nananthus*' is *Rabiea*, and her '*Aloinopsis*' is, for the most part, *Nananthus*. One species referred to *Aloinopsis* by Dr. Bolus in

* This is now regarded as a synonym of *M. vittatum* N. E. Br.

1929, namely, *Mesembryanthemum crassipes* Marloth, was treated by Dr. Brown (1931) as a species of *Titanopsis* Schwantes, and in view of doubt as to its correct genus, I have excluded it.

As regards the typification of the four generic names the writer is in complete agreement with N. E. Brown, but it is possible that Brown's taxonomic work may require modification. It is doubtful whether *Aistocaulon* and *Rabiea* are generically distinct from *Nananthus*. One morphological feature on which Brown laid great stress, namely, whether the ovary was inferior or half-superior, seems to be only of specific importance. It is merely a question of the shape of the upper part of the ovary. The ovary of all *Mesembryanthemeae* is inferior, being always immersed in and fused with the torus.

1. *Aistocaulon rosulatum* (Kensit) Poelln. in Jacobsen, Succ. Pl. 123 (1935).—*Mesembryanthemum rosulatum* Kensit in Trans. Roy. Soc. S. Afr. 1, 152, t. 21, fig. B (1909).—*Aloinopsis rosulata* (Kensit) Schwantes in Zeitschr. Sukk. 2, 178 (1926), et l.c. 3, 105 (1927).—*Acaulon rosulatum* (Kensit) N. E. Br. in Journ. Bot. 66, 77 (1928), et in Brown, Tischer et Karsten, Mesembr. 103, fig. 15 (1931).

Since *Aistocaulon* Poelln. is a monotypic genus, if indeed it is really distinct from *Nananthus*, the nomenclatural type is *Mesembryanthemum rosulatum* Kensit.

2. *Nananthus vittatus* (N. E. Br.) Schwantes in Gartenfl. 77, 68 (1928)*; N. E. Br. in Journ. Bot. 66, 78 (1928), et in Gard. Chron. 89, 92, fig. 48, 49 (1931).—*Mesembryanthemum vittatum* N. E. Br. in Gard. Chron. 6, 772 (1876), et in Burt Davy, Fl. Transv. 1, 160, 162 (1926); L. Bolus in S. Afr. Gard. and Country Life, 18, 127, f. 6 (1928), et Notes Mesembr. 1, 63, fig. 6 (1928).—*M. transvaalense* Rolfe in Bot. Mag. t. 8674A (1916).—*Aloinopsis vittata* (N. E. Br.) Schwantes in Zeitschr. Sukk. 2, 178 (1926); L. Bolus in S. Afr. Gard. and Country Life, 19, 241, cum fig. (1929).—*A. transvaalense* (Rolfe) Schwantes, l.c.

This is the nomenclatural type of *Nananthus* N. E. Br. in Gard. Chron. 78, 433 (1925).

3. *Nananthus aloides* (Haw.) Schwantes in Gartenfl. 77, 68 (1928); N. E. Br. in Journ. Bot. 66, 78 (1928), et in Gard. Chron. 89, 92 (in clavi), 133, fig. 67—69 (1931), et in Brown, Tischer et Karsten, Mesembr. 274, fig. 151 (1931).—*Mesembryanthemum aloides* Haw. Suppl. Pl. Succ. 88 (1819), et Rev. Pl. Succ. 87 (1821); Burch. Trav. 1, 332 (1822); N. E. Br. in Journ. Linn. Soc. Bot. 45, 123 (1920); Pole Evans in Fl. Pl. S. Afr. t. 54 (1922), non auctt. al. *Aloinopsis aloides* Schwantes in Zeitschr. Sukk. 2, 178 (1926); L. Bolus in S. Afr. Gard. and Country Life, 19, 244 (1929).

Since, as shown above, this is the type-species of *Aloinopsis*

Schwantes, it follows that that name becomes a synonym of *Nananthus* N. E. Br., so long as species 2 and 3 above are regarded as being congeneric.

4. *Nananthus rubrolineatus* (N. E. Br.) Schwantes in Gartenfl. 77, 68 (1928); N. E. Br. in Journ. Bot. 66, 78 (1928), et in Gard. Chron. 89, 92 (in clavi), 134, fig. 70 (1931), et in Brown, Tischer et Karsten, Mesembr. 276, fig. 153 (1931).—*Mesembryanthemum rubrolineatum* N. E. Br. in Kew Bull. 1911, 82.—*Aloinopsis rubrolineata* (N. E. Br.) Schwantes in Zeitschr. Sukk. 2, 178 (1926); L. Bolus in S. Afr. Gard. and Country Life, 19, 244 (1929), et Notes Mesembr. 2, 129 (1929).—*Nananthus Dyeri* L. Bolus, l.c. 83.—*Aloinopsis Dyeri* (L. Bolus) L. Bolus l.c. 129, et in S. Afr. Gard. and Country Life, 19, 245 (1929).

5. *Nananthus Pole-Evansii* N. E. Br. in Gard. Chron. 89, 92 (in clavi), 133, fig. 64—66 (1931), et in Brown, Tischer et Karsten, Mesembr. 275, fig. 152 (1931).

6. *Rabiea albinota* (Haw.) N. E. Br. in Gard. Chron. 89, 53 (1931).—*Mesembryanthemum albinotum* Haw. in Phil. Mag. 68, 126 (1826).—*Aloinopsis albinota* (Haw.) Schwantes in Zeitschr. Sukk. 2, 178 (1926).—*Nananthus albinotus* (Haw.) L. Bolus in S. Afr. Gard. and Country Life, 17, 399, fig. 21 F, et 400, fig. 22 (1927), et l.c. 18, 127, fig. 7 (1928), et l.c. 19, 244 (1929), et Notes Mesembr. 1, 63, fig. 7, et 96, fig. 21 F, 22 (1928); Schwantes in Gartenfl. 77, 68 (1928); N. E. Br. in Journ. Bot. 66, 78 (1928).—*N. Comptonii* L. Bolus, Notes Mesembr. 2, 120 (1929).

This is the type-species of *Rabiea* N. E. Br. in Gard. Chron. 89, 53 (1931).

7. *Rabiea albipuncta* (Haw.) N. E. Br. in Gard. Chron. 89, 54 (1931).—*Mesembryanthemum albipunctum* Haw. in Phil. Mag. 68, 126 (1826).—*Aloinopsis albipuncta* (Haw.) Schwantes in Zeitschr. Sukk. 2, 178 (1926).—*Nananthus albipunctus* (Haw.) Schwantes in Gartenfl. 77, 68 (1928); N. E. Br. in Journ. Bot. 66, 78 (1928); L. Bolus in S. Afr. Gard. and Country Life, 19, 244 (1929), excl. ic.

8. *Raniea cibdela* (N. E. Br.) N. E. Br. in Gard. Chron. 89, 54 (1931).—*Mesembryanthemum aloides* Haw. sec. Salm Dyck, Mesembr. §4, fig. 3 (1840),* non Haw. (1819).—*M. albipunctum* var. *majus* Haw. in Phil. Mag. 68, 127 (1826).—*M. cibdelum* N. E. Br. in Journ. Linn. Soc. Bot. 45, 64 (1920).—*Aloinopsis cibdela* (N. E. Br.) Schwantes in Zeitschr. Sukk. 2, 178 (1926); L. Bolus in S. Afr. Gard. and Country Life, 19, 244 (1929).—*Nananthus cibdelus* (N. E. Br.) Schwantes in Gartenfl. 77, 68 (1928); N. E. Br. in Journ. Bot. 66, 78 (1928).

* The dates of publication of the plates of this work have been the subject of a successful bibliographical research by Mr. W. T. Stearn of the Lindley Library, Royal Horticultural Society, to whom the writer is indebted for this date.

* Schwantes' paper appeared in February, and Brown's in the following month.

9. *Rabiea carolinensis* (L. Bolus) N. E. Br. in Gard. Chron. 89, 53 (1931).—*Mesembryanthemum carolinense* L. Bolus in Ann. Bolus Herb. 3, 128 (1922); N. E. Br. in Burt Davy, Fl. Transv. 1, 160, 162 (1926).—*Khadia carolinensis* (L. Bolus) L. Bolus, Notes Mesembr. 3, 6 (1936).

The writer has seen no material of *Mesembryanthemum carolinense*, and therefore expresses no opinion as to the transference of this species to *Khadia* N. E. Br.

10. *Rabiea tersa* N. E. Br. in Gard. Chron. 89, 54 (1931).

No other author seems to have commented on this and the next species.

11. *Rabiea Lesliei* N. E. Br. l.c.

OTHER SPECIES, DESCRIBED BY DR. BOLUS.

1. *Aloinopsis Broomii* L. Bolus, Notes Mesembr. 2, 474 (1935).
2. " *Gerstneri* L. Bolus, l.c. 3, 46 (1937).
3. " *Jamesii* L. Bolus, l.c. 2, 294 (1931).
4. " *Lodewykii* L. Bolus, l.c. 3, 47 (1937).
5. " *Loganii* L. Bolus, l.c. 2, 397 (1933).
6. " *pallens* L. Bolus, l.c. 474 (1935).
7. " *Peersii* (L. Bolus) L. Bolus in S. Afr. Gard. and Country Life, 19, 245 (1929).—*Nananthus Peersii* L. Bolus in Ann. Bolus Herb. 4, 104 (1927).
8. *Aloinopsis Schoonesii* L. Bolus, Notes Mesembr. 2, 295 (1931).
9. " *Wilmaniae* L. Bolus, l.c. 397 (1933).
10. *Nananthus Comptonii* L. Bolus, l.c. 120 (1929).
11. " *difformis* L. Bolus, l.c. 392 (1933).

CONSIDERATIONS REGARDING TYPIFICATION.

1. The first species to receive a binomial under a new generic name is not necessarily the type.
2. A type-species may be implicitly indicated by the author of a new generic name, and due regard should be paid to this point by subsequent authors in choosing a lectotype.
3. Authors choosing lectotypes in accordance with the second consideration should avoid placing undue stress on precise shades of meaning of technical terms used in the original description.
4. When an author chooses a lectotype, his choice should be accepted unless it can be shown that the choice was made in contravention of considerations 2 and 3, or as a result of wrong identification.
5. The choice of exceptional species as generic lectotypes should be avoided.

SELECT LIST OF PAPERS, BY DR. T. A. SPRAGUE, BEARING ON TYPIFICATION.

The type-species of *Bignonia*. Journ. Bot. 60, 236, 363 (1922), et l.c. 61, 192 (1923).

Statice and Limonium. Journ. Bot. 62, 267 (1924).

Standard-species. Kew Bull. 1926, 128.

Type-species of *Allantoma*. Journ. Bot. 70, 231 (1932).

The type of *Ormocarpum Kirkii* (with E. Milne-Redhead). Kew Bull. 1934, 43.

Note on typification. Kew Bull. 1936, 441.

The above have been selected from over fifty papers on plant nomenclature, contributed to the Journal of Botany and the Kew Bulletin by Dr. Sprague between 1920 and 1936.*

XXIV—MEERBURGH'S IMPATIENS CAPENSIS.

B. L. BURTT.

Impatiens capensis was described and illustrated by Nicolaas Meerburgh in his little-known work "Afbeeldingen van zeldzaame Gewassen." It is the only one of four new species proposed there whose date of publication is accurately known. A note on the identification of *Impatiens capensis* Meerburgh has been published by Dr. G. M. Schulze of Berlin† since the present article was originally written; it has, however, been revised throughout to take account of his conclusions, which are not altogether in agreement with those expressed here.

The title-page of Meerburgh's book is dated 1775, and this has generally been accepted‡ as the date of the whole work, but it is quite clear from the introduction that it was published in parts of 10 plates and the accompanying text and that 1775 is only the date of the first part.

Impatiens capensis is illustrated on plate 10, the last plate of the first part, and there is no reason to doubt that it was published in 1775. A glance at the plate is sufficient to show that it is quite different from any of the South African balsams and it may, I think, be easily recognized as *Impatiens biflora* Walt. (*I. fulva* Nutt.), a common North American species now naturalized in several parts of Britain. There is no specimen of Meerburgh's now in existence and Schulze (l.c.) is of the opinion that the plate cannot be identified as *I. biflora* with absolute certainty; he therefore ranks *I. capensis* as 'species incerta.' Several botanists at Kew, however, have recognized the illustration of *I. capensis* as *I. biflora*, and there does not seem to be sufficient doubt to justify the rejection of Meerburgh's

* While this paper was in the press, a further part of Dr. Bolus' "Notes on Mesembryanthemum, 3," appeared in which she treats *Aloinopsis Schwantes* as a synonym of *Nananthus* N. E. Br. and adopts the generic name *Rabiea* N. E. Br. in place of *Nananthus* N. E. Br. emend. L. Bolus (1929). The necessary new combinations are made, together with *Nananthus Orpenii* (N. E. Br.) L. Bolus, and other new species.

† "Über *Impatiens capensis* Meerburg und *Impatiens capensis* Thunb." in Notizblatt Bot. Gart. Mus. Berlin, 13, 662 (Nov. 1937).

‡ For instance, Pritzel, Thes. Litt. Bot. ed. 2, 211 (1872); The Bradley Bibliography 1, 262 (1911); Cat. Linn. Soc. Library, 524 (1925). In Index Londinensis all the plates are quoted as 1785—evidently a slip for 1775—and Schulze (l.c.) therefore quotes 1785.

name. *I. capensis* Meerburgh (1775) clearly antedates *I. biflora* Walt. (1788) and must therefore stand as the correct name for the North American species, although the specific epithet is unfortunately quite inappropriate.

In "Index Kewensis" *Impatiens capensis* Meerburgh is cited as if it were the same as *I. capensis* Thunb. (1794), although Thunberg applied the name quite independently and to an entirely different plant. Consequently the fact that *I. capensis* Thunb., the name in current use for a South African species, is a later homonym has been overlooked. The question therefore arises, what is the correct name for Thunberg's *I. capensis*?

In 1921 Mrs. Bolus described a balsam from the Knysna forest as *I. Duthieae* L. Bolus, distinguishing it from *I. capensis* Thunb. by its smaller flowers and the shape of the lateral petals. However, when the herbarium material was sorted geographically it was realized that this was the only species that Thunberg was likely to have collected as the others grow further east than he penetrated. An examination of Thunberg's specimen, kindly sent on loan to Kew by the authorities at Uppsala, shows conclusively that *I. capensis* Thunb. (non Meerb.) and *I. Duthieae* L. Bolus are the same and the latter therefore becomes the correct name for this plant and the new name, *I. Marlothiana*, proposed by Schulze (l.c.) is unnecessary.*

The herbarium material is so unsatisfactory that a complete investigation of the South African balsams has not been practicable. Nevertheless it seems fairly certain that specimens from Natal and Transvaal hitherto referred to *I. capensis* Thunb. were wrongly identified.

To summarize, the two species concerned are:—

(1) *Impatiens capensis* Meerburgh, *Afbeeldingen van zeldzaame Gewassen*, t. 10 (1775); *Plantae Rariores*, t. 10 (1789); Schulze in *Notizblatt Bot. Gart. Mus. Berlin*, 13, 662 (1937). *I. biflora* Walt. *Fl. Carolin.* 219 (1788); Britton & Brown, *Ill. Fl. N. United States*, ed. 2, 2, 440 (1913). *I. fulva* Nutt. *Gen. Amer.* 1, 146 (1818); Syme, *Engl. Bot.* 2, 217, t. 314 (1864).

A native of North America naturalized in several parts of Europe.

(2) *I. Duthieae* L. Bolus in *Ann. Bolus Herb.* 3, 70 (1921). *I. capensis* Thunb. *Prodr. Pl. Cap.* 41 (1794); Thunb. *Fl. Cap.* 2, 54 (1818), ed. Schultes 187 (1823); Harv. in *Harv. & Sond. Fl. Cap.* 1, 312 (1860); Marloth, *Fl. S. Afr.* 2, pt. 2, 149, 150, t. 50 (1925)—non Meerburgh. *Balsamina capensis* DC. *Prodr.* 1, 686 (1824) *Impatiens Marlothiana* G. M. Schulze in *Notizbl. Bot. Gart. Mus. Berlin*, 13, 665 (1937).

A native of South Africa, from Swellendam eastwards to Knysna.

* Dr. Schulze tells me that he was unable to examine authentic material either of *I. capensis* Thunb. or of *I. Duthieae* L. Bolus. He therefore had no choice but to accept the alleged differences between them given in the diagnosis of *I. Duthieae*.

Returning to the question of the dates of Meerburgh's work, it has not yet been possible to ascertain the dates of publication of the later parts. The only clue is found in Ehrhart's diary* of a visit he paid to Leiden, where Meerburgh had charge of the gardens, in 1782. Writing on the 21st September of that year Ehrhart mentioned that Meerburgh was publishing the coloured plates and descriptions and that 5 parts had so far appeared. Actually no more was published till 1789 when the whole 5 parts were reprinted, with 5 additional plates, under the Latin title, "*Plantae Rariores, vivis coloribus depictae*."

Plates 11–50 of the original edition therefore appeared between 1775 and September 1782. It is important, however, that the exact dates of these later parts should be settled, as the names of some of the plants may be affected thereby. For instance, does *Saxifraga stolonifera* Meerburgh (t. 23) antedate *S. sarmentosa* Linn. (1780)? Does *Gorteria araneosa* Meerburgh (t. 40) antedate *G. cernua* Linn. fil. (1781)? The writer will be glad to receive any information which will help to ascertain these dates. It may be mentioned that an examination of Linné's own copy of this work has proved fruitless. Dr. Lam, Director of the Rijks Herbarium, Leiden, and Mr. N. D. Riley, Keeper of the Department of Entomology, British Museum, who was consulted because the work also contains figures and descriptions of *Lepidoptera*, have kindly made enquiries, but they have failed to discover any further information. I am also indebted, amongst others, to Dr. T. A. Sprague, Mr. E. Nelmes and Mr. W. T. Stearn for suggestions and help.

XXV—CONTRIBUTIONS TO THE FLORA OF TROPICAL AMERICA: XXXV.† PLANTAE HINTONIANAE: VII.†

FURTHER NOTES ON THE GENUS *BURSERA*. A. A. BULLOCK.

Two previous papers on Mexican species of *Bursera* have appeared in *Kew Bull.* 1936, 346 and 1937, 447 and a brief note concerning a collection in northern Mexico was published in *Kew Bull.* 1937, 515. Since then a further series of over fifty numbers has been received at Kew from Mr. Hinton, and most of these are of sufficient interest to warrant additional notes. A few of Mr. Hinton's earlier numbers which I have previously failed to identify are included, but the remainder are new collections from the districts of Mina and Montes de Oca, in the state of Guerrero.

It is of interest to note that Mr. Hinton's collection, made mainly since the early part of 1932, now exceeds 11,000 numbers, and must rank as the most important intensive collection that has ever been made in Mexico.

Bursera bicolor (Willd. ex Schlecht.) Engl.; Bullock in *Kew Bull.* 1936, 354.

* Beiträge zur Naturkunde und den damit verwandten Wissenschaften, 2, 115–116 (1788).

† Continued from K.B. 1938, 73.

STATE OF GUERRERO. Parotas, Mina District, in an arroyo, a tree 5 m. high, 23 May 1937 (fl.), *Hinton* 10437.

This very distinct species is now well represented at Kew. In addition to the characteristic leaves, which at once distinguish it from all other species, very young specimens may be determined by the presence of a fairly dense glandular indumentum, a feature which is not common in the genus as a whole.

***Bursera coyucensis* Bullock** in Kew Bull. 1936, 358, et *op. cit.* 1937, 449.

STATE OF GUERRERO. Mina District: Cigarillo, "by the trail," a tree 4 m. high ("see 9047—same tree"), 14 April 1937 (sterile), *Hinton* 10057; Anonas, 200 m., a tree 5 m. high, "frequent here," 16 Aug. 1937 (fr.), *Hinton* 10535.

In the light of all the material of this species now available, I have re-examined the specimens of *Hartweg* 261, formerly tentatively placed under it. I now think that these specimens should be referred to *B. excelsa* (vide infra), a view more in accordance with the geographical distribution of the two species.

***Bursera diversifolia* Rose**; Bullock in Kew Bull. 1936, 359, et *op. cit.* 1937, 449.

STATE OF GUERRERO. Manchon, Mina District, 1150 m.: "in ripa fluminis [Balsas?]" (same tree as 9262), 21 April 1937 (sterile), *Hinton* 10072; *ibid.*, in an arroyo, 12 May 1937 (fl., young fr.), *Hinton* 10422; *ibid.*, shrub 3 m. high, 14 May 1937 (fl.), *Hinton* 10428.

These specimens constitute a most important addition to the representation of this plant at Kew, and they provide further evidence of its hybrid origin. Mr. Hinton's number 10072 bears leaves only, in all stages of development. These are simply pinnate and afford a striking contrast to those of his no. 9262, from the same tree, which are doubly pinnate. The specimen would have been placed, somewhat doubtfully, under *B. glabrifolia* (H.B.K.) Engl. but for Mr. Hinton's note as to its origin. No. 10422, with young, bipinnate leaves, flowers and young fruits, recalls similar specimens of *B. glabrifolia*, as also does no. 10428, which, however, is in a much younger condition. There is now little doubt that *B. diversifolia* is a hybrid between *B. bipinnata* (Sessé et Moc. ex DC.) Engl. and *B. glabrifolia* (H.B.K.) Engl.

***Bursera elemifera* (Royle) Baill.**; Bullock in Kew Bull. 1936, 359.

A specimen which must be regarded as the type has now been found in the British Museum herbarium. It bears the legend: "Mexico, Oaxaca,—from Dr. Royle (1846).—The tree which yields Gum Elemi." It is clearly conspecific with the *Finck* specimens previously cited (Bullock, *l.c.*).

***Bursera dubia* Bullock** in Kew Bull. 1937, 452.

STATE OF GUERRERO. Placeres—Cigarillo, Mina District: by the arroyo (same tree as 9045), 14 April 1937 (sterile, leafless), *Hinton* 10056; *ibid.*, (same tree as 9045), 23 July 1937 (sterile; mature leaves), *Hinton* 10527.

These additional gatherings are from the same tree as the type specimen; in their sterile condition they could not be readily identified without this knowledge.

***Bursera excelsa* (H.B.K.) Engl.**; Bullock in Kew Bull. 1936, 360—*Elaphrui*? species Benth. Pl. Hartw. 29 (1839).

STATE OF MEXICO. Rincón del Carmen, District of Temascaltepec, in a barranca, a tree 4 m. high, 2 May 1935, (young fl.) *Hinton* 7723.

STATE OF GUERRERO. Murga, District of Montes de Oca, 100 m., a spreading tree 5 m. high, 21 June 1937 (mature fl.), *Hinton* 10354.

STATE OF GUANAJUATO. Leon, "Copal of the Mexicans; a small tree; May" (very young inflorescences and leaves), *Hartweg* 261.

A re-examination of the available material has now led to the identification of one of Mr. Hinton's earlier numbers which I had placed on one side for further study (No. 7723) and to a new identification of the *Hartweg* number, which I had referred tentatively to *B. coyucensis* (Kew Bull. 1936, 359). The newly identified material is in a much younger state than any I have seen previously, and all the parts are densely clothed with a pale reddish tomentum, in striking contrast with the very thin indumentum of the mature specimen on which the species was based. These specimens give further support to the delimitation of *B. excelsa* given in Kew Bull. 1936, 360–361, where an extensive new synonymy was proposed.

***Bursera fragrantissima* Bullock** in Kew Bull. 1937, 454.

STATE OF GUERRERO. Mina District: Manchon, 1700 m. 22 April 1937 (sterile, leafless) *Hinton* 10085; *ibid.*, 9 June 1937 (fl., young leaves), *Hinton* 10457; *ibid.*, 14 July 1937 (fr., mature leaves), *Hinton* 10495; Carriceras, 1040 m., in an arroyo, a tree 6 m. high, 24 April 1937 (sterile, leafless), *Hinton* 10093; Cundan, 1300 m., 30 June 1937 (fr., mature leaves); *Hinton* 10372; *ibid.*, 1320 m., a small tree on a rock, 29 June 1937 (sterile, mature leaves), *Hinton* 10373; Cundan Chico, 900 m., "very frequent in this valley," 2 July 1937 (fr., mature leaves), *Hinton* 10375.

The three Manchon gatherings cited above are from the same tree as no. 9339, a fruiting specimen which was cited under the original description. Mr. Hinton again notes that the tree is very resinous, and "sap pours out of a pin-prick anywhere in the bark."

***Bursera grandifolia* (Schlecht.) Engl.**; Bullock in Kew Bull. 1936, 364, et *op. cit.* 1937, 450, in obs.

Seven new collections of this species, five from the district of Montes de Oca, and three from Mina, have been received from Mr.

Hinton, under his numbers 10187, 10188, 10211, 10226, 10420, 10424, and 10431; all consist of good flowering material, upon which work on the distribution of the sexes may be undertaken.

Bursera grandifolia forma *robusta* Bullock in Kew Bull. 1937, 449.

Mr. Hinton's number 10182 is a collection, with flowers, fruit and young leaves, from the same tree as the type specimen.

Bursera heteresthes Bullock in Kew Bull. 1937, 454.

STATE OF GUERRERO. Mina District: Cigarillo, in the arroyo Viscaina (same tree as no. 9044), 14 April 1937 (sterile; leafless), Hinton 10055; *ibid.* (same tree as no. 9044), 23 July 1937 (sterile; mature leaves), Hinton 10526; Puerto de Oro, 500 m., 29 July 1937 (fr.; mature leaves), Hinton 10529.

Bursera Hintoni Bullock in Kew Bull. 1936, 366, et *op. cit.* 1937, 450.

STATE OF GUERRERO. Mina District: Manchon, 1150 m., near the river, a tree 10 m. high, 21 April 1937 (fl.), Hinton 10071; *ibid.* (same tree as no. 9246), 25 May 1937 (fl.; young fr.). Hinton 10440; Carriceras, 1100 m., in an arroyo, a tree 12 m. high 24 April 1937 (fl.), Hinton 10091; Sta. Ana, 1100 m., in an arroyo, a tree 5 m. high, 29 April 1937 (fl.), Hinton 10114.

These additional specimens are all in a fairly young state, and none of them has fully developed leaves. The form of the inflorescence shows its very close affinity with *B. excelsa*, as was indicated in the original description.

Bursera laxiflora S. Wats; Bullock in Kew Bull. 1936, 370, et *op. cit.* 1937, 515.

STATE OF GUERRERO. Petatlán, District of Montes de Oca, a tree 5 m. high, 19 June 1937 (fr.) Hinton 10337.

This specimen has much larger leaves, with larger and broader leaflets, than any I have seen hitherto, but I have no hesitation in assigning it to this species. It constitutes a new record for the species, which has been found previously only in the states of Sonora and Sinaloa.

Bursera longipes (Rose) Standl.; Bullock in Kew Bull. 1936, 371.

STATE OF GUERRERO. Vallecitos, District of Montes de Oca, 500 m., in an arroyo: slender tree 15 m. high, bark red, wood soft, white, brittle, with very little resin, "frequent, 100 m. to 800 m.", 21 May 1937 (fr.), Hinton 10210; *ibid.*, 21 May 1937 (mature leaves), Hinton 10212; *ibid.*, a tree 20 m. high, 23 May 1937 (fl.; very young leaves), Hinton 10220; *ibid.*, a tree 15 m. high, 26 June 1937 (fr.), Hinton 10369.

VERNACULAR NAME: *Guande colorado*.

Mr. Hinton adds the notes that this is "the tallest of all the *Bursera* [spp.]," and that it is the only one on the coast slope called *guande colorado*. The stature of the tree observed by Mr. Hinton disagrees with that given by Rose, and there is a discrepancy in

connexion with the indumentum. Rose states that the leaves are completely glabrous, even when very young, but Mr. Hinton's specimens show a fairly dense, villous indumentum at the extreme base of the petiole and adjacent part of the young stem, and a similar though less dense hairiness is found in the lower part of the inflorescence rachis.

The group of Mexican *Bursera* species with large entire leaflets and exalate rachis requires further investigation; most of them are included under the name *B. Simaruba* by Standley (in Contrib. U.S. Nat. Herb. 23, 547: 1923), but with this view I cannot agree.

Bursera ovalifolia (Schlecht.) Engl.; Bullock in Kew Bull. 1936, 373.

STATE OF MEXICO. Bejucos, District of Temascaltepec, 610 m., on a dry hill, a tree 10 m. high, very resinous, 16 April 1933 (leafless; very young infl.), Hinton 3787.

STATE OF GUERRERO. Placeres, Mina District, 350 m., on a hill, a tree 10 m. high, 15 April 1937 (very young leaves and infl.), Hinton 10062.

This species is very closely allied to the preceding, and the material available for study is still inadequate. The indumentum at the base of the petiole and on the rachis of the inflorescence in *B. longipes* is, however, not present in *B. ovalifolia*.

Bursera penicillata (Sessé et Moc. ex DC.) Engl.; Bullock in Kew Bull. 1936, 374.

STATE OF GUERRERO. Aguazarco, Mina District, on llano in pine forest, a tree 5 m. high, 1 June 1937 (fl.; fully developed but immature leaves), Hinton 10442, 10443.

These specimens are identified with some hesitation, and differ from other specimens of *B. penicillata* in their larger leaves, without the characteristic indumentum in the axils of the leaflets, and usually narrower or obsolete wing of the rachis. The representation of this species at Kew is still inadequate, and fruiting material is particularly required. These two specimens are regarded as atypical. They show an even closer resemblance to *B. fragrantissima* than was indicated in the description of the latter species.

Bursera sessiliflora Engl. var. *pubivalvis* Bullock in Kew Bull. 1937, 451.

STATE OF GUERRERO. District of Montes de Oca: Vallecitos, 760 m., on cliffs, a tree 5 m. high, with milky sap, 22 May 1937 (young fr.; leafless), Hinton 10218; *ibid.*, a tree 4 m. high 3 July 1937 (sterile, leafy), Hinton 10553; San Antonio, 900 m.; a tree 5 m. high, June 1937 (young fr., leafy), Hinton 10370; Aguazarca, in pine forest, a tree 6 m. high, 2 June 1937 (fl., young leaves), Hinton 10446.

The two fruiting specimens cited above have the characteristic hairy drupes by which the variety is distinguished from Engler's

species; the other two have been placed here merely from their occurrence in the same district. All the available material requires further investigation.

Bursera Tecomaca (Sessé et Moc. ex DC.) Standl.; Bullock in Kew Bull. 1936, 377, et op. cit. 1937, 451.

STATE OF GUERRERO. Mina District: Calavera, 500 m., in a barranca, a tree 6 m. high, 16 April 1937 (fr., leafless), *Hinton* 10066; Mesa Queisle, on a hill, a tree 4 m. high, 4 May 1937 (fl.; young, fully developed leaves), *Hinton* 10414; Manchon, in an arroyo, a tree 6 m. high, 14 May 1937 (fl.; young leaves), *Hinton* 10429.

VERNACULAR NAMES. *Guande, Guande colorado.*

The two leafy specimens cited above show that this species exhibits great variation in the length of the acuminate or cuspidate tip of the leaflets. All the young parts are very viscid, and resin exudes from the bark of two- and three-year-old branches, giving them the appearance of having been varnished.

Bursera trimera Bullock in Kew Bull. 1936, 379, et op. cit. 1937, 452.

STATE OF MEXICO. Nanchititla, District of Temascaltepec, by water, a tree 4 m. high, with white flowers, 11 April 1933 (fl.; leafless), *Hinton* 3765.

STATE OF GUERRERO. Placeres, Mina District, on a hill, a very resinous tree 5 m. high, 15 April 1937 (fl.; leafless), *Hinton* 10061.

The identification of leafless material is becoming more certain as long series of specimens become available. The bark appears to possess characteristic features in almost every species of the genus, and in the present case the identification was made deliberately from the bark alone, and later confirmed by examination of the flowers.

Bursera velutina Bullock in Kew Bull. 1936, 380, et op. cit. 1937, 452.

STATE OF GUERRERO. Mina District: Placeres-Cigarillo, 400 m., on the roadside, a tree 5 m. high, 5 April 1937 (fl.; leafless), *Hinton* 10016; Cigarillo, on a hill, a tree 4 m. high, 15 April 1937 (fl.; leafless), *Hinton* 10058; Placeres, on a hill, a tree 5 m. high, 15 April 1937 (fl.; young leaves), *Hinton* 10064; *ibid.*, a shrub 4 m. high, 2 Aug. 1937 (fr.; mature leaves), *Hinton* 10530; *ibid.*, a shrub 3 m. high, 2 Aug. 1937 (sterile; mature leaves on a long vegetative shoot), *Hinton* 10531.

This is another extremely resinous species; resin has been deposited in a globule about an inch in diameter on a branch of no. 10058. It is translucent, and amber coloured.

XXVI—MISCELLANEOUS NOTES.

Cacti.* For cactus growers, whether amateur or nurseryman, this is undoubtedly the best work in English for the identification of their plants. In spite of the absence of keys to genera and species the 1188 specific descriptions are clear and concise. The 93 photographic illustrations have been chosen with care, and the printers are to be congratulated on the excellence of reproduction.

The classification followed is that of Britton and Rose, and a warm tribute is paid to the lasting value of their monograph. Professor Borg has followed the International Rules for his nomenclature, and it is pleasing to note that he has adopted the conserved name *Mammillaria* Haw. in place of *Neomammillaria* Britt. et Rose. Only two departures from the rules and recommendations have been noted. The first is *Peireskia* instead of *Pereskia* on the ground that Linné wrote the latter " . . . evidently by mistake, in commemoration of Nicolaus C. F. Peireskius." Professor Borg wrote this under a misconception; the name *Pereskia* was originally published by Plumier, Gen. Nov. 35 (1703), in honour of "D. Nicolaus Peireskius," so that clearly Plumier made no mistake in the spelling but deliberately latinized it. The name *Pereskia* proposed by Plumier was first validly published not by Linné, but by Philip Miller in 1754. The relevant references are given by Sprague in Kew Bull. 1928, 359, in a paper on the "Correct spelling of generic names" which Professor Borg has apparently overlooked. The second is explained by the author on page 47; " . . . I am using invariably a small letter when the specific name is a pure-adjective . . ." Thus *Echinocactus Grusonii* is used, and *Selenicereus grusonianus*. A small initial letter is also used for trivials which are vernacular names or old generic names.

Professor Borg is clearly not in favour of the excessive "splitting" of genera which has become common in recent years. On page 47 he says, "There is a growing suspicion, perhaps not altogether unfounded, that . . . the original conception and value of a generic name are being too frequently departed from by systematic botanists. There is little doubt that several of the new genera are so ill-defined, and the characters on which they are founded are so uncertain, that very often the same species is classified under different genera by expert botanists . . ." One may agree with this general indictment, but it requires modification. The "splitters" are usually botanists who have little or no knowledge of other groups of plants, and are inclined to found genera on characters which are of only specific importance.

A few new species and varieties are described in the text, such as *Opuntia neuquensis*, p. 67, and these are accompanied by Latin as well as English descriptions. No type-specimen is cited, however,

* "Cacti. A Gardener's Handbook for their Identification and Cultivation." By Professor J. Borg, pp. xi + 419 + 46 photographic plates (93 illustrations). Macmillan & Co., London, 1937. £1 1s. net.

and one must assume that the type is a living plant seen by the author.

On pages 48-49 a useful systematic list of the tribes and genera of *Cactaceae* is given, with the number of species in each genus, and the number described in the text.

Professor Borg's adherence to the Britton and Rose classification is convenient to the botanist but makes consultation of the work by the gardener more difficult, owing to the species being arranged systematically. In small genera of only a few species this is not serious, but in large genera such as *Opuntia* (181 species described) or *Mammillaria* (158 species described), an alphabetical arrangement under the sections, with a key to the sections, would have been preferable.

The brief bibliography, which precedes the very complete index, includes only six books in English, and of these, only one, the Britton and Rose monograph, can rival the present work in scope. In general usefulness, Professor Borg's book is unequalled.

On the purely cultural side, there is nothing new, but the advice given is sound and useful. There are chapters on "Soil," "Potting," "Watering," "Care of Seedlings," "Propagation," by cuttings, offsets, grafts, etc., and on "Hybridization," and the book concludes with a summary of cultural hints describing the conditions under which each genus or tribe will flourish.

A. A. BULLOCK.

Hardy Bulbs.*—Some fifty years ago hardy and especially half-hardy bulbs were grown in great quantity in the British Isles, but their popularity waned. Since the Great War a new and enthusiastic body of collectors and cultivators has arisen and at the present time several nursery firms are offering a very extensive range of bulbs, corms and tubers amongst which are many plants new and unfamiliar even to the keen gardener. The more these plants were cultivated the more obvious it became that the literature available required to be brought together in an up-to-date and concise form. This service has been rendered by Lt.-Colonel C. H. Grey, who is the possessor of an unrivalled collection and is one of the most enthusiastic cultivators in the country. The author has not merely given an account of all the well-known species of monocotyledonous bulbous plants in cultivation but has attempted to make the work practically exhaustive. The task, therefore, which he set himself was an immense one, since the literature is extremely scattered. It necessitated nothing less than a search through the Index Kewensis of most of the relevant genera of the families in question, and extracting the names of all species which had been introduced to gardens or which might, in the author's

* "Hardy bulbs: including Half-hardy Bulbs and Tuberous and Fibrous-rooted plants." By Charles Hervey Grey, Lt.-Col., D.S.O., F.L.S. Vol. I. *Iridaceae*. London, Williams & Norgate, Ltd. 1937. 8vo. Pp. xxvi + 403. 47 pls. Price £1 16s.

opinion, profitably be introduced. The original descriptions in various papers, monographs and floras were then transcribed or, when in another language, translated into English.

So far the first volume only has appeared, which covers the *Iridaceae*, but we understand volume 2, which deals with the *Orchidaceae* and *Amaryllidaceae*, and volume 3, which treats of the *Liliaceae*, will appear before the end of the year. The *Iridaceae* alone embrace about 50 genera and over 2000 names (including synonyms); these are arranged alphabetically, so that it is the work of a moment to turn up any species.

With regard to the classification, where revisions or monographs are available these have been followed, and in addition a certain amount of published critical work has been sought out and incorporated. In the main, however, the author has followed the only course which was perhaps feasible in the circumstances, namely, that of providing in each genus a list of species (including synonyms) with descriptions, without any attempt at critical treatment. The result is that the accounts vary considerably; those of certain genera are sound and up-to-date (e.g. *Iris*—which appears to have been particularly well done) whilst that of others (of which *Gladiolus* is a notable example) will require copious revision as more knowledge accumulates. This is inevitable, and if realized from the start will prevent disappointment. General notes on cultivation, and special notes in certain cases, are given but much is left for the cultivator himself to discover: any attempt to give details would have unduly increased the size of a volume already rather large.

The work, which represents a prodigious amount of concentrated effort, is very well got up, and is copiously illustrated by Mrs. Grey's well-known and spirited drawings, many of which are in colour. Horticulturists will be grateful for so comprehensive a treatise which brings together in the English language within the compass of three volumes a multitude of descriptions hitherto scattered and only available for consultation in two or three of the largest botanical libraries in the country.

The Lily Year-Book.*—The Lily Year-Book published by the Royal Horticultural Society always covers a wide range of interest. A paper by K. E. Toms, Agricultural Officer, St. Helena, gives an account of the cultivation of *Lilium longiflorum* in that island. The species was mentioned by Mellis in his standard work and it is evident that it was introduced as early as 1875. During recent years efforts have been made to grow it on a large scale for export purposes, especially for autumn and winter flowering in England. Mr. Toms explains the steps taken to increase the stock and to keep it free from virus diseases. Two papers on lilies on calcareous

* "Lily Year Book, No. 6, 1937." Royal Horticultural Society, London, 1937. Pp. 153, 28 figs. Price 5s. paper, 6s. cloth.

soil and lime-free soil, by F. C. Stern and F. Stoker respectively, are of special value to gardeners in showing the significance of factors such as aeration, water supply and dressings of humus in connexion with the calcareous habitat. Another article of unusual interest is an account of a lecture by Mrs. Constance Spry on the decorative value of Lilies. A survey of Forrestian lilies by Sir William Wright Smith gives a useful summary of *Lilium* as it occurs in Yunnan, Szechwan and S.E. Tibet. In addition to the above there are accounts of the "Discussions" of the Lily Group in 1937 and numerous short articles both horticultural and botanical, all of which are of interest to growers and students of the genus.

An Artist's Herbal.*—In this attractive volume Miss Mansfield has brought together thirty-eight pencil drawings of medicinal and other herbs grown in the United States. Each plate is accompanied by a few lines of text describing the habit and uses of the plant illustrated. The information given is rather meagre and the value of the work lies in the plates, which, for the most part, give an excellent idea of the character of the plants they represent. Many of the subjects are treated rather as formal designs than naturalistic plant portraits. There is an introduction by Mrs. Fox, dealing with the history and cultivation of herbs in America.

Ecology in Town and Classroom.†—This volume is a companion to the same author's "Field Studies in Ecology," which was noticed in K.B. 1935, 584. The earlier work dealt with a scheme of outdoor ecological work developed in connexion with the author's classes at Bristol University, and in the present volume Dr. Bracher shows that valuable practical work can also be carried out in the vicinity of towns. There are chapters on the vegetation of streets, coal tips, muddy river banks, and other urban habitats, and also a section on the study of turf samples in the classroom. The two volumes together form a valuable guide to the conduct of elementary ecological courses in schools and universities.

* By Louise Mansfield. The Macmillan Company, New York, 1937. Pp. 76. Plates 39. Price 10s. 6d.

† By R. Bracher, M.Sc., Ph.D. J. W. Arrowsmith, Ltd., Bristol, 1937. Pp. 96. plates 3, figs. 9. Price 2s. 6d.

Printed under the authority of HIS MAJESTY'S STATIONERY OFFICE
By the South Essex Recordern, Ltd., High Road, Ilford.

(577) Wt. 17/32 800 5/38 S.E.R. Ltd. Gp. 381

BULLETIN OF MISCELLANEOUS INFORMATION

No. 5 1938

ROYAL BOTANIC GARDENS, KEW

XXVII—ADDITIONS TO THE FLORA OF BORNEO AND
OTHER MALAY ISLANDS: VII.* H. N. RIDLEY.

THEACEAE.

Adinandra cordifolia Ridley, sp. nov., ab *A. verrucosa* Stapf, cui affinis, foliis ellipticis cordatis, petiolis brevibus, floribus minoribus, pedicellis longioribus, sepalis sericeis, baccis subglobosis glabris multicostatis differt.

Frutex. Folia oblongo-elliptica, obtusa vel breviter obtuse acuminata, basi rotundata, cordata, subsessilia, 11–13 cm. longa, 6.5–7 cm. lata, coriacea, glabra, supra nitida, nervis 10-paribus subtus elevatis, nervulis elevatis inconspicuis; petioli brevissimi, 2 mm. longi, crassi. Flores singuli vel bini, axillares. Pedicelli crassi, sericei, 5 mm.–2 cm. longi. Bractee coriaceae, rotundatae, sericeae, 5 mm. latae. Sepala oblongo-rotundata, pustulata, sericea, 1.2 cm. longa. Petala oblonga, sericea. Filamenta linearia, basi connata, dense sericea. Ovarium ovoideum, sericeum, 1.5 cm. longum. Stylus 1 cm. longus, stigmatibus capitato. Bacca globosa, apice plano, glabra, 20–25-costata.

SARAWAK. Beccari 1025, 1978, 3159. Pengkulu Ampat, young jungle, *Haviland* b.p.r.e. (type): "shrub, leaves broad, dark green."

WEST DUTCH BORNEO. Landak, *Teysmann* 11236.

This remarkable species is allied to *A. verrucosa* Stapf, of Mt. Kinabalu, differing in the elliptic almost sessile cordate leaves, the longer pedicels of the flower, and silky sepals. The fruit is not conic, passing into the style, but globose, flattened at the top, and with 20 or 25 rather obscure ribs. I have seen no fully developed petals.

Ternstroemia (Euternstroemia) citrina Ridley, sp. nov., a *T. gymnanthera* (W. et A.) Sprague, cui affinis, foliis multo latioribus ovatis vel oblongis, floribus minoribus, petalis oblongis differt.

Frutex. Folia ovata vel oblonga, acuminata, basi cuneata, coriacea, 6–10 cm. longa, 3–5 cm. lata, costa supra canaliculata subtus elevata, nervis 4-paribus valde inconspicuis; petioli 1–1.5 cm. longi. Flores in ramis singuli vel in racemis terminalibus 1–2.5 cm. longis. Pedicelli 5 mm. longi. Bractee ovatae, acutae, minutae, caducae. Sepala 5, coriacea, 2 externa lanceolata acuta, 3 interiora oblonga obtusa majora. Petala 5, flava, oblonga, apice rotundata, denticulata, 4 mm. longa. Stamina (in flore masculino) plura, brevia,

* Continued from K.B. 1938, 123.

antheris lineari-oblongis. Ovarium (in flore femineo) ovoideum. Stylus 2 mm. longus. Staminodia pauca. Bacca globosa, 7 mm. longa.

SARAWAK. Beccari 1967, 2057. Selabat mangrove, shrub, Haviland 642; Kuching, petals yellow, Haviland 3017 (type).

The little flowers in this bush are often scattered below the leaves but in some cases crowded in short subterminal racemes.

Ternstroemia (Euternstroemia) Hosei Ridley, sp. nov., a *T. patente* (Korth.) Choisy, cui similis, foliis multo crassioribus haud acuminatis, nervis patentibus nec ascendentibus, petiolis longioribus, pedicellis brevioribus crassioribus, floribus carnosissimis siccis atris differt.

Arbor vel frutex. Folia oblanceolata vel obovata, subacuta vel obtusa, basi acuminata, rigide coriacea, 8-14 cm. longa, 5-8 cm. lata, costa supra canaliculata subtus elevata, nervis 5-paribus supra obscuris subtus valde inconspicuis patentibus; petioli 2-2.5 cm. longi. Flores masculi singuli. Pedicelli 8 mm. longi. Sepala 5, ovata, subaequalia, marginibus denticulatis, 2 mm. longa. Petala 5, oblonga, spathulata, apice latiore rotundato, 5 mm. longa. Stamina brevissima, antheris ellipticis aequalibus. Pistillodium semiovoideum. Stylus brevis, crassus. Flores feminei non visi. Bacca parva, bilocularis, 8 mm. longa.

SARAWAK. Beccari 2943. Baram, Haviland & Hose "1966," 3162; Hose 235 (type).

Ternstroemia (Euternstroemia) denticulata (Pierre) Ridley, stat. nov. *T. japonica* var. *denticulata* Pierre, Flore For. Cochinch. pl. 124.

BRIT. N. BORNEO. Sandakan, East Coast, Creagh.

This closely agrees with the Cambodian plant of Pierre and occurs also in Siam. It is impossible to retain it as a variety of *T. japonica* Thunb., of China and Japan, as the flowers and fruits are much smaller and the foliage quite different.

Ternstroemia aneura Miq.

SARAWAK. Beccari 1700, 1701, 1887. Kuching, small tree, flowers pale yellow, Haviland 2075. Baram, Hose 319. Mt. Poi, Hewitt 5.

New record for Borneo.

Ternstroemia (Erythrochiton) Beccarii Stapf mss., descr. Ridley, sp. nov., a *T. denticulata* (Pierre) Ridley, cui similis, foliis enerviis rigide coriaceis oblanceolatis obtusis, bracteolis remotioribus, sepalis integris haud denticulatis differt.

Frutex. Folia oblanceolata, obtusa vel minute emarginata, basi cuneata, enervia, coriacea, siccitate supra grisea, subtus cuprea, minute longitudinaliter rugosa, 3-6 cm. longa, 1-2 cm. lata, costa supra depressa subtus elevata; petioli 5-7 mm. longi. Flores masculi ignoti. Flores feminei singuli, axillares. Pedicelli

graciles, 1.5-2 cm. longi. Sepala 5, obovata, rotundata, coriacea, 4 mm. longa, 2 externa minora. Petala oblonga, basin versus angustata, apicibus rotundatis, 5 mm. longa, 2 mm. lata. Staminodia oblonga, superne attenuata. Ovarium biloculare, ovulis 2 pro loculo. Stigma sessile, planum, lobulatum. Bacca elliptica, obtusa, 1.5 cm. longa, 1 cm. diametro.

SARAWAK. Beccari 2582 (type), 2928. Mt. Matang, Haviland 1469.

Peculiar in this group in its small nerveless leaves coppery beneath.

Ternstroemia (Erythrochiton) magnifica Stapf mss., descr. Ridley, sp. nov., nulli speciei arcte affinis, floribus maximis, foliis magnis oblanceolatis subtus glaucis distincta.

Arbor parva. Folia elliptico-oblanceolata, abrupte acuta, basi attenuata, coriacea, supra laevia, subtus glauca, 15-18 cm. longa, 6-6.5 cm. lata, costa supra canaliculata subtus elevata, nervis 15-paribus tenuibus subtus conspicuis, nervulis et reticulationibus etiam conspicuis; petioli validi, 2 cm. longi. Flores masculi singuli, extra-axillares, flavi, fragrantissimi. Pedicellus crassus, 1-2 cm. longus. Sepala 5, rotundata, coriacea, 2 cm. longa, 1 cm. lata. Petala 5, oblonga, apice cucullata, marginibus minute denticulatis, coriacea, basi connata, 3 cm. longa, 1.5 cm. lata. Stamina plurima, basi corollae adnata, filamentis brevissimis subnullis, antheris linearibus 8 mm. longis. Pistillodium conicum, stylo brevi obscure trifido. Flores feminei non visi.

SARAWAK. Kuching, Haviland 1984: "small tree, leaves glaucous on the back, flower yellow, sweet-scented."

This beautiful plant, which seems to have been only once collected, is quite unlike any other in the genus in its very large flowers and large glaucous leaves.

XXVIII—ADDITIONS TO THE FLORA OF BORNEO AND OTHER MALAY ISLANDS: VIII.* CONVULVACEAE COLLECTED BY THE OXFORD UNIVERSITY EXPEDITION TO SARAWAK, 1932. S. J. VAN OOSTROOM (Rijksherbarium, Leiden).

Jacquemontia tomentella (Miq.) H. Hallier var. *micrantha* H. Hallier in Engl. Bot. Jahrb. 49, 377 (1913).

SARAWAK. Near Long Kapa, Mount Dulit (Ulu Tinjar), under 300 m., in secondary forest, Aug. 14, Richards 1257: "Large liane on trees, 9-12 m. high. Corolla pale magenta. Leaves and stem whitish green."

Distribution: Borneo.

Merremia Korthalsiana Van Ooststr., sp. nov.

Frutex scandens, ramis teretibus in sicco cinereo-brunneis substriatis glabris vel in partibus junioribus paullo pubescentibus, junioribus gracilioribus 2-3 mm. diam., adultioribus crassioribus in typo ad 7 mm. diam. fistulosis. Folia petiolata, petiolis in sicco

*Continued from previous article.

nigrescentibus leviter striatis supra leviter sulcatis, sulco pilis brevissimis plus minusve praedito vel glabro, (2.5-) 3-6 cm. longis; laminae chartaceae vel tenuiter coriaceae, late ovatae vel orbiculares, apice abrupte acuminatae vel cuspidatae, acumine angusto acutissimo 1-1.5 cm. longo, basi late cordatae vel truncatae, (7-) 10-15 cm. longae, (7-) 9-14 cm. latae, supra in sicco nigrescentes, glabrae, opaeae vel subnitidae, subtus pallidiores, in nervo mediano nervisque primariis secundariisque pubescentes vel glabrae; nervus medianus et nervi laterales primarii utrinque 7-8 (-10), ascendentes, ad marginem curvati, supra plerumque subimpressi, subtus prominentes, nervis secundariis parallelis supra leviter prominulis subtus prominentibus, nervis minoribus praesertim in pagina superiore tenuiter denseque reticulatis prominulis. *Inflorescentiae* in axillis foliorum posita, longe pedunculatae, apice cymoso-corymbosae; pedunculi circ. 12 cm. longi, minute pubescentes vel glabri, in sicco longitudinaliter striati, apice racemoso-ramosi; rami primarii plures, in axillis bractearum foliacearum deciduarum positi, pubescentes, 1.5-4 cm. longi, apice cymosi, floribus pluribus; bracteae bracteolaeque parvae, lineato-subulatae, pubescentes, inferiores circ. 4 mm., superiores circ. 2.5 mm. longae; pedicelli pubescentes, ad 20 mm. longi. *Sepala* late elliptica vel orbicularia, apice rotundata, minutissime mucronata, in sicco nigrescentia, nitida, extra glabra, intus resinoso-punctulata, aequalia vel exteriora subbreviora, ad 10 mm. longa. *Corolla* late infundibuliformis vel campanulata, ad 24 mm. longa, margine obscure lobata, extra glabra, intus infra et inter bases filamentorum papillis elongatis minutis munita. *Filamenta* circ. 5 mm. supra basin corollae inserta, circ. 10 mm. longa, basi subdilatata, margine papillis elongatis minutis nonnullis praedita; antherae rectae, glabrae, 3-4 mm. longae. *Discus* brevis, sub-5-lobatus. *Ovarium* conicum, glabrum; stylus filiformis, glaber, basi non articulatus, circ. 11-12 mm. longus, stigmate bigloboso papilloso.

DUTCH S. E. BORNEO. Doesoen, *Korthals* 237 (two sheets in the Rijksherbarium at Leiden, n. 901, 184.114, a flowering branch (type), and n. 901, 184.115, a sterile branch).

SARAWAK. Mount Dulit, under 300 m., a frequent species, chiefly or entirely in secondary forest, Oct. 15, *Richards* 2219: "Large liane, corolla bright yellow."

This new species belongs to the section *Hailale* H. Hallier in Engl. Bot. Jahrb. 49, 379, 380 (1913). The description has been made from the type specimen, *Korthals* 237 in the Rijksherbarium at Leiden. The specimens collected by *Richards* (n. 2219) in Sarawak doubtless belong to the same species. There are, however, some very unimportant points of difference. The leaves of the specimens *Richards* 2219 are completely glabrous and a little more shining above; the peduncles may be slightly longer than in the type, reaching a length of about 20 cm.; the pedicels may reach a length of 25 mm. after flowering.

XXIX—NOTES ON AFRICAN RUBI IN THE KEW HERBARIUM. C. E. GUSTAFSSON (Trelleborg, Sweden).

It is certain that not many new species of *Rubus* can be discovered in Africa. In "Rubi Africani" (Arkiv för Botanik, 26 A, No. 7: 1934), I pointed out, however, that my monograph did not lay claim to be final, for the *Rubus* species mentioned there are for the most part described from the type specimens, whereas individual bushes may differ in those characters which are variable or which cannot be observed in the herbarium specimens. From the present investigation it will be evident that the extent of such variations can frequently be determined only by the observation of living plants.

In Rubi Africani, p. 2, I pointed out that Focke in his "Species Ruborum" (1911) had classified the majority of the African species of *Rubus* under the Subgenus *Idaeobatus* (p. 128), which, among other characters, is distinguished in having: "fructus e carpellis multis, maturis inter se cohaerentibus, a gynophoro conico sicco vel delinquescente secedentes et ideo intus cavi." On account of the data supplied on the labels I am led to assume that the fruits of several species, on the contrary, resemble those of the European blackberries. Such notes are given for: *R. exsuccus* (by Kirk), *R. inedulis*, *R. pinnatus* var. *afrotropicus*, *R. Ledermannii* var. *serrulatus*, *R. kirungensis* and *R. Stuhlmannii* var. *aberdarensis*. Still, it is of course inappropriate to refer these species of *Rubus*, which have pinnate leaves, to the Subgenus *Eubatus*, to which the European blackberries belong. I am of opinion that they should be formed into a separate Subgenus. Matters are quite different, however, in the case of *R. rosifolius* Sm., of which Focke wrote: "fructus interne cavi." Moreover, with regard to a specimen of *R. Volkensii*, collected at an elevation of 2500 m. on Mt. Elgon, Mrs. Cyril Lugard noted: "habit like raspberry." On examination I also found that the receptacle in *R. Volkensii* is long, as in *R. idaeus*, and hairy. Hence these two species fulfil the conditions of classification in the Subgenus *Idaeobatus*.

SECTION AFRO-MONTANI FOCKE.

In Rubi Africani, p. 2, I explained that Sect. *Afro-montani* Focke contains two groups of species which are probably unrelated. One group consists of *R. Friesiorum* C. E. Gust., *R. immixtus* C. E. Gust., *R. runssorensis* Engl., *R. Doggetti* C. H. Wright and perhaps *R. afro-gustafssoni* Chiov. The other group comprises *R. Erlangeri* Engl., *R. mauensis* Engl., *R. Volkensii* Engl. and *R. Chiesae* Chiov. It is consequently important to ascertain whether the ripe fruits are hollow or not.

Rubus Friesiorum C. E. Gust. There are typical specimens of this species in the Kew Herbarium from the Aberdare Mountains and from Mt. Kenya. Besides, it has been collected in Tanganyika Territory, Mbulu District, Oldeani Volcano, north wall of crater,

3100 m., 23 Sept. 1933, *B. D. Burt* 4226. Burt's specimens closely resemble var. *Hageniae* C. E. Gust. The terminal leaves of one of the specimens agree with the description; in two other larger specimens they are almost circular in shape. Further, it appears from Burt's specimens that the inflorescence in more developed specimens is many-flowered and more compound. It now remains to be proved whether specimens growing in the classical localities on the Aberdare Mountains and Mt. Kenya may also have pinnate leaves. Since the terminal leaflets of the turion leaves reproduced in Rubi Africani, t.1, are lobate, there is reason to suppose such a possibility.

Rubus Friesiorum C. E. Gust. var. *elgonensis* C. E. Gust., var. nov.; ut forma principalis sed rami floriferi densius et longius pilosi, plus minus glandulosi; foliola terminalia eorum basi integra vel emarginata, fere orbiculata; stipulae angustiores; inflorescentiae longiores et interdum latiores; sepala ovata; carpella glabrescentia.

UGANDA, Mt. Elgon, bamboo zone, 3300 m., Jan. 1918, *R. A. Dümmer* 3541 (type), and in open forest zone, Apr. 1930, *L. C. C. Liebenberg* 1645.

Rubus Doggettii C. H. Wright from the Bujuku Valley on Mt. Ruwenzori should be compared in the field with *R. runssorensis* Engl., also growing on Mt. Ruwenzori, so that the difference between them can be correctly determined. In "Bull. Jard. Bot. de l'État, Bruxelles," 13, 268 (1935), I suggested that *R. Doggettii* might be a shade form of *R. runssorensis*. If that is the case its leaves should be greyish on the underside when it grows in the sunlight.

Rubus Chiesae Chiov. In the herbarium there is a specimen named *R. Volkensii* Engl., which was collected by H. Scott on 21 Oct. 1926 on Mt. Zuquála in Abyssinia, 2700-2900 m. This specimen is more fully developed than Chiovenda's type specimen and is closely related to *R. Volkensii*. As the leaves of *R. Chiesae* may also be longly acuminate, the words "longe acuminata" in Rubi Africani, p. 7, should be changed for "aequaliter serrata" and "breviter acuminata" for "inaequaliter et incisiter serrata," but it should be noted, however, that the serration in less typical specimens of *R. Volkensii* may closely resemble that of *R. Chiesae*.

SECTION AFRO-DIGITATI C. E. GUST.

Rubus myrianthus Baker. I have referred this species to Sect. *Afro-digitati*, whereas Focke in Species Ruborum, 212 (1911), has grouped it together with some Asiatic, Australian and American *Rubi* in the Subgenus *Lampobatus*. Although I am not in a position to judge the value of Focke's classification, I should point out that the material of *R. myrianthus* which Focke had at his disposal was defective. He says (p. 216) that the leaves are ternate. Baker, on the other hand, in his description writes: "foliis digitatim quinquefoliolatis," which is correct. Further, Focke's figure

(p. 217) is incorrectly drawn, for it was made from a damaged specimen, in which the main axis was truncated. He is of the opinion, however (p. 216) that *R. myrianthus* is apparently related to *R. dictyophyllus*.

SECTION AFRO-IDAEI FOCKE.

Subsect. *Trifoliolati*.—Of the species grouped in this subsection, *R. Steudneri* Schweinf. and *R. adenophloeus* Focke are difficult to distinguish. The former is found in the Sudan and Abyssinia, the latter in the Uluguru Mountains in Tanganyika Territory. Both seem to grow in Uganda and Kenya Colony. For example a specimen (no. 1644) collected by Liebenberg in April 1930 in Uganda, is almost completely like the type of *R. adenophloeus* from the Uluguru Mountains. It is only a little more evenly serrated.

A specimen of *R. adenophloeus* Focke has been collected in Tanganyika Territory, above Chenzema, Uluguru Mountains, 2100 m., in secondary scrub, 2 Jan. 1934, *Michelmores* 873. The specimen entails the following correction in the description (Rubi Africani, p. 28): Folia plus minus inaequaliter serrata. Foliolum terminale basi integra vel subemarginata. Foliola lateralibus breviter petiolulata, fere elliptica, parte infima petioli fere aequilonga vel longiora. Carpella primo pilosa, deinde glabra. *Michelmores* has noted: "Flowers smallish and reddish, berries luscious and orange or red and apparently not turning black."

Rubus Steudneri Schweinf. In the Kew Herbarium there are two specimens of this species from Sudan, Mongalla, Mt. Kuretti, ravines, 3000 m., 10 Feb. 1929, *Chipp* 61. In one of them, it is true, the glands cannot be seen but they are probably concealed by the indumentum. In Rubi Africani, p. 25, it is stated that the axis is tomentose. The indumentum consists of more or less numerous stellate hairs, mixed with single hairs. In the above-mentioned specimens the stellate hairs are dense. The terminal leaves in *R. Steudneri* may have an entire or an incised base.

Rubus Steudneri Schweinf. var. *aberensis* Engl. seems to have a wider distribution than the main species. The herbarium contains one specimen from Abyssinia, several from Mt. Elgon or its environs and one from Mt. Kilimanjaro. This variety has few or no glands and stellate hairs are present. With regard to one specimen, collected by Major Lugard on Mt. Elgon, the note on the label says "fruit orange," while another specimen, collected by Tothill, is said to have "fruits dark reddish." From this it seems probable that the colour of the fruits may change from orange to dark reddish on ripening. On a specimen collected at Butandiga, Bugishu, in Uganda, on 3 Sept. 1932, Thomas remarks: "scandent to 12 ft., stems light brown," while Greenway notes on a specimen collected on Mt. Kilimanjaro: "scandent shrub growing over bushes and small trees."

It is to a certain extent explicable that the above variety has been confused with *R. dictyophyllus* Oliv. For instance, *R. Steudneri*

has normally grey tomentose leaves on the under side, but if it grows in the shade this greyish colour disappears and then leaves of both species have the same colour. There are two such specimens in the herbarium: Uganda, Mt. Elgon, 2700 m., J. D. Snowden 807, and Tanganyika Territory, Mt. Kilimanjaro, S. slope between Umbwe and Weru Weru Rivers, 1950 m., 1 Sept. 1932, Greenway 3216. Moreover, if only the upper part of the inflorescence of *R. dictyophyllus* has been collected, as in the case of the type specimen, it is frequently difficult to ascertain from the herbarium specimens whether or not 5-digitate leaves occur.

Rubus ulugurensis Engl. var. **apricus** C. E. Gust., var. nov. Folia supra densius pilosa, subtus cano-tomentosa; foliola lateralialongius petiolulata. Axis rami floriferi magis tomentosus.

TANGANYIKA TERRITORY, Kikogo Forest Reserve, Mufindi, Iringa Distr., 31 Jan. 1934, Michelmores 945. Forma principalis est forma umbrosa.

Rubus adenocomus Focke. The type is obviously a shade form without fully developed floral branches. In Bull. Jard. Bot. Bruxelles, 13, 268 (1935) the description has been corrected to: Inflorescentia pubescens, glandulosa, comparate parva, folia superans, ramusculis brevibus subaequilongis ex axillis bractearum composita vel ramulis longioribus ex axillis foliorum superiorum aucta.

Subsect. **Villosi**.—In Rubi Africani, p. 5, I stated that the species of *Rubus* belonging to this group are uniform. This uniformity, however, does not exclude the possibility of a variation in individual characters. In Bull. Jard. Bot. Bruxelles 13, 269 (1935) I have stated that they vary in such a manner that, with the exception of *R. Petitianus* A. Rich and *R. petalabigens* C. E. Gust., it is difficult in the other species of the group to distinguish any stable and at the same time distinctive characters.

In Bull. Jard. Bot. Bruxelles 13, 274 (1935) I also pointed out that the name *R. Borbonicus* Pers. should be replaced by *R. apetalus* Poir., as the latter is older and Poiret's "la Cafrerie" is situated in Réunion (Ile de Bourbon) and that specimens from there are more hairy than might be supposed from Poiret's description, but the degree of hairiness is a little variable.

Rubus apetalus Poir. seems to have a stronger tendency to a division of the leaves (septenate) than the other species of the group, but I have occasionally seen such leaves also in *R. Adolphi-Friederici* Engl., and Focke states that they can also be found in *R. Ecklonii* Focke.

In *R. apetalus* Poir. the carpels are more or less tomentose, whereas in the other species they are said to be glabrous. In *R. Ecklonii* Focke they are, however, said to have a few hairs at the tips. In the herbarium there is also a specimen with tomentose carpels: Uganda, Virunga Mts., in scrub at base of Mt. Sabinio,

1900 m., W. J. Eggeeling 1129. As the under side of the leaves is green it is certainly a shade form, which is in fact difficult to distinguish from *R. exsuccus* A. Rich. and *R. Adolphi-Friederici* Engl. Further, there is a specimen, no. 2693, collected by R. A. Dümmer in Uganda in December 1915, in which the younger carpels are tomentose, and the older almost or quite glabrous. In its pyramidal inflorescence it closely resembles *R. interjungens* C. E. Gust., but in its comparatively strong, almost straight prickles it is similar to *R. Adolphi-Friederici*, while its deeply serrate leaves resemble those of *R. exsuccus* A. Rich.

In the type of *R. apetalus* the prickles are reddish, small, straight or slightly bent; in *R. exsuccus* they are large and falcate. In *R. apetalus*, the axis of the flowering branches appears to be bluntly angular; in *R. exsuccus* and *R. Adolphi-Friederici* it is often furrowed. In *R. Ecklonii* the terminal leaves are more elongated than in the majority of other species, but that is also the case in *R. apetalus* f. *pyramidalis*. The serration of the leaves, too, is variable.

In *R. apetalus* from Madagascar, *R. interjungens* and in a specimen like *R. exsuccus* from Uganda, the petals are said to be white; in Dümmer 2693, mentioned above, they are stated to be pale lilac-rose. Similar specimens at the Bruxelles herbarium are recorded as having petals which are violet in colour.

The inflorescence of the type specimens of *R. apetalus*, *R. Adolphi-Friederici* and *R. assaortinus* is comparatively narrow and of uniform breadth; in *R. apetalus* f. *pyramidalis* and *R. interjungens* it is pyramidal. This character can only be used when the flowering branches are fully developed. If they are but slightly developed, the number of the axillary floral branches is also reduced.

With reference to a specimen from Mt. Kilimanjaro, which is identical with the type of *R. interjungens* C. E. Gust., C. G. Rogers states: "fruits, red, edible." Another closely related specimen is said to have "fruits eaten by children, orange." From these notes it seems possible that the colour of the fruits changes from orange to red. Engler says that in *R. Adolphi-Friederici* the drupels are "sanguinei, acidae," while Fries states that they are "rubescentes." Kirk says with regard to a specimen like *R. exsuccus* that "the fruit is good, exactly like the brambles but small." In Rubi Africani, p. 36, I wrote with regard to *R. exsuccus*: "fructus atro-rubri?" and, according to Richard: "carpella sicca," but the latter statement is incompatible with Kirk's assertion, mentioned above. With regard to *R. assaortinus*, Chiovenda wrote: "drupeolae pericarpis succoso, glabro et sicco, nigro." If we compare the distinctly red fruits of *R. Adolphi-Friederici* in the herbarium (Tanganyika Territory, Njombe, 3 Dec. 1931, Lynes 21) with the equally developed, dark fruits of *R. exsuccus* also found there, we cannot but admit the possibility of there being a real specific difference, especially if the carpels in the latter were really found to be dry.

To bring all these variable characters into systematic order on the basis of dried herbarium specimens is indeed a difficult task. Definite information can be obtained only by the collection of good specimens with critical notes made in the field or by means of comparative cultures.

Rubus apetalus Poir. var. *roseus* C. E. Gust. var. nov.; foliola magnitudine inaequalia; illa infima parte infima petioli saepe longiora; inflorescentia pyramidalis, aculeis parvis rubentibus armata; petala rosea.

TANGANYIKA TERRITORY. Poroto Mountains near Mbeya, 2250 m., 18 Feb. 1934, *Michelmores* 965.

Rubus Petitianus A. Rich. In the Kew Herbarium are preserved *Schimper* 729, 731 and 733, mentioned by me in *Rubi Africani*, p. 31. Owing to the hairiness of these specimens, *R. Petitianus* has been placed in Subsect. *Villosi*, in spite of the fact that the petals are larger and have evidently a somewhat greater durability. In *Species Ruborum* 178 (1911) Focke considers that no. 733 is a "var. vel spec. div. *Schimper*." No. 733 cannot be distinguished from nos. 729 and 731. They are more pilose than the type in the Paris Herbarium, but this may be due to their different habitats. Glands in the inflorescence are also found in the type.

Rubus interjungens C. E. Gust. With regard to this species collected by Rogers on the N. slopes of Mt. Kilimanjaro, 1950 m., 29 Nov. 1932, which is identical with the type, he has also supplied the following interesting note: "cane simple erect. Flower white. Petals fall at once." I presume, however, that the stem must be supported by adjacent bushes in order to be erect. In *Rubi Africani*, p. 32, I classified *R. interjungens* as an intermediate form between *R. apetalus* and *R. pinnatus* var. *afrotropicus*. Owing to the variation in Subsect. *Villosi* I must now admit that *R. interjungens* has hardly anything to do with *R. pinnatus*. On the other hand, there is in the herbarium a specimen of *R. pinnatus* var. *afrotropicus*, collected by A. Whyte in May, 1900, at Lubwas, Uganda, in which the indumentum of the axis closely resembles that of Subsect. *Villosi*.

Subsect. *Pinnati veri*.—Owing to the green undersides of the leaves and less hairiness the typical species of the group are not difficult to separate from those of other groups. Transitional forms, however, occur. Thus *R. Ledermanii* Engl., which has leaves of exactly the same shape as those of *R. pinnatus* Willd., has been referred to this group. It is, however, slightly more pilose, besides which the undersides of the leaves are somewhat greyish. This form, of which I have only seen one specimen from the Cameroons and one from the Belgian Congo, seems to be such a transitional form. Moreover, there are transitional forms between *R. intercurrents* C. E. Gust. and *R. rigidus* Sm. (*sensu amplo*).

Rubus pinnatus Willd. If one compares the type of *R. pinnatus* from the Cape with the variety *afrotropicus* Engl. from the equatorial

regions, it will be seen that the difference between them is considerable. It is, however, a difference in degree, not in kind. For instance, f. *glaber* C. E. Gust. from the Cape Province also has to a certain extent a pyramidal inflorescence, whereas slender branches of var. *afrotropicus* have narrower and smaller inflorescences.

As the habitat causes a variation in hairiness, the description (*Rubi Africani*, p. 45) of *R. pinnatus* Willd. must be corrected to:—Inflorescentia plus minus molliter tomentosa.

R. pinnatus Willd., Tanganyika Territory, Mbisi Mountains, Ufipa, 2100–2400 m., 1 Nov. 1933, *Michelmores* 712, varietas axi glabro, aculeis validis, carpellis parce tomentosis.

Rubus pinnatus Willd. forma *subglandulosus* C. E. Gust., forma nov.; ramus floriferus aculeis sat validis armatus, in parte inferiore glaber; inflorescentia glandulis subsessilibus parce obsita; sepala viridia; carpella glabra. On the 12th January 1931 Major and Mrs. Lugard collected this form on Mt. Elgon, at an elevation of 1950 m. They have noted: "creeper to 20 ft.; sepals green, petals suppressed. Fruit orange." No tendency to produce glands has been observed before in *R. pinnatus*.

Rubus pinnatus Willd. var. *afrotropicus* Engl. On the 3rd January 1932, in the Morogoro District, Tanganyika Territory, at an altitude of 1350 m., Wallace collected a form which differs from the type only in having white petals and glabrous carpels. The native name is rufifi (Kiswahili).

Rubus Stuhlmannii Engl. Tanganyika Territory, Lukwanguli, Uluguru Mountains, 2400 m., 3 Jan. 1934, *Michelmores* 897. Note: "Leaves not white beneath, flowers white." Var.; axis quam pro typo magis tomentosus; aculei minores; foliola jugi infimi parte infima petioli saepe longiora.

Rubus Stuhlmannii Engl. var. *aberdarensis* C. E. Gust. The words "sepala post anthesin reflexa" in *Rubi Africani*, p. 43, should be changed to "sepala patula vel reflexa." This species was collected by Grant (Forestry Department no. 1217) at Kinobop, Aberdare Mts., at an altitude of 2250 m., and he has supplied the following notes: "small pinkish petals, flowers in an inflorescence of from 30–60 approx. Fruit edible, colour from black to dark crimson, resembling European Blackberry in shape and colour." In the herbarium there is also a specimen, Kenya Forestry Department, no. 750: "the common bramble of the Aberdare Mountains and Mt. Kenya, 2100–2700 m., vern. mutari, J. L. Moon, 21 July 1913."

Rubus Scheffleri Engl. A duplicate of the type specimen from Limuru, Kenya Colony, is in the Kew Herbarium. There are also two specimens from Olomoti Volcano, Tanganyika Territory, 2490 m., 16 Sept. 1932, *B. D. Burtt* 4374. These are identical with *Fries* 729 from western Kenya, which I have rather doubtfully referred to *R. Scheffleri*. In comparing *Burtt*'s specimens with the type I have not been able to see any essential difference.

It should also be mentioned that in the herbarium there is a specimen classified as *R. Scheffleri* Engl. (?) labelled Tanganyika Territory, Arusha district, Mt. Meru crater, 3450 m., 5 Oct. 1932, B. D. Burtt 4152. It appears to have partly erect sepals, although it reminds one of *R. Scheffleri*.

Rubus kingaensis Engl. var. *pubescens* C. E. Gust. Identical with this variety is the following specimen: Tanganyika Territory, Morogoro District, forest, 1350 m., 16 Oct. 1932, G. B. Wallace 161. "Climber. Fls. pink. Fruit edible. Kiswahili name: lufifi." It is perhaps intermediate between *R. kingaensis* Engl. and *R. rungwenensis* Engl.

The same *Rubus* has been collected in Tanganyika Territory, Lupanga, Uluguru Mountains, forest edge, 1400 m., 23 Dec. 1933, Michelmores 848. Note: "Leaves green beneath, berries when unripe red, when ripe fair sized, black with grey bloom, very juicy and very good to eat. Kiluguru name: fifi." The description (Rubi Africani, p. 48), should be corrected thus: Foliola supra paulum pilosa vel fere glabra, lateralia in jugo superiore sessilia vel fere sessilia.

R. rungwenensis Engl., Tanganyika Territory, above Chenzema, Uluguru Mountains, 2250 m., 2 Jan. 1934, Michelmores 876. Note: "In scrubby and probably secondary forest. A very ordinary looking bramble with pink flowers, leaves not white beneath, berries black when ripe." The description for this species (Rubi Africani, p. 49) should be emended thus: Folia plus minus subtiliter duplicato-serrata, supra obscure viridia et pilosa, subtus magis pallida et pubescentia.

Subsect. **Pauciflora**.—*Rubus kirungensis* Engl. In the herbarium there are two sheets: Uganda, Virunga Mts., 3150 m., 10 Dec. 1930, B. D. Burtt 2874. The main form grows on lava high up on the mountain and may be regarded as a microphyllous form of *R. kirungensis* var. *glabrescens* (Engl.) C. E. Gust., growing on lower levels, which has leaves of normal size. The leaves of the main form are crenate-serrate. Fully developed petals are somewhat longer than or almost as long as the sepals.

Rubus iringanus C. E. Gust. sp. nov.; a *R. kirungensis* Engl. ramis floriferis densius pilosis, foliis eorum non pinnatis, sepalis ad fructum adpressis, petalis albis differt.

Frutex humilis, Turio non collectus. Axis rami floriferi teres usque obtusangulus, pilosus, probabiliter eglandulosus. Aculei parvi, inaequales, majores basi paulum dilatata saepissime curvati, aculeolis rectis immixti. Folia comparate parva, 3-nata, in inflorescentia singula simplicia, sat aequaliter serrata, supra obscure viridia et dense pilosa, subtus parum pallidiora et solum in nervis pubescentia. Folium terminale foliorum 3-natorum basi integra late ovatum vel late obovatum, breviter acutum vel fere obtusum, petiolulo suo dupl. longius vel fere aequilongum; lateralia parum

petiolulata-sessilia, obtusa, basi plus minus cuneata, parte infima petioli longiora. Petiolus pilosus, aculeolis curvatis armatus. Stipulae ad basin petioli affixae, anguste lanceolatae. Inflorescentia foliosa, parva et pauciflora, floribus singulis et breviter pedicellatis ex axillis superioribus instructa. Calyx fere ad basin partitus. Sepala molliter tomentosa, sat longe acuminata, ad fructum adpressa. Petala parva, alba. Stamina stylos superantia. Carpella glabra. Fructus immaturi rosei.

TANGANYIKA TERRITORY, Kigogo Forest Reserve, Mufindi, Iringa District, 31 Jan. 1934, Michelmores 948.

Subsect. **Discolores apetal.**—As mentioned before, *R. apetalus* should be placed in Subsect. *Villosi*. Since the petals of Subsect. *Rigidi veri* also are comparatively small and fall early, *R. madagascariensis* C. E. Gust. and *R. atrocoeruleus* C. E. Gust. may be placed in the same subsection thereto. The affinity of *R. Quartinianus* A. Rich to *R. rigidus* is on the other hand dubious.

Rubus Quartinianus A. Rich. In the herbarium there are specimens of Schimper 1439 from Lanka Berr in Abyssinia, mentioned in Rubi Africani, p. 52. There are also specimens of var. *Pappianus* C. E. Gust. Judging from the specimens I have seen, *R. Quartinianus* has a narrow and few-flowered inflorescence, but as the variety and its closely-related species, *R. Chioendae* C. E. Gust., have been shown to have a wider and many-flowered inflorescence, that may possibly be the case also in this species.

Rubus atrocoeruleus C. E. Gust. A fully typical specimen is preserved in the herbarium: Zambesia [Nyasaland], Shibisa to Tshinmuzi, 600-1200 m., Sept. 1859, Dr. Kirk. A specimen collected by Scott-Elliott (no. 8552) in Nyasaland, Shire Highlands, Ndirani, seems to belong to this species, as does also a specimen from S. Rhodesia, Chimanimani Mts., 24 Febr. 1907, Johnson 215. The latter is said to have "fruits black." It is difficult to distinguish *R. atrocoeruleus* from certain variations of *R. inedulis* Rolfe. The ripe fruits of the former, however, are "atrocoerulei" (Fries), whereas those of the latter are "lutei" (Rolfe) or "aurantiacorubri" (Fries, Stolz).

Subsect. **Rigidi veri**.—*Rubus transvaliensis* C. E. Gust. should scarcely be placed in this subsection, but I cannot think of a more appropriate classification. The type of var. *hyimbilensis* C. E. Gust. is preserved in the herbarium (13 Nov. 1913, Stolz 2286) and a description is given in Bull. Jard. Bot. Bruxelles, 13, 275 (1935).

Rubus rigidus Sm. Through the courtesy of the Linnean Society of London I obtained a photograph of the type specimen from the Cape preserved in the Linnean Herbarium. This photograph and the accompanying description furnished me with quite a clear picture of its habit. *R. rigidus* Sm. very closely resembles the type of *R. inedulis* Rolfe. I am afraid, however, that a complete and correct analysis of the numerous varieties of *R. rigidus* Sm. (*sensu amplo*) can be made only by means of a comparison in the field of

he variations of the bushes. For it is sometimes difficult to judge whether varying characters in herbarium specimens occur on a single plant, or on different specimens.

In the herbarium there is a specimen labelled *R. rigidus* Sm., which was collected by G. Adamson in the Shire Highlands, Nyasaland. In this specimen some of the fruits are hairy, while others are glabrous. It might just as correctly have been named *R. inedulis* Rolfe.

Rubus rigidus Sm. forma *lachnocarpus* C. E. Gust. is a slightly prickly form of *R. rigidus* with pubescent carpels and predominantly trifoliate leaves. The following specimen in the herbarium resembles the type: Southern Rhodesia, Odzani River Valley, distr. Manica, div. Umtali, 1914, A. J. Teague 195. Little different from it is another specimen, also collected in Southern Rhodesia, Chipinga, which is furnished with the following note: "Flowers small, reddish. Berries ripening red and then black." A similar note is found on a specimen from Mozambique.

Rubus rigidus Sm. var. *Mundtii* (Cham. et Schldl.) Focke. In the herbarium there is a specimen devoid of petals: Kenya, N'dara-Berg in Taita, Febr. 1877, J. M. Hildebrandt 2461. It resembles *R. madagascariensis*, but differs in having a furrowed axis in the inflorescence and a deeper serration of the leaves.

Rubus rigidus Sm. var. *incisus* C. E. Gust. is characterised by its comparatively long sepals. In the herbarium there are two specimens of this plant from Southern Rhodesia, collected by Michelmores, one from Chipinga, the other from Melsetter between Jansen's Hill and Lemonkop. The following note is given: "petals red of moderate size. Growth stiff." The leaves, however, are not so deeply serrate as in the type specimen.

Rubus rigidus Sm. var. *huillensis* (Welw. ex Oliv.) Focke. The type in the Kew Herbarium bears the following note: "Welwitsch, Iter Angolense n. 1281 (Huillensis ad int.). Distr. Huilla, Juxta rip. rivor. ad 4500 ped. usque 5600. c. fl. et fr. Nov. 1859. Frutex 3-5 ped. altus, laxe ramosus. Fructus edulis quidem est parum succosus, atropurpureus."

Rubus intercurrents C. E. Gust., like *R. Ledermannii* Engl., has the same shape of leaf as *R. pinnatus*, but the undersides of the leaves are more or less grey-felted. *R. intercurrents* C. E. Gust. var. *confluens* has a pyramidal inflorescence like *R. pinnatus* var. *afrotropicus*, but grey-felted leaves like *R. rigidus*. A specimen of this plant, no. 454, was collected by C. F. Swynnerton in Southern Rhodesia near Chirinda, 1140 m., and bears the following note: "a bramble with pink flowers and red fruits." In 1891 J. Buchanan collected the same *Rubus* in Nyasaland.

Rubus inedulis Rolfe. In the Kew Herbarium Brown's specimen (Rubi Africani, p. 63) is marked as the type and Dawe's specimen as the co-type. The former has a stronger tendency to pinnate leaves and its inflorescence does not reach so far above the leaves;

the co-type, which seems to be common, has mainly trifoliate leaves in the inflorescence, which reaches far beyond the leaves. With regard to his specimen Brown has supplied the following note: "fruit inedible, yellow." As some collectors state that the fruits are yellow, others that they are reddish, one must suppose that the colour changes from yellow to reddish on ripening. In contradistinction to this it should be observed that the fruits of other forms of *R. rigidus* are clearly stated to be red and then become black or at least dark red. *R. chrysocarpus* Mundt, however, is supposed also to have yellow fruits.

With regard to the edibility of the fruits there seems to be a difference of opinion. The abnormally well-developed fruits may no doubt be eaten but they have a sour and bitter taste. At any rate abnormal fruits frequently occur concerning which the author says: "the fruits appear to be in abnormal condition, the receptacle and achenes being swollen into a spongy densely tomentose mass. It is suspected to be a galled condition." It is remarkable that these malformations occur in *R. inedulis* from Kenya, Uganda and Belgian Congo right down to Southern Rhodesia, that is, from latitude 0° to 20°S., whereas I cannot remember having seen such malformations in any other species of *Rubus* there. *R. inedulis* is said to grow in shrubs near cultivated places and on savannahs.

I am greatly indebted to the authorities at Kew for facilitating my difficult studies of the variation of African *Rubus* by supplying me with extensive material.

XXX—A SYNOPSIS OF THE LABIATAE OF THE GUIANAS. CARL EPLING.

The *Labiatae* of the Guianas are largely weedy in nature, being mostly plants of wide distribution in the tropics at least of the New World. Three genera, *Leonurus*, *Leonotis* and *Coleus*, are introduced from the Old World. The remaining three genera are American but none of their species is confined to the Guianas. Of these only *Hyptis* embraces species of significant distribution. They are three in number: *H. laciniata*, unique in lacinate leaves, *H. arborea*, almost unique amongst *Labiatae* in tree-like habit, and *H. dilatata*.

LEONURUS L.

1. *L. sibiricus* L. Sp. Pl. 584 (1753).
A widely distributed tropical weed.

LEONOTIS R. BR.

1. *L. nepetaefolia* (L.) R. Br. Prodr. 504 (1810).
A widely distributed tropical weed.

MARSYPIANTHES MART.

1. *M. Chamaedrys* (Vahl) Kuntze, Rev. Gen. 524 (1891).—*Clinopodium Chamaedrys* Vahl, Symb. 3, 77 (1794). *Marsypianthes hyptioides* Mart. ex Benth. Lab. Gen. et Sp. 64 (1832) et in DC. Prodr.

12, 84 (1848). *M. viscosa* Klotzsch in Schomb. Fl. Br. Guian. 1148 (1848). *H. Chamaedrys* Willd. Sp. Pl. 3, 85 (1800). *H. pseudo-chamaedrys* Poit. in Ann. Mus. Par. 7, 469, t. 31, f. 1 (1806). *H. inflata* Spreng. Syst. Veg. 2, 731 (1825). *H. lurida* Spreng. Syst. Veg. 2, 731 (1825). *M. hyptioides* var. *bracteosa*, *umbrosa*, *eriocephala* et *arenosa* Benth. in DC. Prodr. 12, 85 (1848).

Widely distributed in the American tropics from Mexico to Paraguay. A species of considerable variability, the variants of which seemingly have no correlated distribution. *M. hyptioides* var. *bracteosa* Benth. is unique in the ovate bracts. I have seen no other specimens comparable. *M. hyptioides* var. *umbrosa* Benth. is a large-leaved form in which the calyx teeth are often long-acuminate; it passes into *M. hyptioides* var. *eriocephala* Benth. in which the calyx teeth are long-acuminate and very woolly, but in which the leaves are smaller. *M. hyptioides* var. *arenosa* Benth. is a viscid form with small leaves, often thickish, the heads being short-peduncled, the whole plant often sordid with particles of earth or sand which cling to it. Two of these variants may often grow in the same locality. To what extent the differences are environmental and to what extent racial is too complex a question to determine from herbarium specimens.

COLEUS LOUR.

1. *C. Blumei* Benth. Lab. Gen. et Sp. 56 (1832).

Found frequently in the tropics, apparently as an escape. The species is apparently a garden form of mixed parentage.

OCIMUM L.

Posterior stamens appendaged near the base:

A shrub as much as 2 m. tall; upper calyx tooth shortly decurrent on the tube, the lower pair connate nearly to the apex, the tube naked within..... 1. *O. gratissimum*

Annual herbs; upper calyx tooth decurrent to the base of the tube, concave and cordate at maturity, the lower pair nearly free; tube hirsute within; corolla 7-8 mm. long..... 2. *O. Basilicum*

Posterior stamens naked or pilose at the base, hardly appendaged:

Upper calyx tooth decurrent along the tube to its base, 7-8 mm. long; corolla 3-4 mm. long..... 3. *O. micranthum*

Upper calyx tooth shortly decurrent on the tube, 2.5 mm. in diameter at maturity; corolla 3-4 mm. long..... 4. *O. sanctum*

1. *O. gratissimum* L. Sp. Pl. 1197 (1753).

Frequently collected in the tropics, its nativity being uncertain. A pubescent form very similar to this species but more commonly

collected in the old world tropics is known as *O. gratissimum* var. *hirsutum* Wawra, or as *O. suave* Willd. I am uncertain of its relation to this species.

2. *O. Basilicum* L. Sp. Pl. 597 (1753).

Frequently collected in the tropics, often, if not always, as an escape from cultivation.

3. *O. micranthum* Willd. Enum. Hort. Berol. 630 (1809).

A common weed in the American tropics.

4. *O. sanctum* L. Mant. 85 (1767).

An occasional weed in the American tropics.

HYPTIS JACQ.

Hyptis Jacq. (nomen conservandum) Coll. 1, 101 (1786).—*Mesosphærum* P. Br. Hist. Jamaic. 257, t. 18, f. 3 (1756). *Brotera* Spreng. in Trans. Linn. Soc. 6, 151, t. 12 (1802). *Hypothronia* Schrank in Syll. Ratisb. 1, 85 (1824). *Hippothronia* Benth. Lab. 130 (1833), nomen. *Gnoteris* Raf., Sylva Tellur. 76 (1838). *Siagonarrhen* Mart. ex J. A. Schmidt in Mart. Flora Brasil. 8, 146 (1856), nomen. *Schaueria* Hassk. in Flora, 25, II Beibl., 25 (1842).

A. Herbs, either procumbent or prostrate and often rooting at the nodes, or if erect, usually less than 60 cm. tall, with several stems arising from the base; flowers in dense capitula; leaves mostly sessile or subsessile:

Leaves pinnately dissected..... 6. *H. laciniata*

Leaves simple, crenate or serrate:

Calyx teeth deltoid, obtuse..... 14. *H. Parkeri*

Calyx teeth subulate or aristate:

Calyx tube pilose-annulate within and without, the annulus about midway of the mature tube 15. *H. lantanaefolia*

Calyx tubes hirtellous but hardly annulate, often pilose without at the base:

Leaves truncate-rounded and somewhat dilated at the base; style branches almost obsolete, united into a small capitulum 10. *H. dilatata*

Leaves cuneately narrowed at the base; style branches apparent, plane:

Bracts ovate; plant prostrate, creeping..... 16. *H. atrovirens*

Bracts lanceolate; plant erect, often as much as a metre tall:

- Leaves glabrous on the upper surface, hirtellous on the veins beneath; calyx teeth mostly 1-1.5 mm. long..... 12. *H. lanceolata*
- Leaves sparsely and evenly villous-hirsute on both surfaces, thinner than in the preceding; calyx teeth mostly 1.5-2.5 mm. long, sharper than in the preceding 13. *H. brevipes*
- AA. Shrubs or tall herbs, one species a tree :
 Flowers solitary or few in loose cymules, disposed in loose showy panicles :
 Flowers in cymules, disposed in leafy panicles; a tree to 15 m., its leaves rough and leathery 1. *H. arborea*
 Flowers in diffuse nearly naked panicles; a tall herb with soft leaves 2. *H. Salzmanni*
- Flowers in congested cymules, sometimes pectinate and branching, or in compact capitula :
 Calyces abruptly recurved near the throat at maturity :
 Leaves 1-2.5 cm. long, softly hirsute, even silky :
 Leaves ovate, rounded-cuneate at the base; mature capitula 9-10 mm. in diameter on peduncles 1.5-2 cm. long 7. *H. paludosa*
 Leaves obovate, cuneate below the middle; mature capitula 5-6 mm. in diameter on peduncles 7-15 mm. long..... 8. *H. microphylla*
 Leaves 3-9 cm. long, hirsute-villous... 9. *H. recurvata*
- Calyces straight, not recurved :
 Flowers few in loose cymules or, if more numerous, the cymules forking and pectinate :
 Bracts erect, sheathing the flowers; calyx teeth 1-1.5 mm. long ... 5. *H. mutabilis*
 Bracts inconspicuous, aristate :
 Calyx teeth 1-1.5 mm. long..... 3. *H. pectinata*
 Calyx teeth 2-3 mm. long..... 4. *H. suaveolens*
- Flowers many in dense capitula, subtended by an involucre of spreading lanceolate bracts :
 Capitula sessile or nearly so; calyx teeth 3-5 mm. long 11. *H. hirsuta*

- Capitula on peduncles mostly 0.5-3.5 cm. long, rarely less; calyx teeth 1-2.5 mm. long ;
 Leaves glabrous on the upper surfaces, hirtellous on the veins beneath; calyx teeth mostly 1-1.5 mm. long..... 12. *H. lanceolata*
 Leaves sparsely but evenly villous-hirsute on both surfaces, thinner than in the preceding; calyx teeth mostly 1.5-2.5 mm. long ... 13. *H. brevipes*

1. *H. (Buddleioides) arborea* Benth. in DC. Prodr. 12, 132 (1848). —*Mesosphaerum arboreum* Kuntze, Rev. Gen. 2, 526 (1891), nomen. *M. arboreum* var. *bracteosum* Rusby in Mem. Torr. Bot. Cl. 6, 107 (1896). *H. arborea* subsp. *guianensis* Briq. in Ann. Conserv. et Jard. Bot. Genève, 2, 199 (1898). *H. arborea* subsp. *bracteosa* Briq., loc. cit.

A large shrub or small tree as much as 15 m. tall, its trunk as much as 10 cm. in diameter, its bark grey and shallowly fissured, its branchlets nearly terete and rufo-floccose; leaf-blades 8-20 cm. long, 3-5-7 cm. broad, usually elliptical, less often rounded at the base and ovate, their margins obscurely crenulate, the upper surface rough and shining, the lower densely rufo-tomentellous with branched hairs, borne on petioles 1-3 cm. long, those of the fertile branchlets commonly reduced in size, obovate and silvery; flowers in lax branching cymules subtended by linear incanous bracts 4-5 mm. long, disposed in leafy erect panicles on peduncles 1.5-4 cm. long; calyces incanous, floccose-tomentose, 5-7 mm. long at anthesis, their teeth deltoid-acuminate, 2-2.5 mm. long, the orifice somewhat oblique, the tube 6-8 mm. long at maturity; corolla blue, its tube 10-11 mm. long; filaments villous, seated in the throat; columella of the gynobase surpassing the ovules; nutlets complanate, 4 mm. long, 1.5 mm. broad, winged.

BR. GUIANA: Rio Arapoo near Mt. Roraima; in Kotinga valley near Mowaimata; near Arobupu, 1260 m.; in Paramacutoi savanna, 750 m.

Known also from Bolivia (Santa Cruz) and Colombia (Antioquia). I can find no greater morphological variation between the plants of Guiana, Colombia and Bolivia than might be expected upon an individual.

2. *H. (Hypenia) Salzmanni* Benth. Lab. Gen. et Sp. 138 (1833), et in DC. Prodr. 12, 137 (1848). —*H. Salzmanni* var. *filipes* Benth. in DC. Prodr. 12, 137 (1848). *Mesosphaerum Salzmanni* Kuntze, Rev. Gen. 2, 527 (1891), nomen.

A perennial herb as much as 2 m. tall, its branches slender and usually densely pilose; leaf-blades 1.5-2.5 cm. long, 8-12 mm. broad,

deltoid-ovate, obtuse, rounded at the base, irregularly crenate, the upper surfaces hirsute with short hairs and sprinkled with a few longer ones, glandular, the lower ashy, subtomentose, borne on petioles 3-8 mm. long; flowers in glabrous glaucous panicles with internodes 5-10 cm. long, the lower branchlets often foliose, subtended by ovate-lanceolate bracts 2-3 mm. long, borne on slender glabrous pedicels 0.5-3 cm. long; calyces hirtellous, 2.5 mm. long at anthesis, their teeth deltoid-lanceolate, acute, their tubes globose-campanulate at maturity, 4 mm. long, the teeth 1-1.5 mm. long; corolla tubes 5-6 mm. long.

Collected by Schomburgk, without locality; ranges from Venezuela (Bolívar) to Brasil (Minas Geraes).

3. *H. (Mesosphaeria) pectinata* (L.) Poit. in Ann. Mus. Par. 7, 474, t. 30 (1806).—*Nepeta pectinata* L. Syst., ed. 10, 1096 (1759). *Brotera persica* Spreng. in Trans. Linn. Soc. 6, 151 t. 12 (1802). *H. nepetoides* Fisch. ex Schrank in Bot. Ges. Regensb. 2, 52 (1822). *Mesosphaerum pectinatum* Kuntze, Rev. Gen. 2, 525 (1891), nomen. Widely distributed throughout the American tropics.

4. *H. (Mesosphaeria) suaveolens* (L.) Poit. in Ann. Mus. Par. 7, 472, t. 29, f. 2 (1806).—*Ballota suaveolens* L., Syst. ed. 10, 1100 (1759) et Pl. Jam. Pugill. 15 (1759). *H. Plumieri* Poit. in Ann. Mus. Par. 7, 473 (1806). *Schaueria graveolens* Hassk. in Flora 25, II Beibl. 25 (1842). *Mesosphaerum suaveolens* Kuntze, Rev. Gen. 2, 525 (1891), nomen. *H. congesta* Leonard in Journ. Wash. Acad. Sci. 17, 70 (1927).

Widely distributed through the tropics.

5. *H. (Mesosphaeria) mutabilis* (L. C. Rich.) Briq. in Bull. Herb. Boiss. 4, 788 (1896).—*Nepeta mutabilis* L. C. Rich. in Actes de la Soc. Hist. Nat. de Par. 110 (1792). *Mesosphaerum mutabile* Kuntze, Rev. Gen. 2, 525 (1891), nomen.

Widely distributed in the tropics in one form or another as indicated below; that of the Guianas is mostly var. *spicata*:

var. *spicata* (Poit.) Briq. in Bull. Herb. Boiss. 4, 788 (1896).—*H. spicata* Poit. in Ann. Mus. Par. 7, 474, t. 28, f. 2 (1806). *H. rostrata* Salzm. ex Benth. Lab. Gen. et Sp. 121 (1833). *H. tenuiflora* Benth. Lab. Gen. et Sp. 121 (1833) et in DC. Prodr. 12, 122 (1848). *H. spicata* var. *rostrata* Benth. in DC. Prodr. 12, 122 (1848). *H. mutabilis* var. *rostrata* Briq. in Engler u. Prantl, Nat. Pflanzenf. ed. 1, 4, 3a, 339 (1897). *M. spicatum* Rusby in Bull. Torrey Bot. Cl. 27, 83 (1900). *H. singularis* Glaziov in Bull. Soc. Bot. France 58, Mém. III, 554 (1911), nomen.

Stems either glabrate or villous; lower leaf-surfaces now glabrous, now pubescent, hardly tomentose; verticillasters borne on slender peduncles 2-5 mm. long, disposed in slender, diffuse panicles; mature calyx tubes 4-6 mm. long, the teeth hardly longer than the diameter of the tube.

var. *canescens* (HBK.) Briq. in Bull. Herb. Boiss. 4, 788 (1896).—*H. canescens* Kunth in Humboldt et Bonpland, Voy., Nov. Gen. et Sp. 2, 321 (1817). *H. barbata* Schrank in Denkschr. Bot. Gesell. Regensb. 2, 52 (1822). *H. micrantha* Pohl ex Benth. Lab. Gen. et Sp. 120 (1833). *H. polystachya* var. *longiflora* Benth. Lab. Gen. et Sp. 120 (1833). *H. spicata* var. *micrantha* Benth. in DC. Prodr. 12, 122 (1848). *M. canescens* et *barbatum* Kuntze, Rev. Gen. 2, 526 (1891), nomina. *H. trichocalyx* Briq. ex Micheli in Mém. Soc. Phys. Hist. Nat. Genève, 32, 10, 21 (1897). *H. spicata* var. *Bromfieldi* Benth. in DC. Prodr. 12, 122 (1848). *H. mutabilis* var. *Bromfieldi* Briq. in Engler u. Prantl, Nat. Pflanzenf. ed. 1, 4, 3a, 339 (1897). *H. mutabilis* var. *micrantha* Briq. in Engler u. Prantl, Nat. Pflanzenf. ed. 1, 4, 3a, 339 (1897). *M. yungasense* Britton ex Rusby in Mem. Torrey Cl. 4, 246 (1895). *H. canaminensis* Rusby in Mem. N.Y. Bot. Gard. 7, 342 (1927).

Stems usually pubescent; leaf-blades usually truncate or even subcordate at the base, the lower surface canescent-tomentose; verticils rather crowded, disposed in rather strict panicles; mature calyx tubes 3-4 mm. long, the teeth scarcely longer than the diameter of the tube.

var. *polystachya* (HBK.) Briq. in Engler u. Prantl, Nat. Pflanzenf. ed. 1, 4, 3a, 339 (1897).—*H. polystachya* Kunth in Humboldt et Bonpland, Voy., Nov. Gen. et Sp. 2, 321 (1817). *H. aspera* Mart. et Gal. in Bull. Herb. Acad. Brux. 11, II, 189 (1844). *H. mutabilis* var. *cuneata* Briq. in Ann. Conserv. et Jard. Bot. Genève 2, 209 (1898). *Mesosphaerum polystachyum* Cook et Collins in Contrib. U. S. Nat. Herb. 8, 191 (1903).

Stems scabro-villous; lower leaf-surfaces either pubescent or villous, scarcely tomentose; verticils borne on slender peduncles 2-5 mm. long, disposed in ample, many-flowered panicles; bracts usually purple; mature calyx tubes about 4 mm. long, their teeth 1-1.2 mm. long, setaceous.

var. *pavoniana* Briq. in Ann. Conserv. et Jardin Bot. Genève 2, 208 (1898).—*H. canescens* var. *arvensis* Benth., Lab. Gen. et Sp. 712 (1835).

Stems shortly villous, strict; uppermost leaf-blades (all available) rhomboid-ovate, cuneate at base, the lower surface canescent; panicles rather crowded, strict, narrow; mature calyx tube about 4 mm. long.

6. *H. (Plagiotis) laciniata* Benth. in Hooker's Journ. of Bot. 2, 49 (1840).—*Mesosphaerum laciniatum* Kuntze, Rev. Gen. 2, 526 (1891), nomen.

A small tender glabrous herb, procumbent or prostrate, its slender branches 15-30 cm. long, apparently creeping in mud and water; leaves singular in the genus, pinnately dissected, 1.5-2 cm. long, ovate, the laciniae 9-11, incised-dentate, the ultimate lobes

1-2 mm. long, obtuse, the sinuses rounded and excavated, forming lacunae 3 mm. long near the mid-vein, petioles 0.5-1 cm. long; flowers 10-40 in small axillary capitula, borne on peduncles 2-2.5 cm. long; calyx tube 1.2-1.5 mm. long at anthesis, the orifice strongly oblique, the teeth lanceolate-setaceous, 0.4-0.6 mm. long, unchanged at maturity, the tube then 3 mm. long, decurved near the throat; corolla tubes 2 mm. long.

BR. GUIANA: In dry campo near Mt. Pacaraima; known also from a locality in Colombia on the upper Orinoco.

7. *H. (Cyrta) paludosa* St. Hil. ex Benth. Lab. Gen. et Sp. 82 (1833) et in DC. Prodr. 12, 90 (1848).—*Mesosphaerum paludosum* Kuntze, Rev. Gen. 2, 526 (1891), nomen.

A canescent herb of swampy places, a metre tall or more, with quadrate canescent-villous branches, somewhat silky; leaf-blades 1-2.5 cm. long, 0.6-1.5 cm. broad, ovate, rather acute, cuneately narrowed at the base, the upper surface canescent-villous and glandular, the lower white, silky, their margins serrulate, petioles 1-3 mm. long, silky; flowers in globose capitula 9-10 mm. in diameter at maturity, disposed in ample foliose panicles, borne on silky peduncles 1.5-2.5 cm. long; flowering calyces 2.5 mm. long, their linear teeth equal to the tube, unchanged at maturity, the tubes then 4 mm. long, abruptly and strongly recurved at the throat, somewhat villous above the middle; corollas scarcely 3 mm. long.

Collected in Br. Guiana by Schomburgk. Occurs principally in Brasil (Rio Janeiro, Matto Grosso).

8. *H. (Cyrta) microphylla* Pohl ex Benth., Lab. Gen. et Sp. 82 (1833) et in DC. Prodr. 12, 90 (1848).—*Mesosphaerum microphyllum* Kuntze, Rev. Gen. 2, 526 (1891). *H. inundata* Hertzog in Fedde, Rep. 7, 66 (1909). *Mesosphaerum capitellatum* (etiam *H. capitellata*) Jenn. in Ann. Carn. Mus. 11, 246 (1917).

Reported by Kostermans (Pulle, Fl. Surin. 4, 342 (1936)) from Paramaribo, Dutch Guiana, based upon Wulfschlägel n. 398, a specimen of which I have no record. It is to be expected.

9. *H. (Cyrta) recurvata* Poit. in Ann. Mus. Par. 7, 467, t. 28, f. 2 (1806).—*H. recurvata* var. *hirsutior* et *grandifolia* Benth. Lab. Gen. et Sp. 81 (1833). *H. microcephala* Bert. ex Benth. Lab. Gen. et Sp. 81 (1833), nomen. *Mesosphaerum recurvatum* Kuntze, Rev. Gen. 2, 527 (1891), nomen.

Frequent throughout the American tropics.

10. *H. (Eriosphaeria) dilatata* Benth. in DC. Prodr. 12, 103 (1848).—*H. crenata* var. *angustifolia* Benth. ex Seem. Bot. Voy. Herald, 187 (1852-7). *Mesosphaerum dilatatum* Kuntze, Rev. Gen. 2, 526 (1891), nomen.

Perennial aromatic herbs 30-50 cm. tall, their stems more or less decumbent, glandular-villous, the lower internodes scarcely 1 cm. long, the upper 2-2.5 cm. long; leaf-blades sessile, oblong,

1.5-3 cm. long, 6-14 mm. broad, the upper tending to ovate, all obtuse, truncate-rounded and often abruptly somewhat dilated at the base, their margins subrevolute, crenate, the upper surfaces appressed-villous, the lower ashy, villous-tomentose; capitula hemisphaeric, 1.5-2 cm. in diameter at maturity, subtended by recurved bracts 5-7 mm. long, disposed in the upper axils on villous peduncles 1-3 cm. long; tube of the flowering calyx 2-2.5 mm. long, its teeth about 2 mm. long, lanceolate-acuminate, the tube 3.5-4 mm. long at maturity; corolla tube 6-6.5 mm. long.

BR. GUIANA: on Mt. Tonpaeging, Rio Negro; occurs also in Colombia (Meta), Venezuela (Carabobo, Amazonas) and Brasil (Espírito Santo, Goyaz, Matto Grosso).

11. *H. (Xylodontes) hirsuta* Kunth in Humboldt et Bonpland, Voy., Nov. Gen. et Sp. Pl. 2, 318, t. 161 (1817).—*Mesosphaerum hirsutum* Kuntze, Rev. Gen. 2, 526 (1891), nomen. ? *H. siderotricha* Briq. in Bull. Herb. Boiss. 4, 791 (1896). *M. siderotrichum* Briq., loc. cit., nomen.

BR. GUIANA: Upata, Guacaima; occurs elsewhere in South America from Venezuela to Paraguay at lower elevations.

12. *H. (Cephalohyptis) lanceolata* Poir. Encyl. Suppl. 3, 114 (1813).—*H. globifera* G. F. W. Meyer, Prim. Fl. Esseq. 207 (1818). *H. lanceifolia* Thonn. ex Schum. et Thonn., Beskr. Guin. Pl. 261 (1827). *H. brevipes* var. *glabrior* Benth. in DC. Prodr. 12, 107 (1848). *Mesosphaerum lanceolatum* Kuntze, Rev. Gen. 2, 526 (1891), nomen. *H. brevipes* var. *remotidens* Briq. in Ann. Conserv. et Jardin Bot. Genève, 2, 226 (1898). *H. brevipes* var. *lanceifolia* Briq., loc. cit.

Apparently a native of Guiana, this species is widely distributed throughout Africa, never appearing, however, in the Malaysian Archipelago or in Mexico or Cuba. In Bahia forms apparently intermediate with *H. brevipes* occur. Otherwise it maintains its identity as here described. Specimens from the Mazaruni River collected by de la Cruz have uniformly smaller calyces and capitula but seem otherwise hardly different. The size and shape of leaf may vary greatly, even on the same plant. *H. brevipes* var. β of Bentham, based upon a fragmentary specimen collected by Schomburgk on the upper Rupununi, is apparently referable here. The capitula are nearly sessile and the calyx teeth are longer, more acute and more rigid.

13. *H. (Cephalohyptis) brevipes* Poit. in Ann. Mus. Par. 7, 465 (1806).—*H. acuta* Benth. in Linnaea, 6, 82 (1831). *Thymus biserratus* Blanco, Fl. Filip. 478 (1837). *Pycnanthemum subulatum* Blanco, Fl. Filip. ed. 2, 333 (1845), et ed. 3, 2, 251, t. 204 (1878). *H. melanosticta* Griseb. Fl. Br. W. Ind. 458 (1861). *Mesosphaerum brevipes* et *melanostictum* Kuntze, Rev. Gen. 2, 526 (1891), nomina. *H. brevipes* var. *serrata* Briq. in Ann. Conserv. et Jard. Bot. Genève, 2, 226 (1898).

H. brevipes is apparently a native of the region of northern lowland Brasil and the Guianas. It is widely distributed throughout northern South America except in those regions occupied by *H. lanceolata*, with which it seemingly comes in contact in one place only, in Bahia, where intermediates occur. Outside South America it occurs widely in the Carribean Islands, in Central America and Mexico and throughout Malaysia, occurring even in China.

14. *H. (Cephalohyptis) Parkeri* Benth. Lab. Gen. et Sp. 108 (1833) et in DC. Prodr. 12, 108 (1848).—*Mesosphaerum Parkeri* Kuntze, Rev. Gen. 2, 525 (1891), nomen. *H. juruana* Loesn. ex Pilger in Verh. Bot. Ver. Brandenb. 47, 187 (1905).

A perennial herb of varied aspect, apparently scrambling over other vegetation or prostrate, its stems slender, as much as a half metre long, with internodes 3-6 cm. long; leaves nearly sessile, 4-6 cm. long, glabrous or hirtellous, elliptical-lanceolate or elliptical, rather obtuse at the apex, narrowly rounded-truncate at the base, the margins convex, serrate; mature capitula hemisphaerical, about 8 mm. in diameter, borne on slender hirsute peduncles 4-5 cm. long, subtended by ovate-oblong bracts 5-7 mm. long; flowering calyces turbinate-campanulate, 3-3.5 mm. long, their teeth scarcely 1 mm. long, deltoid-ovate, obtuse, the anterior pair somewhat smaller, the tube 3-5 mm. long at maturity; corolla white; nutlets truncate.

Frequently collected in the Guianas and in Brasil (Amazonas, Matto Grosso).

var *verbenaefolia* (Mart. ex Schmidt) Epl. in Bull. Torrey Bot. Cl. 58, 465 (1931).—*H. verbenaefolia* Mart. ex Schmidt in Mart. Flora Brasil. 8, 110 (1858). *Mesosphaerum verbenaefolium* Kuntze, Rev. Gen. 2, 527 (1891), nomen.

Leaves mostly elliptical, acute, more or less hirsute.

BR. GUIANA: near Georgetown and doubtless elsewhere; frequent also in Brasil (Pará, Amazonas).

15. *H. (Cephalohyptis) lantanaefolia* Poit. in Ann. Mus. Par. 7, 468, t. 29, f. 1 (1806).—*H. lantanaefolia* var. *glabra* Kosterm. in Pulle, Fl. Surin. 4, 349 (1936). *Mesosphaerum lantanaefolium* Kuntze, Rev. Gen. 2, 525 (1891), nomen.

Widely distributed in the American tropics from southern Mexico to eastern Bolivia.

16. *H. (Pusillae) atrorubens* Poit. in Ann. Mus. Par. 7, 466, t. 27, f. 3 (1806).—*Mesosphaerum atrorubens* Kuntze, Rev. Gen. 2, 525 (1891), nomen. *H. procumbens* Cham. et Schlecht. in Linnaea, 5, 101 (1830). *H. pasuorum* Mart. ex Schmidt in Mart. Fl. Brasil, 8, 118 (1868), nomen. *H. tenella* Briq. et Spruce in Ann. Conserv. et Jard. Bot. Genève, 2, 223 (1898). *M. tenellum* Briq., loc. cit., nomen.

Throughout the tropical lowlands in North and South America; a form which may be endemic occurs also in Africa in Senegambia and Sierra Leone.

XXXI—TWO NEW SPECIES OF *SENECIO* FROM ARGENTINA. ANGEL L. CABRERA (Museo de la Plata, Argentina).

Among Mr. H. F. Comber's botanical collections made in Neuquen Territory of the Argentine Republic, which corresponds to N.W. Patagonia, there are two interesting, and as yet undescribed, species of the genus *Senecio*. Thanks to the courtesy of Sir Arthur W. Hill I have been given the opportunity of studying these plants, which are here described. The type specimens are preserved in the Herbarium of the Royal Botanic Gardens, Kew.

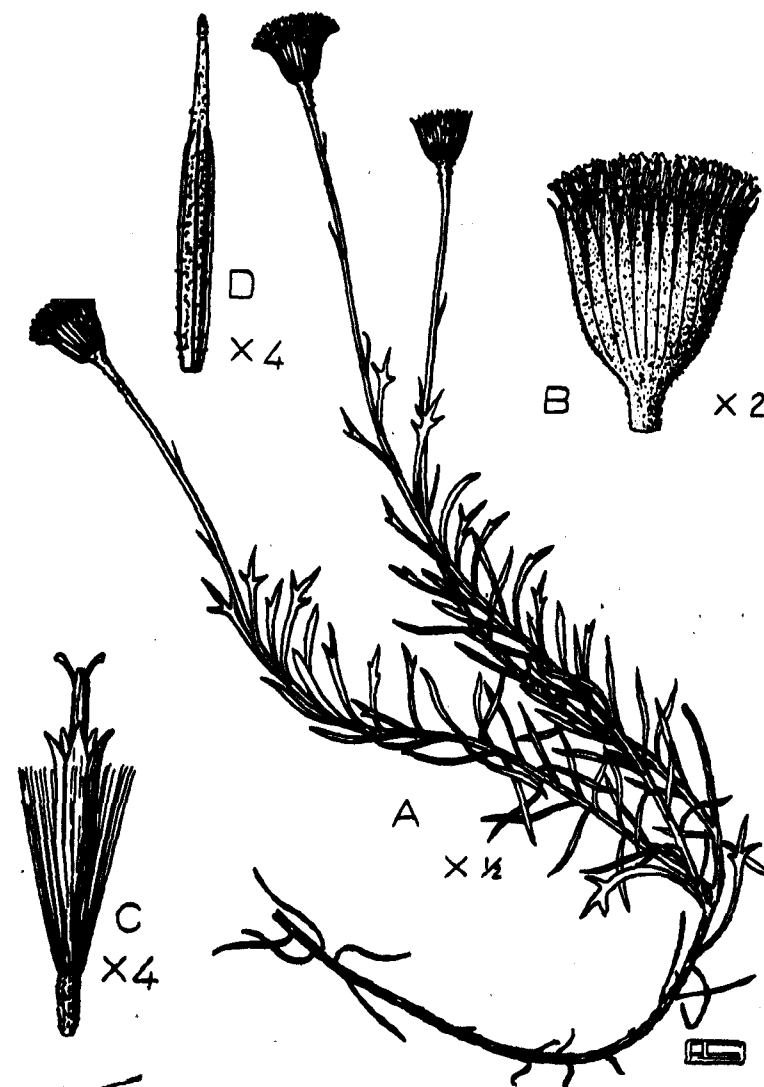


Fig. 1. *Senecio Comberi* Cabr. A, entire plant; B, head; C, floret; D, involucre bract.

Senecio Comberi Cabrera, sp. nov.; affinis *S. maolino* Reiche, sed foliis linearibus differt. Proximus etiam ad *S. leucophyton* Phil. et *S. gilvum* Phil., sed achaeniis pilosis et bracteis involucribus 20–23 distinctus.

Suffrutex, 20–25 cm. elatus, caulibus ascendentibus basi ramosis cylindraceis plus minus dense tomentosis inferne foliosis superne nudis monocephalis. *Folia* densa, linearia vel oblanceolato-linear, acuta, apice mucronata, basi attenuata, integra vel ad partem superiorem 1–3 lobulis acutis munita, utrinque plus minus dense argenteo-tomentosa, margine leviter revoluta, 15–30 mm. longa, 1–3 mm. lata (lobulata usque ad 7 mm. lata). *Capitula* discoidea. *Involucrum* campanulatum, ecalyculatum, 11 mm. elatum, 13–15 mm. crassum; bractee involucriales 20–33, lineares, apice longe attenuatae papillosaeque, dorso laxe tomentosae, 11 mm. longae, 1 mm. latae. *Flores* aurantiaci, isomorphi, corolla tubulosa 7.5 mm. longa, pentalobata (lobulis 1 mm. longis apice parce papillosis). *Antherae* 2.5 mm. longae. *Styli* rami 1.5 mm. longi, apice pilis papillosis coronati. *Achaenia* (valde immatura) cylindracea, breviter papillosa, 2 mm. longa. *Pappi* setae albae, brevissime denticulatae, 7 mm. longae.

ARGENTINA. Neuquen: San Martin de los Andes, 900 m.s.m., H. F. Comber 788, 15 Nov. 1926 (typus in Herb. Kew.).

Senecio neuquensis Cabrera, sp. nov.; *S. portalesiano* Remy affinis, sed planta glaberrima, achaeniis glabris, pedunculis longioribus differt.

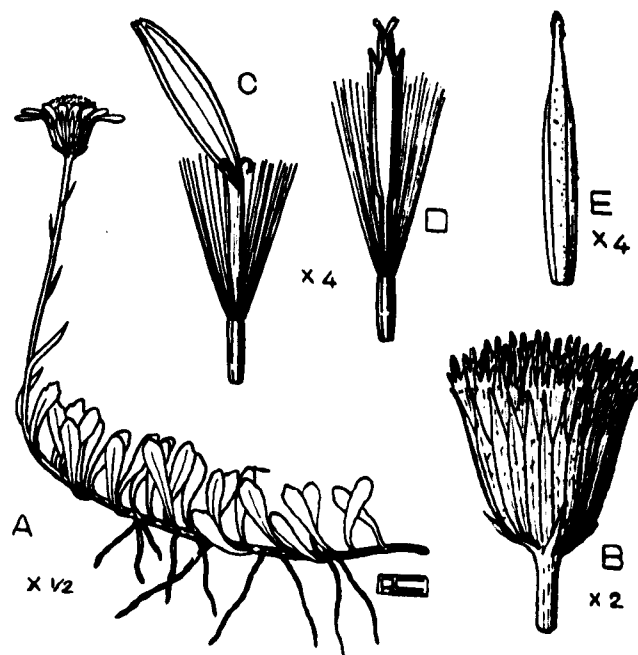


Fig. 2. *Senecio neuquensis* Cabr. A, entire plant; B, head without ligulate florets; C, ligulate floret; D, disc floret; E, involucre bract.

Suffrutex glaber, caulibus ascendentibus haud ramosis 14–18 cm. longis inferne dense foliosis radicanibusque superne nudis tantum aliquis bracteis munitis monocephalis. *Folia* alterna, sessilia, modice firma, spathulata, apice obtusa, basi attenuata, subpetiolata, integerrima vel parte superiore 1–2-dentata, 15–20 mm. longa, 4–5 mm. lata, nervis inconspicuis. *Capitula* radiata, apice caulium solitaria. *Involucrum* campanulatum, calyculatum, 8–9 mm. elatum, 10–12 mm. crassum, floribus disci aliquid brevius; bractee calyculi 5–9, subulatae, brevissimae; bractee involucri plus minus 20, lineares, superne acuminatae, apice penicillatae, glabrae vel dorso leviter glandulosae, 8–9 mm. longae, 1 mm. latae. *Flores* lutei (vel aurantiaci), dimorphi. *Flores* marginis feminei, ligulati, tubo 4 mm. longo, ligula 6 mm. longa 1.8 mm. lata, apice tridentata. *Flores* disci androgyni, tubulosi, corolla 7 mm. longa pentaloba (lobulis deltoideis circa 1 mm. longis). *Antherae* 2.5 mm. longae. *Styli* rami 1.5 mm. longi, apice pilis papillosis coronati. *Achaenia* (valde immatura) cylindracea, glabra, 2 mm. longa. *Pappi* setae albae, leviter denticulatae, 5–6 mm. longae.

ARGENTINA. Neuquen: Zapala district, H. F. Comber 1261, 1925–1927 (typus in Herb. Kew.).

XXXII—CONTRIBUTIONS TO THE FLORA OF SIAM. ADDITAMENTUM XLIX.*

Callicarpa glandulosa Fletcher [Verbenaceae-Viticeae]; *C. longifoliae* Lamk. affinis, sed foliis glandulis rubris nec flavis praeditis, nervis lateralibus paucioribus differt.

Frutex habitu diffusus, c. 2 m. altus (ex Kerr); ramuli obtuse quadrangulares, saepe teretes, glabri, brunneo-grisei. *Folia* elliptica vel oblongo-elliptica, apice acuminata, acuta, basi cuneata, 9–17 cm. longa, 4.5–5 cm. lata, chartacea, supra brunneo-viridia, subtus griseo-viridia, supra parce stellato-pubescentia glandulisque numerosis rotundatis rubris sessilibus vestita, costa supra conspicua subtus prominulis parallelis intra marginem arcuatim junctis, nervis transversis tenuibus plus minusve parallelis, margine dentata, petiolo 0.5–1.5 cm. longo supra canaliculato parce stellato-pubescente suffulta. *Inflorescentia* e cymis axillaribus composita, pedunculis primariis 3–5 cm. longis parum pubescentibus, pedicellis 2 mm. longis glabris, bracteis parvis linearibus ad 2 mm. longis. *Flores* non visi. *Fructus* purpureus (ex Kerr), globosus, 3–4 mm. diametro, glaber, apice glandulis flavis sessilibus praeditus.

SURAT. Chumpawn, Ta Ngaw, c. 50 m., by stream in evergreen forest, Kerr 11469.

Premna annulata Fletcher [Verbenaceae-Viticeae]; *P. paniculatae* Fletcher affinis, sed foliis oblongis coriaceis, annulo ad ramulorum nodos piloso differt.

*Continued from K.B. 1938, 133.

Frutex scandens (ex Kerr); ramuli obtuse quadrangulares, glabri vel parum pubescentes nisi ad nodos annulatim pilosi, flavo-fulvi, lenticellis parvis numerosis praediti. *Folia* elliptica vel oblongo, apice acuta, basi leviter attenuata vel rotundata 5–10 cm. longa, 1.5–3 cm. lata, coriacea, supra olivaceo-viridia vel fulva, lucida, glabra nisi ad costam tenuiter pubescentia, subtus pallidiora, glabra, costa supra conspicua subtus prominente, nervis lateralibus 5–6-paribus supra conspicuis subtus prominulis parallelis, nervis transversis validis irregularibus, margine integra vel interdum profunde dentata, petiolo 5–10 mm. longo supra canaliculato pubescente suffulta. *Inflorescentiae* 1.5–2 cm. longae, basi 3 cm. latae, parce pubescentes, ramos parvos laterales terminantes; bracteae lineari-lanceolatae, 1–2 mm. longae, pubescentes. *Calyx* extra glaber vel parce pubescens; tubus 1.75 mm. longus, intus glaber; limbus bilabiatus, labium posticum 1 mm. longum dentibus tribus, labium inferum 0.75 mm. longum dentibus duobus ornatum. *Corolla* extra glabra; tubus 3 mm. longus, intus glaber nisi ad staminum insertionem longe pilosus; limbus bilabiatus; labium posticum 2 mm. longum, 2 mm. latum, labium inferum 3.5 mm. longum, trilobatum, lobis apice rotundatis. *Stamina* 4; filamenta 2.5 mm. longa, 2 mm. supra corollae tubi basin adfixa; antherae 0.5 mm. longae. *Ovarium* globosum, 1 mm. diametro, glabrum. *Stylus* 4 mm. longus, bilobatus.

NAKAWN SRITAMARAT. Patalung, Sak, under 50 m., scrub by stream, Kerr 19269.

Premna Garrettii Fletcher [Verbenaceae-Viticeae]; *P. villosae* C. B. Clarke affinis, sed foliis obovatis nec ovatis nec ellipticis differt; ab etiam affini *P. dubia* Craib calyce intus fere glabro vix pubescente differt.

Frutex altus, multiramulosus (ex Garrett); ramuli obtuse quadrangulares, glabri, griseo-brunnei, lenticellis magnis et conspicue elevatis praediti. *Folia* elliptica vel obovata, apicem versus rotundata, summo apice abrupte acuta, basi parum attenuata, 7–12 cm. longa, 4–5 cm. lata, utrinque brunnea, supra fulvo-pubescentia, subtus fulvo-tomentosa glandulisque sessilibus occultis vestita, costa supra conspicua subtus prominente, nervis lateralibus 5–6-paribus supra conspicuis subtus prominulis parallelis, nervis transversis numerosis parallelis, margine integra ciliata, petiolo 1–2 cm. longo supra profunde canaliculato tomentoso suffulta. *Inflorescentia* terminalis corymboso-paniculata, 4 cm. longa, basi 10 cm. lata, pedunculis pedicellisque leviter tomentosis. *Calyx* extra valde albo-pubescent; tubus intus glaber, pilis paucis brevibus exceptis, 1.5 mm. longus; limbus obscure bilabiatus, labium inferum dentibus duobus minutis ornatum, labium posticum integrum vel subintegrum. *Corolla* flava (ex Garrett), extra tenuiter pubescens; tubus 2.5–3 mm. longus, ad staminum insertionem dense pilosus; limbus 4-lobatus, lobis 1.5 mm. longis 1.2 mm. latis apice rotundatis intus glabris. *Stamina* 4; filamenta 3–3.5 mm. longa, 1.5 mm. supra

corollae tubi basin adfixa; antherae 0.25 mm. longae. *Ovarium* globosum, 0.75 mm. diametro, apice tenuiter pubescens. *Stylus* 4.5 mm. longus, bilobatus.

PAYAP. Chiengrai, Doi Tam Tu Pu, summit West Peak, c. 530 m., limestone rock, Garrett 296.

Premna paniculata Fletcher [Verbenaceae-Viticeae]; *P. Wightianae* Schauer affinis, sed foliis basi attenuatioribus apice acuminatis, panicula minore, fructu haud aspero differt.

Frutex scandens (ex Kerr); ramuli primo quadrangulares mox teretes, glabri, grisei vel griseo-brunnei, lenticellis numerosis et conspicue elevatis praediti. *Folia* ovata vel elliptica, apice acuta, basi parum cuneata, 4–9 cm. longa, 2–5 cm. lata, chartacea, supra subtusque griseo-brunnea viridi-tincta, glabra, tomento tenui pilorum longiusculorum ad costam excepto, costa supra conspicua subtus prominente, nervis lateralibus 2–4-paribus supra conspicuis subtus prominulis parallelis, margine integra vel parum crenata, glabra vel ciliata, petiolo 3–5 mm. longo supra canaliculato ad canalem parum pubescente suffulta. *Inflorescentiae* 1–2 cm. longae, 1–2 cm. latae, ramos parvos laterales terminantes, pubescentes et glandulosae. *Calyx* extra parce pubescens; tubus 2.5 mm. longus, intus leviter pubescens glandulisque paucis sessilibus munitus; limbus bilabiatus; labium inferum 1 mm. longum dentibus duobus, labium posticum 0.75 mm. longum dentibus tribus ornatum. *Corolla* non visa. *Fructus* obovoideus, 5 mm. longus, 3 mm. diametro, glaber, rugosus.

RACHABURI. Prachuap, Pak Tawan, c. 20 m., dry evergreen forest, Kerr 20536.

Premna quadridentata Fletcher [Verbenaceae-Viticeae]; *P. scoriarum* W. W. Sm. affinis, sed petiolis longioribus, foliis subtus pilis e costa abeuntibus in ordines duos dispositis notatis differt.

Frutex scandens (ex Kerr); ramuli teretes, valde nodosi, glabri, obscure grisei vel nigri, lenticellis numerosis magnis conspicue elevatis muniti. *Folia* latissime elliptica, apice obtuse acuminata, basi rotunda nunc subito decurrentia, 7–14 cm. longa, 4.5–11 cm. lata, rigide chartacea, subtus ut supra brunnea saepe flavo-tincta, parum glandulosa, glabra (nisi supra ad costam tenuiter pubescentem et subtus ad axillas venarum caespitoso-pilosas additis insuper pilis brevibus in lineas duas dispositis), costa supra conspicua subtus prominente, nervis lateralibus 5–7-paribus supra conspicuis subtus valde prominulis parallelis, nervis transversis numerosis, margine integra glabra, petiolo 2–4 cm. longo supra canaliculato glabro glandulis sucineis vestito suffulta. *Inflorescentia* 3–7 cm. longa, 6–9 cm. lata, pubescens et glandulosa. *Calyx* extra parum pubescens, 6–9 mm. longus; tubus intus glaber, 1.25–1.5 mm. longus; limbus glandulosus; tubus intus glaber, 1.25–1.5 mm. longus; limbus bilabiatus, 4-lobatus. *Corolla* alba (ex Kerr), extra glabra; tubus 2.75–3 mm. longus, intus pilosus; limbus bilabiatus, labium posticum 1 mm. longum, labium inferum trilobatum 2 mm. longum, lobis apice rotundatis. *Stamina* 4; filamenta 2.5–3 mm. longa;

antherae 0.5 mm. longae. *Ovarium* globosum, 0.75 mm. diametro, glabrum. *Stylus* 4.5 mm. longus, bilobatus.

PUKET. Ranawng, Kaw Chang, edge of evergreen forest bordering beach, *Kerr* 16563.

***Premna repens* Fletcher** [Verbenaceae-Viticeae]; *P. annulatae* Fletcher affinis, sed foliis pumilis profunde dentatis vel lobatis siccitate obscure griseo-caeruleis valde distincta.

Frutex erectus, ad 2 m. altus, nunc ramis prostratis supra saxa calcarea repentibus praeditus (ex *Kerr*); ramuli fere teretes, glabri, brunnei vel brunneo-grisei, lenticellis paucis et conspicue elevatis praediti. *Folia* elliptica vel lanceolata, apice obtuse acuminata, basi anguste cuneata, 2-6 cm. longa, 1.2 cm. lata, chartacea, supra caeruleo-viridia, subtus griseo-viridia, supra parum pubescentia sed saepius glabra, subtus glabra sed glandulis parvis sessilibus brunneis parce vestita, costa supra conspicua subtus prominente, nervis lateralibus 2-3-paribus subtus prominulis parallelis, nervis transversis paucis validis parallelis, margine lobata parum recurva ciliata, petiolo 3-5 mm. longo supra parum canaliculato pubescente suffulta. *Inflorescentiae* 5-7 mm. longae, ramos parvos laterales terminantes, pedunculis pedicellisque pubescentibus praeditae. *Calyx* extra parum puberulus; tubus 1-1.5 mm. longus, intus glaber; limbus bilabiatus, dentibus quinque praeditus. *Corolla* extra glabra vel parce pubescens; tubus 2.25 mm. longus, ad staminum insertionem longe pilosus; limbus bilabiatus; labium posticum 2.5 mm. longum, 2 mm. latum, labium inferum 5.25 mm. longum, trilobatum, lobis apice rotundatis. *Stamina* 4; filamenta 1.75 mm. longa, 1.75 mm. supra corollae tubi basin adfixa; antherae 0.5 mm. longae. *Ovarium* globosum, glabrum, 0.8 mm. diametro. *Stylus* 3.5 mm. longus, bilobatus.

RACHABURI. Prachuap, Sam Roi Yawt, c. 500 m., *Kerr* 10950.

***Premna serrata* Fletcher** [Verbenaceae-Viticeae]; *P. amplexanti* Wall. affinis, sed foliis parvis ovatis cordatis glabris glanduloso-serratis distinguenda.

Frutex circiter 1 m. altus (ex *Kerr*); ramuli vulgo teretes, brunneo-grisei, primo pubescentes, mox glabri, lenticellis numerosis praediti. *Folia* ovata, apice acuta, basi cordata, 3-6 cm. longa, 2-3.5 cm. lata, chartacea, supra viridi-brunnea vel brunnea, subtus pallidiora, supra glabra vel parum pubescentia, subtus praesertim ad costam nervosque laterales pubescentia, glandulosa, nervis supra conspicuis subtus prominulis, nervis lateralibus 4-6-paribus, nervis transversis paucis saepe irregularibus, margine serrata ciliata, petiolo 0.5-1 cm. longo supra canaliculato pubescente suffulta. *Inflorescentiae* 2 cm. longae, basi 2 cm. latae, ramos laterales terminantes. *Calyx* extra glaber, glandulis rotundis sessilibus sucineis praeditus; tubus 1.5 mm. longus, intus glaber; limbus 1 mm. longus, bilabiatus, glandulosus, labium posticum dentibus tribus, labium inferum dentibus duobus ornatum. *Corolla* viridis, purpureo-striata (ex

Kerr), extra parum pubescens glandulisque sessilibus vestita; tubus 3.5-4 mm. longus, intus pilosus; limbus bilabiatus, labium posticum integrum, 2.5 mm. longum, 2.5 mm. latum, labium inferum 3 mm. longum, 5 mm. latum, trilobatum. *Stamina* 4; filamenta 2.5-4 mm. longa, 2.5 mm. supra corollae tubi basin adfixa; antherae 0.5 mm. longae. *Ovarium* globosum, 0.8-1 mm. diametro, glabrum; *Stylus* 5.5 mm. longus.

NAKAWN SAWAN. Kampengpet, Kao Hua Mot, c. 900 m., savannah limestone, *Kerr* 6122.

***Premna siamensis* Fletcher** [Verbenaceae-Viticeae]; *P. flavescens* Ham. affinis, sed foliis minoribus magis cordatis, calyce dentibus quattuor nec quinque ornato differt.

Frutex scandens; ramuli obtuse quadrangulares, pilis longis articulatis glandulisque paucis sessilibus sucineis vestiti. *Folia* ovata vel parum elliptica, apice obtusa, basi rotundata vel saepius cordata, 5-12 cm. longa, 2.5-8 cm. lata, chartacea, supra olivaceo-viridia interdum fere nigra, subtus griseo-viridia, supra parum glandulosa et pubescentia nisi ad costam nervosque laterales pilis longis articulatis hirsuta, subtus pilis similibus dense vestita, costa utrinque conspicua, nervis lateralibus 6-8-paribus subtus conspicuis nervis transversis numerosis parallelis, margine integra ciliata, petiolo 1.5-4 cm. longo tomento denso vestito suffulta. *Inflorescentia* terminalis, corymboso-paniculata, tomentosa, 12-18 cm. longa, basi 14-20 cm. lata, pedunculis primariis 2-7 cm. longis. *Calyx* extra pilis curtis rigidis articulatis vestitus; tubus 1-1.2 mm. longus, intus glaber; limbus 4-lobatus, lobis 0.5 mm. longis apice obtusis. *Corolla* extra parce pubescens; tubus 1.5 mm. longus, intus pilosus; limbus bilabiatus, labium posticum 0.75 mm. longum, 1 mm. latum, labium inferum trilobatum 1.75 mm. longum, lobis apice rotundatis. *Stamina* 4; filamenta 2-2.5 mm. longa; antherae 0.4 mm. longae. *Ovarium* obovoideum, 0.75 mm. longum, glabrum vel apice pilis paucis instructum. *Stylus* 3 mm. longus, bilobatus.

PAYAP. Chiangmai, Pang Tawn, *Put* 3810.

***Gmelina attenuata* Fletcher** [Verbenaceae-Viticeae]; *G. asiaticae* Linn. foliis biformibus integris et profunde lobatis affinis, sed foliis maioribus basi attenuatioribus, inflorescentiae forma differt.

Frutex humilis, circiter 5 m. altus (ex *Kerr*); ramuli quadrangulares, brunneo-variegati, primo pubescentes glandulis albis sessilibus vestiti, mox fere glabri et multo minus glandulosi. *Folia* elliptica vel subobovata, apice subacuminata ibique leviter lobata, basi valde attenuata, 6-10.5 cm. longa, 2-5 cm. lata, chartacea, supra brunnea, subtus griseo-brunnea, supra glabra, subtus parum pubescentia, glandulis rotundis albis sessilibus praedita, costa et nervis lateralibus supra inconspicuis, costa subtus prominente, nervis lateralibus 3-5-paribus subtus prominulis parallelis, nervis transversis validis numerosis parallelis, margine integra parum recurva glabra, petiolo 0.5-2 cm. longo brunneo supra canaliculato

summita. *Inflorescentia* terminalis, 2 cm. longa, tomento denso fulvo praedita; flores pedicellis curtis fulvis puberulis suffulti; bractae ad paniculae basin pubescentes, inferiores 15-20 mm. longae, superiores minimae. *Calyx* extra tomento fulvo vestitus; tubus 4 mm. longus, intus glaber, parum sinuoso-lobatus. *Corolla* flava (ex Kerr), immatura, extra tenuiter tomentosa.

PAYAP. Chiangmai, c. 1100 m., open grassy forest, Kerr 6224.

Gmelina paniculata Fletcher [Verbenaceae-Viticeae]; *G. attenuata* Fletcher affinis, sed foliis maioribus haud lobatis basi rotundatis vel nunc parum attenuatis differt.

Arbor parva; ramuli teretes vel obtuse quadrangulares, brunnei, primo parce pubescentes, pilis ad nodos magis numerosis, mox glabri, lenticellis paucis, spinis in axillis foliorum 0.8-1 cm. longis. *Folia* late ovata vel elliptica, apice subacuminata, basi vix cuneata, 7-13 cm. longa, 5-8 cm. lata, chartacea, utrinque brunnea rubicundo-tincta, supra glabra vel parce pubescentia, subtus glabra glandulis numerosis albis rotundatis vel quadrangularibus vestita, costa supra conspicua subtus prominente, nervis lateralibus 4-5-paribus subtus prominulis parallelis, nervis transversis numerosis longo brunneo supra canaliculato et praesertim apicem versus pubescente suffulta. *Inflorescentia* terminalis, 2-4 cm. longa, tomento fulvo glanduloso vestita; bractae ovatae vel lanceolatae, 2.5-10 mm. longae, 1-5 mm. latae. *Calyx* extra glanduloso-pubescentia et glandulis magnis nigris vestitus; tubus 3 mm. longus, intus glaber, dentibus quattuor 1 mm. longis 1.5 mm. latis ornatus. *Corolla* extra glanduloso-pubescentia; tubus 2.5 cm. longus, intus glaber; limbus bilabiatus, labium posticum 5 mm. longum, 5 mm. latum, labium inferum trilobatum, 10 mm. longum, 18 mm. latum, lobis apice rotundatis. *Stamina* 4, filamentis duobus 14-15 mm. longis 13.5 mm. supra corollae tubi basin adfixis, ceteris 7.5 mm. longis 12.5 mm. supra corollae tubi basin adfixis; antherae 2.5 mm. longae. *Ovarium* obovoideum, 2.8 mm. longum, glabrum. *Stylus* 2.8 cm. longus, breviter bilobatus. *Fructus* ovoideus, parce pubescens, 1.5-2 cm. longus, 1 cm. diametro.

PRACHINBURI. Krabin, Aranya, Pet 2086.

Gmelina tomentosa Fletcher [Verbenaceae-Viticeae]; *G. villosae* Roxb. affinis, sed foliis basi deltoideis supra tomentosis, corolla maiore differt.

Frutex circiter 2.5-3 m. altus (ex Nos); ramuli obtuse quadrangulares, primo valde tomentosi, mox glabri, spinis paucis 0.5 cm. longis praediti. *Folia* juniora ovata, matura deltoidea, apice rotundata vel late obtusa, basi parum cuneata vel deltoidea, 3-8 cm. longa, 3-7 cm. lata, supra fulvo-adpresso-tomentosa, subtus fulvo-tomentosa glandulisque rotundis vel quadrangularibus albis sessilibus praedita, costa supra conspicua subtus prominente, nervis lateralibus 4-6-paribus supra conspicuis subtus prominentibus

parallelis, nervis transversis validis numerosis parallelis, margine integra ciliata, petiolo 1.5-3.5 cm. longo dense tomentoso suffulta. *Inflorescentia* terminalis, 2-5 cm. longa; bractae parvae, lanceolatae, 4 mm. longae, 1 mm. latae, tomentosae. *Calyx* extra dense tomentosus, glandulis albis glandulisque nigris magnis paucis praeditus; tubus 3 mm. longus, intus glaber, dentibus quattuor 0.5 m. longis munitus, saepe fere sinuoso-lobatus. *Corolla* extra tomento fulvo glandulisque albis vestita; tubus 2 cm. longus, intus glaber; limbus bilabiatus, labium posticum 10 mm. longum, 10 mm. latum, labium inferum trilobatum 18 mm. longum, lobis apice rotundatis. *Stamina* 4; duo filamenta 21-22 mm. longa, 9 mm. supra corollae tubi basin adfixa, reliqua 9-10 mm. longa, 8 mm. supra corollae tubi basin adfixa; antherae 2.5 mm. longae. *Ovarium* glabrum, 2 mm. diametro. *Stylus* 30 mm. longus.

RACHASIMA. Korat, Ban Chum Seng, Noe 211.

Clerodendron venosum Wall. var. *pubescens* Fletcher [Verbenaceae-Viticeae]; a typo et ramulis et foliis omnino pubescentibus differt.

PAYAP. Chiangmai, Me Tun, c. 600 m., mixed forest, Kerr 6190.

Glossocarya crenata Fletcher [Verbenaceae-Caryopterideae]; *G. premnoidi* Ridl. foliis glanduloso-punctatis affinis, sed foliis minoribus pubescentibus crenatis differt.

Frutex habitu diffusus (ex *Lakshnakara*); ramuli obtuse quadrangulares, tomento fulvo vestiti. *Folia* ovata, apice rotundata, basi leviter cordata, 2-3.5 cm. longa, 2-3 cm. lata, chartacea, utrinque griseo-viridia, supra parce glandulosa et pubescentia pilis ad costam nervosque laterales magis numerosis, subtus tomentosa, glandulis numerosis sucineis vestita, costa supra conspicua subtus leviter prominente, nervis lateralibus 3-4-paribus supra conspicuis subtus prominulis parallelis, nervis transversis paucis irregularibus, margine profunde crenata, glabra vel ciliata, petiolo 0.5-1 cm. longo supra parum canaliculato suffulta. *Inflorescentia* terminalis, corymboso-paniculata, 4 cm. longa, basi 4-6 cm. lata. *Calyx* extra valde pubescens glandulosusque; tubus 3 mm. longus, intus glaber, limbus quinquelobatus, lobis 0.8 mm. longis basi 1.5 mm. latis intus glabris. *Corolla* alba (ex *Lakshnakara*), extra valde pubescens et glandulosa; tubus 14 mm. longus, intus glaber, pilis parcissimis longis exceptis; lobi 5, subaequales, 3-4 mm. longi, 1 mm. lati. *Stamina* 4; filamenta 20 mm. longa, 8 mm. supra corollae tubi basin adfixa; antherae purpureae (ex *Lakshnakara*), 1 mm. longae. *Ovarium* globosum, 1 mm. diametro, apice sericeo-pilosum. *Stylus* 15 mm. longus, bilobatus.

UDAWN. Kawnken, near railway lines, *Lakshnakara* 1083.

Glossocarya longiflora Fletcher [Verbenaceae-Caryopterideae]; *G. molli* Wall. affinis, sed corollae tubo majore, capsula pilis griseis strigosis munita differt; nec non *G. siamensi* Craib affinis, sed foliis tenuiter tomentosis, corollae tubo majore differt.

Frutex scandens (ex *Lakshnakara*); ramuli obtuse quadrangulares, primum tomento tenuiter vestiti, mox glabri. *Folia* ovata vel elliptica, apice obtusa vel obtuse apiculata, subacuminata, basi cordata, 4-10 cm. longa, 3.5-7 cm. lata, chartacea, supra brunnea saepe viridi-tincta, subtus brunnea vel griseo-brunnea, supra parce pubescentia, subtus tomentosa glandulisque sessilibus sucineis vestita, costa nervisque lateralibus supra conspicuis, costa subtus prominente, nervis lateralibus 5-6-paribus subtus prominulis parallelis, nervis transversis paucis irregularibus, margine integra, recurva, ciliata, petiolo 5-10 mm. longo fulvo-tomentoso suffulta. *Inflorescentiae* ramos laterales terminantes, 3-8 cm. longae, basi 6-10 cm. latae. *Calyx* extra dense tomentosus; tubus 3 mm. longus, intus basi maxime sericeus, ceterum glaber, apice sinuatus. *Corolla* alba (ex *Lakshnakara*), extra tomentosa; tubus 11.5-12 mm. longus, intra glaber; lobi 5, subaequales, 3-4.5 mm. longi, 2.5-3.5 mm. lati. *Stamina* 4; filamenta 18-20 mm. longa, antherae 1 mm. longae. *Ovarium* globosum, 1 mm. diametro, apice sericeo-pilosum. *Stylus* 25 mm. longus, bilobatus. *Capsula* 8-10 mm. longa, 3 mm. diametro, griseo-strigosa.

AYUTHIA. Saraburi, Keng Koi, *Lakshnakara* 284 (type).
LOWER SIAM. Kao Kaw Sawan, c. 150 m., *Annandale* 1832

Hymenopyramis acuminata Fletcher [Verbenaceae-Caryopterideae]; *H. siamensi* Craib affinis, sed foliis minoribus apice magis acuminatis tomento breviori vestitis, glandulis in foliorum pagina inferiore fere omnino abditis, utriculo fere glabro differt.

Frutex scandens (ex *Kerr*); ramuli obtuse quadrangulares, glabri, pilis paucis ad nodos exceptis, griseo-brunnei, lenticellis paucis praediti. *Folia* elliptica vel parum obovata, apice valde acuminata, basi cuneata, 5-8 cm. longa, 2-5.5 cm. lata, rigide chartacea, supra olivaceo-viridia brunneo-tincta, subtus grisea viridi-tincta, supra glabra nisi ad costae basin tomentosa, subtus tomentosa glandulosa, costa nervisque lateralibus supra conspicuis, costa subtus prominente, nervis lateralibus 4-5-paribus subtus prominulis parallelis, nervis transversis validis numerosis parallelis, margine integra glabra, petiolo 1 cm. longo supra parum canaliculato pubescente suffulta. *Panicula* axillaris vel terminalis, foliata, 15-28 cm. longa, basi 15-24 cm. lata, ramis primariis 8-12 cm. longis. *Flores* non visi. *Utriculus* ovoideus, 2-3 cm. longus, acute 4-alatus, glaber vel parce pubescens et glandulosus. *Capsula* obovoidea, 5 mm. longa, 3.5 mm. diametro, fulvo-hirsuta glandulisque numerosis sessilibus sucineis praesertim prope apicem praedita.

CHANTABURI. Krat, Kao Saming, under 50 m., evergreen forest, *Kerr* 17917.

Hymenopyramis vesiculosa Fletcher [Verbenaceae-Caryopterideae]; *H. siamensi* Craib affinis, sed tomento breviori vestita, glandulis in foliorum pagina inferiore fere omnino abditis, utriculo fere glabro differt.

Frutex scandens (ex *Kerr*); ramuli quadrangulares, parce pubescentes vel glabri, grisei, lenticellis numerosis conspicue elevatis praediti. *Folia* ovata vel elliptica, apice acuminata, acuta, basi rotundata vel parum cordata, 8-15 cm. longa, 4-8 cm. lata, rigide chartacea, utrinque grisea brunneo-tincta, supra glabra, subtus tomentosa et glandulosa, costa supra conspicua subtus prominente, nervis lateralibus 5-6-paribus supra conspicuis subtus prominulis parallelis, nervis transversis validis numerosis parallelis, margine integra, petiolo 1-1.2 cm. longo supra canaliculato primo valde pubescente parumque glanduloso mox glabro suffulta. *Inflorescentia* generis. *Calyx* alba (ex *Kerr*), extra tenuiter pubescens; tubus 1.2 mm. longus, intus glaber; limbus 4-lobatus, lobis 1.5 mm. longis 1 mm. latis. *Stamina* 4; filamenta 2.2 mm. longa; antherae 0.5 mm. longae. *Ovarium* glabrum, 0.3 mm. longum. *Stylus* 2.5 mm. longus, breviter bifidus. *Utriculus* ovoideus, 2-3 cm. longus, 1.5-2.5 cm. diametro, acute 4-alatus, parum pubescens vel glaber. *Capsula* obovoidea, in utriculo inclusa, 4-5 mm. longa, 3-4 mm. diametro, fulvo-hirsuta et glandulosa.

MAHARAT. Pang Pui, c. 420 m., limestone rocks, *Kerr* 3626.

NAKAWN SAWAN. Ban Dan, near Paknampo, c. 40 m., *Kerr* 3011

(type).

UDAWN. Nakawn Panom, Muk Dahan, c. 200 m., in rocky crevices, open deciduous forest, *Kerr* 8411. Kawnken, Pu Wieng, c. 100 m., deciduous forest, *Kerr* 20657.

Sphenodesme odorata Fletcher [Verbenaceae-Symphoremateae]; *S. microstyli* C. B. Clarke affinis, sed corollae lobis paulo latioribus differt; nec non *S. orbiculari* Fletcher corollae lobis oblongis affinis, sed foliis haud orbicularibus, ovario glanduloso differt.

Frutex scandens (ex *Kerr*); ramuli obtuse quadrangulares, primo stellato-tomentosi, mox glabri, lenticellis numerosis praediti. *Folia* ovata vel elliptica, apice acuta vel obtusa, basi vulgo rotunda, 12-17 cm. longa, 8-12 cm. lata, subcoriacea, utrinque grisea vel brunneo-grisea, supra fere glabra costa excepta, subtus stellato-tomentosa glandulosa, nervis lateralibus 4-5-paribus ut costa supra conspicuis subtus prominentibus, margine integra glabra, petiolo 1-1.5 cm. longo stellato-tomentoso suffulta. *Cymae* capitatae, 7-florae, in panicula terminali dispositae, bracteae cuiusque capituli 6, late spathulatae, 2.5-3 cm. longae, 0.8-1.5 cm. latae, apice rotundatae. *Calyx* variabilis, extra tomentosus glandulosus; tubus 3-3.5 mm. longus, intra pilosulus; limbus trilobus; lobi 2 mm. longi, 2.75-3 mm. lati, apice emarginati. *Corolla* alba, odorata (ex *Kerr*); tubus 6-7 mm. longus, intus nisi ad basin glabrum pilis longis albis glandulisque numerosis vestitus; limbus lobis 5-7 ornatus; lobi anguste oblongi, 5.5-7 mm. longi, 1.75-2 mm. lati. *Stamina* 5-7 (pro lorum corollae numeor), corollae tubo inclusa, filamenta 1 mm. longa, antherae 0.8 mm. longae. *Ovarium* globosum, 1 mm. diametro, apice glandulosum. *Fructus* immaturus 6 mm. longus, 5 mm. diametro, glaber.

MAHARAT. Lampang, Me Salop, c. 190 m., *Winit* 1284.

PUKET. Ranawng, Kao Tulu, c. 50 m., scrub, *Kerr* 11815 (type).

Sphenodesme orbicularis *Fletcher* [Verbenaceae-Symphorematae]; *S. microstyli* C. B. Clarke affinis, sed foliis orbicularibus, corollae lobis minoribus latioribus differt.

Frutex scandens (ex *Winit*); ramuli obtuse quadrangulares, primo tomentosi, mox glabri. *Folia* orbicularia vel elliptica, apice acuta vel obtusa, basi rotundata, 9-12 cm. longa, 8-11 cm. lata, rigide chartacea, supra griseo-brunnea, subtus ferrugineo-brunnea, supra glandulosa, stellatim pubescentia vel fere glabra, subtus stellatim tomentosa, costa supra conspicua subtus prominente, nervis lateralibus 3-6-paribus vulgo 5-paribus subtus prominulis parallelis, nervis transversis numerosis validis parallelis, margine integra ciliata, petiolo 1-1.5 cm. longo fulvo-tomentoso suffulta. *Cymae* capitatae, 7-florae, in panicula terminali dispositae; bractee cuiusque capituli 6, spatulatae, 1.5-2 cm. longae, 0.4-0.8 cm. latae, acutae vel obtusae, utrinque pilosulae, plus minusve distincte nervatae. *Calyx* extra stellato-tomentosus; tubus 6 mm. longus, intus superne pilosulus; limbus lobis duobus ornatus; lobi 3 mm. longi 3-3.5 mm. lati, apice emarginati. *Corolla* alba (ex *Kerr*), extra tomentosa; tubus 10.5 mm. longus, intra pilosulus nisi ad basin glabram; limbus lobis 5-6 praeditus; lobi anguste oblongi, 7.5 mm. longi, 1.5 mm. lati, acuti vel obtusi, intra pilis brevibus obtusis vestiti. *Stamina* 5-6 (pro lorum corollae numero), corollae tubo inclusa. *Ovarium* 1.5 mm. longum, 1.2 mm. diametro, glabrum. *Stylus* 0.2 mm. longus.

PUKET. Ranawng, Lamlieng, c. 10 m., climbing in scrub, *Kerr* 16411.

Congea connata *Fletcher* [Verbenaceae-Symphorematae]; *C. siamensi* *Fletcher* involucri bracteis basi iunctis affinis, sed involucri cupula altiore, involucri bracteis longioribus magis angustis, foliis angustioribus minusque pilosis recedit.

Frutex scandens (ex *Kerr*); ramuli obtuse quadrangulares vel teretes, tomento fulvo-griseo vestiti. *Folia* oblonga, apice acuta, basi leviter cordata, 7-16 cm. longa, 2-4 cm. lata, rigide chartacea, utrinque viridia, nitida, parce glandulosa et fere glabra, pilis paucis longis albis ad costam exceptis, costa supra conspicua subtus prominente, nervis lateralibus 4-5-paribus supra conspicuis subtus prominulis basi parallelis, nervis transversis numerosis parallelis, margine integra ciliata, petiolo 0.5 cm. longo supra parum canaliculato pilis rigidis parce vestito suffulta. *Cymae* capitatae, 6-florae, in panicula terminali 30-40 cm. longa dispositae; pedunculi cymarum 0.7-1.2 cm. longi, pilis rigidis dense vestiti; bractee cuiusque capituli 3, rubicundo-albae (ex *Kerr*), chartacea, utrinque pilosulae, plus minusve distincte nervatae, oblongo-ellipticae, 2-3 cm. longae, 0.5-0.8 cm. latae, basi in cupulam 6 mm. longam undique pilis longis rigidis praeditam connatae. *Calyx* intus ut

extra sericeus; tubus 6.5-7 mm. longus; limbus 5-lobatus; lobi 1.5 mm. longi, basi 1-1.5 mm. lati, apice acuti. *Corolla* extra parum pubescens; tubus 8.5 mm. longus, intus glaber nisi ad staminum insertionem tenuiter pubescens; limbus bilabiatus; labium posticum 4 mm. longum, bilobatum, lobis 2.5-3 mm. longis apice rotundatis, labium inferum deflexum, trilobatum, lobis 1.75 mm. longis apice rotundatis. *Stamina* 4; filamenta ad 14 mm. longa. *Ovarium* cylindricum, 0.75 mm. longum, 1.25 mm. diametro, apice tenuiter pubescens. *Stylus* 18.5 mm. longus, breviter bilobatus.

CHANTABURI. Krat, Kao Saming, under 50 m., evergreen forest, *Kerr* 17913 (type). Kaw Chang, Klawng Mayom, c. 50 m., evergreen forest by stream, *Kerr* 6810. East Coast, on high banks of stream below waterfall, *Mrs. D. J. Collins* 569. Kaw Chang, *Eryl Smith* 306.

Congea siamensis *Fletcher* [Verbenaceae-Symphorematae]; *C. tomentosae* Roxb. affinis, sed foliis minus pilosis, involucri bracteis basi crateriformibus differt.

Frutex scandens (ex *Kerr*); ramuli teretes, pilis longis articulatis glandulisque sucineis dense vestiti. *Folia* elliptica vel interdum oblongo-elliptica, apice acuta subacuminata, basi rotundata vel interdum cordata, 8-17 cm. longa, 3-7 cm. lata, coriacea, supra viridia vel brunneo-viridia et nitida, subtus pallidiora, supra parce glandulosa et pubescentia vel fere glabra, subtus pilis longiusculis sericeis articulatis praedita, ad costam nervosque laterales pilis patentibus haud numerosis munita, glandulis parvis brunneis sessilibus magis numerosis quam supra instructa, costa supra conspicua subtus prominente, nervis lateralibus 6-7-paribus supra conspicuis subtus prominulis parallelis, nervis transversis validis numerosis parallelis, margine integra ciliata, petiolo 0.5-1 cm. longo terete tomentoso suffulta. *Cymae* capitatae, 6-florae, in panicula terminali dispositae; pedunculi cymarum 1-1.5 cm. longi, pilis fulvis articulatis dense vestiti; bractee cuiusque capituli 3, utrinque pilosulae, plus minusve distincte nervatae, late spatulatae vel obovatae, 2-2.5 cm. longae, 0.75-1 cm. latae, basi in cupulam 4 mm. longam undique pilis longis rigidis praeditam connatae. *Calyx* extra pilis numerosis longis albido-sericeis articulatis vestitus; tubus 4.5 mm. longus, intus pilosulus; limbus 5-lobatus; lobi 1-1.5 mm. longi et lati, apice acuti. *Corolla* extra glabra; tubus 7 mm. longus, ad staminum insertionem hirsutus, ceterum glaber; limbus bilabiatus; labium posticum bilobatum, lobis spatulatis, 4-25 mm. longis 1.5 mm. latis, labium inferum deflexum, trilobatum, lobis 1-1.2 mm. longis basi 1.25-2 mm. latis apice rotundatis intus glabris. *Stamina* 4; filamenta 13-25 mm. longa. *Ovarium* cylindricum, 1.75 mm. longum, 0.9 mm. diametro, glabrum. *Stylus* 18 mm. longus, breviter bilobatus.

PRACHINBURI. Krabin, Ban Keng, c. 25 m., savannah, *Kerr* 1792 (type).

RACHABURI. Kanburi, Sisawat, c. 50 m., climbing on bamboo along river bank, *Kerr* 10166.

XXXIII—PLANTS NEW TO ASSAM: X* C. E. C. FISCHER.

The regions shown in brackets after the specific name are those from which the plant has been previously recorded.

***Viburnum atro-cyaneum* C. B. Clarke [Caprifoliaceae].**

(Mishmi Hills).

Naga Hills: Pulebudze, 2100 m., fls. April, *N. L. Bor* 2707.

This species is included here because the flowers appear not to have been previously described.

Cymes up to 3 cm. diam., crowded. *Calyx* very small, turbinate; lobes triangular-ovate, subacute. *Corolla* white, rotate, 4 mm. diam.; lobes broadly ovate, rounded, twice as long as the tube. *Ovary* broadly conical, 1-celled; style 0.

***Vernonia blanda* DC. [Compositae].**

(Burma).

Naga Hills: Saramati Ridge, 1800 m., fls. March, *N. L. Bor* 2928, "Climbing; flowers pink."

***Craibiodendron Henryi* W. W. Smith [Ericaceae].**

(W. China, Jaintea Hills).

Naga Hills: Pedi, 1800 m., fls. white, Sept., *N. L. Bor* 6271; Kekrima, 1650 m., frt. March., *N. L. Bor* 2828, "small tree." Jaintea Hills: near Jowai, *King's Collector* without number or date.

In Notes Roy. Bot. Gard. Edinb. 5, 159, W. W. Smith has tentatively named a specimen collected at Jowai by G. Mann as *C. Mannii*, but suggests that it may prove to be identical with *C. Henryi*. Bor's specimens show that this apprehension was correct; I can find no differences between the two. The description of *C. Henryi* states that the staminal filaments are glabrous, but I have found them minutely papillose to hispidulous near the apex in all specimens examined, which include the type numbers.

***Diospyros glandulosa* Lace [Ebenaceae].**

(Upper Burma).

Naga Hills: Kohima, 1410 m., fls. pink, April, *N. L. Bor* 2720, "a small tree."

***Jasminum dumicola* W. W. Smith [Oleaceae].**

(Yunnan).

Manipur: without precise locality or date, *G. Watt* 6197, 7384; Moa, 1650 m. fls. Nov., *C. B. Clarke* 41952 A & C. Naga Hills: Khizobama, 1950 m., fls. white, pink outside, March, *N. L. Bor* 2822; Saramati Ridge, 1800 m., flowers scented, March, *N. L. Bor* 2900. The first three sheets mentioned were identified by C. B. Clarke as "*J. attenuatum* Roxb. var.?" but they are certainly this species.

***Trachelospermum auritum* Schneid. [Apocynaceae].**

(Yunnan).

Manipur: Maofang, 1200 m., fls. May, *G. Watt* 7177, "an extensive climber covering trees with a show of white flowers"; Kangpokpi, 900 m., fls. yellowish-white, June, *N. L. Bor* 6376.

***Swertia Lacel Craib* [Gentianaceae].**

(N. Burma).

Naga Hills: Kekrima, 1500 m., in grass-land, fls. spotted with pale blue, Oct., *N. L. Bor* 6639.

***Cordia Clarkei* Brace ex Prain [Boraginaceae].**

(Chittagong).

Naga Hills: Khegwo, 1200 m., frt. March, *N. L. Bor* 2858, "a small tree"; Tizu, 900 m., fls. white, Nov., *N. L. Bor* 6799.

***Ehretia macrophylla* Wall. [Boraginaceae].**

(Nepal and W. China).

Naga Hills: Pulebudze, 1410 m., fls. white, sweet-scented, April *N. L. Bor* 2726.

***Lycopsis arvensis* Linn. [Boraginaceae].**

(Europe, Kashmir, Tibet).

Naga Hills: Japvo 2970 m., fls. bluish-purple, Sept., *N. L. Bor* 6507.

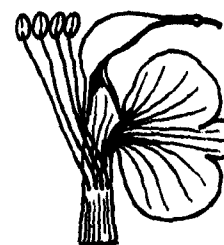
***Lindenbergia philippensis* Benth. [Scrophulariaceae].**

(Chittagong, Burma, Malaisia).

Naga Hills: Kerari, 750 m., fls. yellow, March, *N. L. Bor* 2879.

***Pedicularis curvipes* Hook. f. [Scrophulariaceae].**

This species is known only from fruiting specimens collected by C. B. Clarke in Sikkim and at Japvo in the Naga Hills and the flowers have hitherto remained undescribed. Dr. N. L. Bor, I.F.S., has obtained the flowers in the second of the above localities and the following description is from his specimen.



Pedicularis curvipes Hook. f. Corolla partly opened out, $\times 1.5$.

Calyx tubular-campanulate, slightly unequal at the base, 6.5 mm. long, mouth truncate in front with 2 teeth at the back 2.5 mm. long, triangular-ovate, the apex expanded in a lozenge shape, acute, pectinately toothed. *Corolla-tube* slender, 1.1 cm. long, glabrous; lip semicircular in outline, 1.3 cm. wide, 0.9 cm. long, 3-lobed, midlobe smaller than the other two, emarginate;

* Continued from K.B. 1937, 475.

galea 1.4–1.5 cm. long, inflated and bent at right angles a little below the middle, tapering to a horizontal, shortly 2-fid, lobulate beak. *Stamens* inserted 4.5 mm. above the base of the corolla-tube; filaments filiform, sparsely villous; anthers broadly elliptic oblong, obtuse, 2 mm. long, glabrous. *Ovary* ellipsoid, 2.5 mm. long; style slender, shortly exserted from the beak of the galea.

Naga Hills, Japvo, 2970 m., fls. Sept., *N. L. Bor* 6425.

***Eranthemum ciliatum* (Craib) R. Ben.** [Acanthaceae].
(Upper Burma).

Naga Hills: Tizu river bed, 750 m., fls. bluish-mauve, March, *N. L. Bor* 2939.

***Plectranthus scrophularioides* Wall.** [Labiatae].
(Kumaon to Sikkim).

Naga Hills: Kohima, 1500 m., fls. white, Sept., *N. L. Bor* 6514, "a straggling shrub."

***Pogostemon nigrescens* Dunn** [Labiatae].
(Yunnan).

Naga Hills: Zekwera, 1650 m., fls. magenta, Aug., *N. L. Bor* 6203.

***Mirabilis Jalapa* Linn.** [Nyctaginaceae].

(S. America—run wild in most countries, but not actually recorded from Assam).

Naga Hills: Kekrima, 1620 m., fls. magenta, June, *N. L. Bor* 4468, "gregarious in a nullah."

***Alseodaphne dumicola* W. W. Smith** [Lauraceae].
(W. China).

Naga Hills: Benroumi, 1800 m., fls. May, *N. L. Bor* 2662; Baimho, "all over the hills," 1500 m., frt. July, *N. L. Bor* 5082, "a very large and tall tree; excellent timber."

***Illigera villosa* C. B. Clarke** [Hernandiaceae].

Naga Hills: Chipoketami, 1500 m., fls. pink, July, *N. L. Bor* 5091; Kohima, 1500 m., fls. May, *N. L. Bor* 6366; "creeper; used as a febrifuge."

When he described this species from Kohima (Jour. Linn. Soc. 25, 22: 1889) C. B. Clarke had seen no flowers and he suggested that it might turn out to be merely a variety of *I. khasiana* C. B. Clarke. The flowers now available, however, show sufficient divergence to establish the plant as a good species. They are therefore described below. The species differs from *I. khasiana* C. B. Clarke by the following floral characters:

The flowers are in short corymbs and not in elongate cymes; the petals are broader in proportion; the stamens are much shorter, and shorter than the style, with papillose-glandular filaments; the staminodes are entire; the ovary and style are setose.

Petiole up to 9 cm. long. *Leaflets* up to 12 cm. long and 6.5 cm. wide. *Inflorescence* supra-axillary, corymbose, 2–3 cm. diam.;

peduncle 2–4 cm. long, pubescent, as are the branches and short pedicels; bracteoles ovate, obtuse, 1.5–3 mm. long, rather densely pubescent on both sides, ciliolate. *Calyx* campanulate, 9–10 mm. long, tube short, lobes ovate-oblong, acute or obtuse, 7–8 mm. long, 3–3.5 mm. wide, sparingly setose without, ciliolate. *Petals* ovate-oblong, obtuse, 6–6.5 mm. long, 3 mm. wide, puberulous on both sides, minutely ciliolate. *Staminodes* elliptic-oblong, obtuse, entire, concave, 3 mm. long, 1.5 mm. wide, narrowed at the base and almost stalked. *Stamens* 4 mm. long; filaments stout, papillose-glandular as are the connectives; anthers 2 mm. long; pollen granular. *Ovary* more or less quadrangular, 2.5–3.7 mm. long, densely hairy or setose; style slender 4.2 mm. long, setose.

***Euphorbia Maddeni* Boiss.** [Euphorbiaceae].
(W. Himalayas).

Naga Hills: Khonoma, 1500 m., frt. April, *N. L. Bor* 2735; "Very common in the village, growing on walls."

This may be more properly a variety with oblong seeds 1.3 mm. long, ashy-grey, obtusely 5-gonous, the sides pitted or the pits joined into grooves and black.

***Hedychium venustum* Wight** [Zingiberaceae].
(S. India, Sikkim).

Naga Hills: Kekrima, 1800–2100 m., fls. yellow, July, *N. L. Bor* 6317.

***Cirrhopetalum elatum* Hook. f.** [Orchidaceae].
(Sikkim Himalayas).

Naga Hills: Thekubama, 2160 m., fls. brown, June, *N. L. Bor* 4448.

***Cirrhopetalum Wallichii* Lindl.** [Orchidaceae].
(Nepal, Sikkim).

Naga Hills: Japvo, 2500 m. fls. Sept., *N. L. Bor* 6415.

***Calanthe biloba* Lindl.** [Orchidaceae].
(Nepal, Sikkim).

Naga Hills: Shiloi Jopi, 1800 m., fls. purple, Nov., *N. L. Bor* 6740.

***Gastrochilus pseudodistichus* (King et Pantl) Schltr.** [Orchidaceae].
(Sikkim).

Naga Hills: Paona, 1800 m., fls. banded brown, Sept., *N. L. Bor* 6278.

***Phyllomphax galeandra* (Rchb. f.) Schltr.** [Orchidaceae].
(W. Himalayas, Central India, China).

Naga Hills: Khizobama, 1500–1800 m., fls. July, *N. L. Bor* 5100.
"Lip broad, red. Stem eaten."

XXXIV—MISCELLANEOUS NOTES.

The Director.—The Director has been elected an Honorary Fellow of the Botanical Society of Edinburgh.

The Royal Horticultural Society Honorary Professorship.—Sir William Wright Smith, F.R.S.E., V.M.H., Regius Keeper of the Royal Botanic Garden, Edinburgh, has accepted the invitation of the Council of the Royal Horticultural Society to succeed the late Dr. A. B. Rendle as Honorary Professor of Botany to the Society.

Australian Agricultural Appointments.—We learn with interest that Prof. A. E. V. Richardson, Director of the Waite Agricultural Research Institute, and Waite Professor of Agriculture at the University of Adelaide, S. Australia, has been appointed Deputy Chief Executive Officer of the Commonwealth Council for Scientific and Industrial Research. Prof. Richardson has been succeeded by Prof. J. A. Prescott, Professor of Agricultural Chemistry at the Institute. For further information regarding these appointments, see the Journ. Austr. Inst. Agr. Sci. 4, 53 (1938), and Nature, April 30, 1938, p. 800.

STEPHEN TROYTE DUNN.—It is with great regret that we record the death at his home in Sheen on 18th April, 1938, of Mr. S. T. Dunn, who had been associated with Kew at intervals spread over a period of 30 years. Dunn was the second son of the late Rev. James Dunn and was born on the 28th August, 1868. He was a student at Merton College, Oxford, where he took a B.A. degree.

His association with Kew began in September 1898, when he was appointed Private Secretary to the Director, Sir W. T. Thiselton-Dyer. He remained in that post until March 1901, when he became Assistant for India in the Herbarium. In February 1903 he left Kew to take up the appointment of Superintendent of the Botanical and Forestry Department in Hong Kong. During his sojourn in Hong Kong he made two botanical expeditions into China, to Fokien and to Swatow, and obtained a good working knowledge of Chinese plants that stood him in good stead in later years. For private reasons he resigned his post in Hong Kong, and returned to England in 1910.

From 1913 to 1915 he acted as Official Guide in the Royal Botanic Gardens, Kew. During the later months of this period he also assisted the late Mr. J. S. Gamble in the preparation of the first part of the "Flora of the Presidency of Madras." He then went on a visit to America and on his return was re-appointed as Assistant for India in October 1919, a post he retained until January 1925. From that date until his retirement in 1928 he was Temporary Botanist in the Herbarium.

Besides a good deal of lesser work, mainly appearing in the pages of the Kew Bulletin, Dunn wrote the following books and articles:

"Flora of South-West Surrey" (1893); "Descriptions of New Chinese Plants" (Journ. Linn. Soc. 1903); "The Alien Flora of Britain" (1905); "Revision of the Genus *Illigera*" and "A botanical Expedition to Central Fokien" (Journ. Linn. Soc. 1908); "Revision of the Genus *Millettia*" (Journ. Linn. Soc. 1912); "Revision of the Genus *Actinidia*" and "A Supplementary List of Chinese Flowering Plants" (Journ. Linn. Soc. 1911); "Flora of Kwangtung and Hongkong" (with W. J. Tutcher, K.B., Add. Ser. 10, 1912); "Notes on Chinese Labiatae" (Notes Bot. Gard. Edin. 1913); "A key to the Labiatae of China" (Notes Bot. Gard. Edin. 1915). He was elected a Fellow of the Linnean Society in 1895, and was also a Fellow of the Royal Geographical Society.

Dunn's was a particularly self-effacing character, but he was quick to recognise merit in others. One could not come into contact with him without realising his essential kindness and his fortitude. He will always be remembered by his associates with affection.

C. E. C. FISCHER.

Two new names in *Aglala*.—(1) *Aglala triplex* Ridley, nom. nov.—I find that *A. trimera* Ridley in K.B. 1930, 368, is anticipated by *A. trimera* Merrill in Univ. Calif. Publ. Bot. 15, 128 (1929). I therefore substitute the above name for my species. (2) *Aglala triandra* Ridley, nom. nov.—I propose to substitute this name for *A. unifoliolata* Ridley in Kew Bull. 1930, 369, as the latter name is already occupied for a plant from Celebes described by Valetton in Meded. 's Lands Plantent. 19, 635 (1898). *A. triandra* Ridley was collected near Kuching in Sarawak by Haviland (No. 2849 (type) and also 1745).

H. N. RIDLEY.

Sixty Years of Botany.*—Botanists and many others interested in the history of Botany in this country are greatly indebted to Professor F. O. Bower for his delightfully written "Sixty Years of Botany in Britain." It is a sad reflection that he is almost the only botanist still with us who has been an eye witness, and has taken so large a share in many of the changes which were brought about, especially during the first twenty of the sixty years under review. It will no doubt be a surprise to the present generation of botanists to learn that the awakening of an interest in natural sciences was due not to the Universities of Oxford, Cambridge or Edinburgh, where Botany—except on the dreariest of systematic lines—was in a moribund condition, but to the introduction of teaching in natural science in the National or Elementary Schools throughout the country.

Since there were no teachers competent for the task, the Normal School of Science was founded at South Kensington with Prof.

* "Sixty Years of Botany in Britain (1875-1935). Impressions of an Eye-Witness." By F. O. Bower, Sc.D., LL.D., F.R.S. Macmillan & Co. Ltd., London. 1938. Pp. vii + 112. With frontispiece and 13 other illustrations. Price 10s. 6d.

T. H. Huxley as Dean, and it was to his stimulus and to the band of keen young botanists—Thiselton-Dyer, Vines and Bower—who applied Huxley's practical methods to the teaching of Botany that the renaissance of Botany as a living science in this country is mainly due. Henry Marshall Ward was one of the earliest students at the Normal School of Science who took the courses of Botany for teachers which were being given by Thiselton-Dyer in 1875, when Vines was one of the Demonstrators.

It is little to be wondered at that while Botany at the Universities was in a condition of "academic petrification of an earlier school," the younger generation, who had been inspired by the writings of Hofmeister, Sachs and de Bary, should go to Germany and work in Sachs' laboratory at Würzburg or under de Bary at Strassburg.

Here then were to be found at one time or another Vines, Walter Gardiner, Bower, Francis Darwin, Bayley Balfour, Marshall Ward and D. H. Scott, working alongside such subsequent leaders as Errera, Klebs, Solms-Laubach, Elfving, Schimper and other well-known European botanists.

Bower in his 'Wanderjahre' chapter (IV) gives an interesting picture of work in the laboratories at Würzburg and Strassburg, from which the leaven was brought back to enlighten the darkness brooding over botany in the home Universities.

Thiselton-Dyer, who was so largely responsible for the re-birth of botany as a living science, both by his teaching at South Kensington and by his share in translating the first edition of Sachs' Text Book of Botany, never had the opportunity of working on the Continent. His influence on so many botanists slightly his junior is therefore all the more remarkable, just as was his extraordinary knowledge of the Botany of the Empire and his insight into the problems of Empire development on scientific lines, when he had never travelled outside Europe.

Of all that remarkable set of young botanists who spread the botanical Gospel some sixty years ago, Thiselton-Dyer is perhaps not only the most outstanding figure, but also the one whose attainments and influence have never received their proper appreciation.

The story of the part that Kew and especially the Jodrell Laboratory played in the awakening of Botany is of particular interest, when Bower, Gardiner and Scott were working together in the room now used by the Keeper, with Thiselton-Dyer near at hand and in close touch with all that was in progress. It is pleasant to think of D. H. Scott riding over every day from his home at Bromley across Richmond Park to work in the Jodrell!

To most readers, Chapters VII, VIII, IX and X will be of the greatest interest, because of the admirable character-sketches—accompanied with portraits—of the principal pioneers in the reform of scientific botanical teaching.

Huxley, Thiselton-Dyer, Vines, Marshall Ward, Bayley Balfour, and the foundation of the Annals of Botany, Scott, Gardiner,

Williamson, Daniel and F. W. Oliver, Kidston, Gwynne-Vaughan and Francis Darwin, are all depicted in a masterly manner, and live again before one as one reads the sympathetic and illuminating account of their work.

The book includes a chapter (XI) entitled "The Morphological Kaleidoscope" which gives a comprehensive Sketch of the changes of outlook on the vegetation of the land during the period since 1875, a valuable summary, though as the author points out it is written in a more technical manner and therefore suffers somewhat in comparison with the easy flowing style of the preceding chapters.

In the concluding chapter, "Past—Present—Future," the author's aim is to place the events he has chronicled "in relation to the broad stream of scientific progress, and to touch upon the secondary effects by which botanical science now impinges in increasing degree upon modern life; expanding its amenities, and tending ever more effectively to supply its needs." The chapter forms a valuable summary of the various trends of botanical study and research and its many ramifications at the present day.

A. W. H.

Critica Botanica.*—The late Sir Arthur Hort's scholarly translation of the *Critica Botanica* makes accessible for the first time to those who are not Latin scholars the views on botanical nomenclature held by Linnaeus in 1737. An outline of these views had been published by Linnaeus in his *Fundamenta Botanica* (1736), §§210–324, in a series of aphorisms grouped under the headings *Nomina*, *Differentiae*, *Varietates* and *Synonyma*, dealing respectively with generic, specific and varietal names, and synonyms. The *Critica Botanica* explains the aphorisms and illustrates them by many examples.

While writing his *Hortus Cliffortianus* and *Genera Plantarum* Linnaeus had found plant nomenclature to be in urgent need of reform, and had introduced many name-changes which he subsequently justified in the *Critica*. To him, the origin and form of a name was all-important. No barbarous or hybrid names could be allowed, and no generic names ending in -oides or composed of two separate words. Classical names of plants were the best, and if any such were found to be superfluous for the genera to which they were originally applied in the classics, they could be used for genera unknown to the ancients.

In considering his views on specific names it should be remembered that the phrase-names then current were primarily *specific diagnoses* and only secondarily *names*. Hence he condemned the inclusion of the name of the discoverer or of the country of

* The "*Critica Botanica*" of Linnaeus. Translated by the late Sir Arthur Hort, revised by Miss M. L. Green, with an Introduction by Sir Arthur W. Hill. London, Bernard Quaritch, printed for the Ray Society, 1938. Pp. xxvii + 239. Price 12s. 6d.

origin or habitat in the specific name, as these afforded no diagnostic characters. Similarly, the use of comparatives and superlatives was ruled out. But when Linnaeus introduced binary specific names for common use (*nomina trivialia*), in 1753, these objections disappeared, as these names were used only for reference and not for determination. Thus in 1753 we find names such as *Erica Plukenetii*, *Genista anglica*, *Stachys palustris*, *Plantago major*, *Anthemis altissima*, which he would have excluded in 1737.

To the general botanist perhaps the most interesting part of the book is the chapter on specific names, since it includes estimates of the relative constancy of different characters. Linnaeus considered the number, shape, position and proportion of the various parts as of primary importance. Leaves afforded the most natural diagnostic characters, and the *fulcra* (i.e., bract, tendril, spine, prickle, petiole, peduncle, scape, stipule and gland) were also useful for discriminating species.

The thanks of botanists are due to the Ray Society for the publication of this translation of a classic work on plant-nomenclature.

Report on the Hluhluwe Game Reserve, Zululand.*—In 1936 Dr. J. S. Henkel, late of the South African Forestry Service, was invited by the Provincial Executive Committee of Natal to carry out an ecological investigation of this reserve embracing both plants and animals and with special reference to tsetse flies.

The Hluhluwe Game Reserve was established in 1887, and is an unfenced area of Crown land of nearly 40,000 acres situated in Zululand, in approximately latitude 28°S. and longitude 32°E. It is controlled by the Natal Provincial Government for preserving and maintaining the indigenous species of game, and is thus also a national asset of great value for the preservation of the flora, the existing vegetation being for the most part *primaeval*.

Comprehensive accounts of the area are given dealing with the topography, drainage, soils and climate. An important factor is the wind, which exercises a considerable influence on the vegetation and its associated animals. The highest recorded temperature during two years' observations at Empangeni (210 ft. altitude) was 106°F., in October, the lowest 39°F., in June, and at Hlabisa (1,864 ft. altitude) a maximum of 105° in January, and a minimum of 42°F. in June.

The rainfall is somewhat irregular, the summer months being the wettest. Years of low rainfall sometimes occur. In 1935 the vegetation was seriously affected, many trees and shrubs having died or lost their crowns. Recurring periods of this kind are reflected

* J. S. Henkel, D.Sc., Report on the Plant and Animal Ecology of the Hluhluwe Game Reserve, with special reference to Tsetse Flies. Pp. 38, with 13 plates of photographs and a map.—The Natal Witness, Ltd., Pietermaritzburg, 1937.

in the woody plants of the lowlands, usually of short stature with bushy rounded crowns.

A detailed account of the plant-communities is given, these falling under three distinct zones which are shown on a large-scale coloured map.

There are two species of tsetse fly in the Reserve, and the report shows that definite physical, climatic and vegetative features, as well as soil conditions, are essential for the continued existence of both species. Control measures are dealt with and methods suggested for the elimination of breeding places by altering shade and soil conditions.

Dr. Henkel's studies indicate that tsetse flies are confined in Zululand to definite localities of limited area, mainly sandy alluvial soils, from which, during favourable seasons, they spread into surrounding areas, and that if these true breeding places are eliminated or rendered unfavourable for the development of larvae and pupae, the flies can be exterminated.

The report is a very valuable piece of botanical and zoological research, and provides most interesting reading.

J. HUTCHINSON.

La Mortola Garden*.—A new edition of the "*Hortus Mortolensis*" has long been desired and Lady Hanbury's book "*La Mortola Garden*," which contains a list of the plants in cultivation in this famous Riviera garden, is therefore a welcome publication.

The book, however, is far more than a mere list of plants, since it consists of a Foreword of 4 pages, 7 pages devoted to obituary notices of the late Sir Cecil Hanbury—of whom the book is a worthy memorial—and 44 pages of introduction written by Lady Hanbury, in which much interesting information is given of the history of the garden and the many alterations that have been made during recent years.

The "*Hortus*" proper occupies 138 pages in double column, the plants being arranged alphabetically according to the genera, the family being given after each genus. References are included to Botanical Magazine and other good figures, and also, where no figures exist, to accessible descriptions. Most of the books referred to are in the La Mortola Garden Library.

The usefulness of the list is enhanced by recording with an appropriate symbol whether the plants are annuals, biennials, shrubs or trees, or climbing plants. Indigenous plants are also distinguished.

* "*La Mortola Garden: Hortus Mortolensis*, being an illustrated catalogue of the plants cultivated in the garden of Sir Cecil Hanbury, Kt., . . . at La Mortola, Ventimiglia, Italy". Compiled with the assistance of Sig. Ercoli Mario, Curator, Cav. Lorenzi Maurizio, Secretary. With an Introduction by Lady Hanbury, O.B.E. London, Oxford University Press, Humphrey Milford, 1938. Pp. lxvi + 158. Pl. 62. Price 28s.

Following the plant lists come 20 pages of Garden Notes by Lady Hanbury and 58 charming pictures of the garden and of special plants in cultivation. Two graphs showing seed-distribution and rainfall in the year 1900-1936 and plans of the garden in 1914 and 1937 complete this handsome volume and indicate the changes effected in recent years by Sir Cecil and Lady Hanbury which have added so greatly to the aesthetic beauty of the garden.

The garden is especially rich in the collection of *Cacti* and South African succulent plants, the *Mesembryanthemums* and allied genera and *Aloes* being very well represented. South African bulbous plants, as may be expected, flourish in the garden and add greatly to its beauty and interest. The collection of *Citrus*, which are referred to on p. 42 as "*Agrumi*," a word which may puzzle many readers, is of particular interest and dates from the early days of the garden when Sir Thomas and his brother Daniel laid the foundations and established the botanical character of La Mortola.

The story of the acquisition and development of the site by Sir Thomas Hanbury, as recorded both by the late Sir Cecil Hanbury in the opening pages, and by Lady Hanbury in the Introduction, is of great interest and one learns how much the scientific interest of the garden, which happily is still maintained, was due to the collaboration of Daniel Hanbury, who was a keen botanist, with his younger brother Sir Thomas.

Sir Cecil fully maintained the botanical interest and value of the garden and it was mainly after his marriage that so much was done to enhance its beauty. It is to be hoped that the exchange arrangement of student gardeners with Kew may long be continued for the benefit of both Institutions.

The earliest catalogue of the plants in cultivation was published in 1889 and the last, the "*Hortus Mortolensis*," in 1912. Many losses have been incurred during the past 25 years, while many interesting additions have been made. It is to be hoped that the publication of this new list will ensure the survival of so many of the plants for which La Mortola is justly famous.

**BULLETIN OF MISCELLANEOUS
INFORMATION** No. 6 1938
ROYAL BOTANIC GARDENS, KEW

**XXXV—ADDITIONS TO THE FLORA OF BORNEO AND
OTHER MALAY ISLANDS: IX.*** H. N. RIDLEY.

MALVACEAE.

***Sida retusa* Linn.**

DUTCH S. E. BORNEO. Banjarmasin, Motley 804.
BRIT. N. BORNEO. Papan, Motley.

***Abutilon graveolens* Wight var. *hirtum* Mast.**

BRIT. N. BORNEO. Lahat Datu, Creagh.

***Wissadula periplocifolia* Thw.**

DUTCH S. E. BORNEO. Banjarmasin, Motley 293.

***Urena lobata* Linn.**

Besides the common form, the variety *scabriuscula* DC. occurs at Sandakan, Elmer 20524, and the variety *tomentosa* Bl. on the Sarawak River, Haviland 31.

***Hibiscus radiatus* Cav.**

BRIT. N. BORNEO. Labuan, Burbidge.

BOMBACACEAE.

***Durio cupreus* Ridley, sp. nov., a *D. lanceolato* Mast., cui affinis, foliis valde coriaceis ovatis acuminatis cuspidatis, nervis ferme omnino occultis differt.**

Arbor, cortice rugoso, ramis superne angulatis lepidotis. *Folia* ovata, cuspidata, basi leviter attenuata, obtusa, 8.5–10.5 cm. longa, 4–6 cm. lata, coriacea, supra laevia, nervis occultis, subtus cuprea, densissime lepidota, costa elevata, nervis inconspicuis circiter 12-paribus; petioli 1.2–1.5 cm. longi. *Flores* in ligno vetustiore fasciculatim congesti, 8 in panicula 1 cm. longa, pedunculis crassis lepidotis 1 cm. longis. *Calyx* urniformis, lepidotus, margine obscure lobatus, haud fissus, 1.5 cm. longus. *Petala* extra pilis stellatis tecta, intus glabra. *Staminum* filamenta omnia libera.

SARAWAK. Three miles from Kuching, Haviland 1803.

This species is quite distinct from any other in its ovate cuspidate-acuminate leaves, very coriaceous with the nerves almost completely invisible. In the free stamens it is most nearly allied to *D. lanceolatus* Mast. The only advanced bud which I have seen was not fully developed.

* Continued from K.B. 1938, 176.

STERCULIACEAE.

Sterculia Scortechinii King.

SARAWAK. Two and a half miles from Kuching, *Haviland* 920.

Sterculia bicolor Mast.

SARAWAK. Kuching, *Haviland* 961: "A small tree, flowers pale green." Kuching, *Haviland & Hose* 3405: "Leaves pale below, flowers pink at base inside, hairs on outside pink."

Sterculia luzonica Warb.

A fruiting specimen apparently of this Philippine plant was obtained by *Creagh* at Mabul, East Coast, BRIT. N. BORNEO.

Sterculia subpeltata Bl. var. velutina Ridley, var. nov., a typo differt foliis subtus et petiolis et inflorescentia dense rufo-velutinis.

SARAWAK. Miri, *Hose* 657; Baram, *Hose* 97.

This quite resembles the Javanese and Sumatran plant except for its much denser red indumentum.

Sterculia laevis Wall.

SARAWAK. Kuching, *Haviland* 1621; 1763.

BRIT. N. BORNEO. Sandakan, *Creagh*.

These seem to be identical with the common Malay plant and form a new record.

Sterculia Hewittii Ridley, sp. nov., a *S. laevi* Wall., cui affinis, floribus minoribus, foliis anguste lanceolatis acuminatis differt.

Frutex parvus, glaber. *Folia* lanceolata, acuminata, basi obtusa, chartaceo-coriacea, glabra, 9-17 cm. longa, 3-5 cm. lata, nervis subtus elevatis 7-10-paribus intra margines inarcuantibus; petioli graciles, apice et basi incrassati, 1.5-2.7 cm. longi. *Paniculae* multiflorae, laxae, 7-12 cm. longae, pedicellis gracilibus 2 mm. longis pubescentibus. *Bractae* lanceolatae, acuminatae, 3 mm. longae. *Flores masculi*: *Calyx* globosus, cupulatus, hirtus, 4 mm. longus, lobis linearibus hirtis 4 mm. longis. *Androecii* stipes brevis, crassus, apice deflexus, antheris 5 oblongis curvis. *Flores feminei* non visi. *Folliculi* lanceolati, apicibus curvis, velutini, 6 cm. longi, 3-5 cm. lati. *Semina* 4, subglobosa.

SARAWAK. Baram, *Haviland & Hose* 3738; *Hewitt* (type).

DUTCH BORNEO. Banjarmasin, *Motley* 1033: "Small shrub, flowers greenish."

Allied to *S. laevis* Wall., but very distinct in its narrow stiff leaves with numerous nerves.

Sterculia rhoidifolia Stapf mss., descr. Ridley, sp. nov., a *S. rhynchophylla* K. Schum. foliis rigidis obovatis paucinerviis, floribus majoribus urceolatis differt.

Arbor parva. *Perulae* lanceolatae, acuminatae, hirtae, 4 mm. longae. *Folia* in apicibus ramorum congesta, obovata, obtusa, basi acuminata, 8-9 cm. longa, 4-4.5 cm. lata, coriacea, supra laevia, subtus glabra, nervis tenuibus 5-paribus, nervulis paucis,

reticulationibus minutis; petioli 1.5-2 cm. longi. *Paniculi* plures, in axillis terminalibus, graciles, parce furfuraceae, 10-11 cm. longae, ramis 2 cm. longis. *Pedicelli* graciles, 5 mm. longi. *Flores masculi*: *Calyx* urceolatus, glaber, 5 mm. longus, lobis 5 linearibus incurvis hirtis 7 mm. longis. *Androecii* stipes crassus, conicus, antheris 10 minutis. *Flores feminei* non visi. *Folliculi* 5, subglobosi, tomentosi, 4 cm. longi, 4 cm. lati. *Semina* oblonga, nigra, 1-5 cm. longa.

SARAWAK. Kuching, pedicels and calyx reddish, *Haviland* 2123 (type), 2124; Baram, *Hose* 104.

I know nothing very closely allied to this species: its stiff obovate leaves in a terminal tuft with the many-flowered panicles make it different from any other species. It has somewhat the habit of *S. rhynchophylla* K. Schum., but in details it is quite diverse.

Sterculia arachnifera Ridley, sp. nov., a *S. gracili* Korth., cui affinis, foliis lanceolatis nervis pluribus et foliorum petiolis et floribus hirtis differt.

Frutex, ramulis junioribus rufo-hirtis. *Perulae* ovatae, breves, rufo-hirtae. *Folia* lanceolata, acuminata, cuspidata, basi obtusa, chartacea, supra glabra, subtus pilis stellatis paucis dissitis tecta, 10-12 cm. longa, 2.8-5 cm. lata, nervis subtus elevatis 6-7-paribus intra margines inarcuantibus; petioli graciles, rufo-hirti, 2.5-3 cm. longi. *Panicula* racemiformis, gracilis, hirta, ramis brevibus, 22 cm. longa, pedicellis 2 mm. longis. *Flos masculus*: *Calyx* tubulosus, hirtus, 1 cm. longus, 3 mm. latus, lobis linearibus 8 mm. longis hirtis angustissimis. *Androecii* stipes gracilis, antheris 5 minutis globosis subliberis. *Flos femineus*: *Ovarium* globosum, hirtum. *Styli* 2, recurvi, stigmatibus capitatis, gynophoro brevi glabro.

SUMATRA. East Coast, Asahan, Bandar Puluh, *H. S. Yates* 2142.

This has the tubular flowers of *S. gracilis* Korth., but the leaves are entirely different in shape and the whole plant is more or less hairy.

Sterculia pallidiflora Ridley, sp. nov., a *S. gracili* Korth., cui affinis, calyce tubuloso glabro albo, lobis brevioribus latioribus differt.

Frutex glaber, panicula excepta. *Folia* lanceolata vel oblongo-lanceolata cuspidata, cuspidate 2 cm. longo acuto basi subacuto, chartacea, sicca pallida, 12-20 cm. longa, 4-10 cm. lata, nervis subtus elevatis, uno pare basali, 6 paribus e costa ortis; petioli 3-7 cm. longi. *Panicula* rufo-hirta, 15 cm. longa, ramis 2 cm. longis. *Flores* albi. *Calyx* tubulosus, basin versus attenuatus, parce rufo-hirtus, 12 mm. longus, lobis linearibus obtusis 3 mm. longis, marginibus albo-hirtis. *Androecium* breve, stipite brevissimo conico, antheris minimis oblongis rectis.

SARAWAK. Forests on the slope of Mt. Matang, *Ridley* 12558: "Shrub, flowers white."

This plant, of which I only found a single specimen, belongs to the group of *S. gracilis* Korth., the tube of the calyx being much longer than broad. The lobes are remarkably short in proportion and broader than usual.

***Sterculia campaniflora* Ridley**, sp. nov., a *S. gracili* Korth., cui affinis, foliis oblongis vel ellipticis majoribus, calycis tubo latiore obconico-tubuloso differt.

Frutex glaber. *Folia* oblonga vel elliptica, cuspidata, basi obtusa, 10-20 cm. longa, 6-8-7.5 mm. lata, chartacea, glabra, nervis utrinque elevatis tenuibus intra margines arcuatis 9-12-paribus, nervulis irregularibus anastomosantibus; petioli graciles, apice incrassati, 1 cm. longi. *Paniculae* laxae, graciles, 15 cm. longae, ramis dissitis 3 cm. longis, ramulis apicalibus 5 mm. longis parce puberulis. *Pedicelli* graciles, 3 ad 5 mm. longi. *Calyx* obconico-tubulosus, parce hirtus, 7 mm. longus, lobis linearibus aequilongis hirtis. *Androecium* breviter graciliter stipitatum, antheris 5 oblongis parvis in capitulo erecto dispositis.

SARAWAK. Baram, at Entoyut, *Hose* 450 (type).

BRUNEI. Limbang, *Haviland* 734.

DUTCH BORNEO. Banjarmasin, *Molley* 948: "Shrub. Flowers whitish."

The tube of the calyx is longer than usual and in this it approaches *S. gracilis* Korth., but it is much wider and more obconic in outline. The inflorescence is usually a more spreading panicle and the leaves are elliptic-oblong.

***Sterculia cuspidella* Ridley**, sp. nov., a *S. rhynchophylla* K. Schum., cui affinis, foliis oblongis, basi late rotundata, cuspidate brevior, nervis paucioribus, floribus majoribus et glabrioribus differt.

Arbor, ramulis dense rufo-hirtis. *Folia* oblonga, cuspidata, basi rotundata, 6-5 cm. longa, 5-5 cm. lata, supra glabra, juniora subtus rufo-hirta, adulta costa excepta glabra, nervis 4-paribus tenuibus subtus elevatis intra margines arcuantibus, secundariis paucis, nervulis transversis paucis remotis, reticulationibus laxis; petioli graciles, apicibus incrassatis hirtis, 2.5 cm. longi. *Panicula* gracilis, pubescens, 11-5-18 cm. longa, ramis brevibus 1-1.5 cm. longis remotis paucifloris. *Pedicelli* graciles, pubescentes, 8 mm. longi. *Flores masculi*: *Calyx* cupuliformis, pubescens, 4 mm. longus, lobis linearibus hirtis 5 mm. longis. *Androecii* stipes gracilis, antheris 5 oblongis incurvis, capitulo decurvo. *Flores feminei* et fructus non visi.

SARAWAK. Near Kuching, *Haviland* & *Hose* 3404 (type); Baram, *Hose* 574; Miri, *Hose* 614.

***Sterculia borneensis* Ridley**, sp. nov., a *S. javanica* Bl., cui affinis, foliis subtus pallide tomentosis nec hirtis, calycis lobis elongatis linearibus hirtis incurvis, floribus majoribus differt.

Arbor parva, ramulis rufo-pubescentibus. *Perulae* lanceolatae, acuminatae, rufo-hirtae. *Folia* ovato-oblonga, apice breviter acuta

vel rotundata, basi truncata vel subcordata, 14-31 cm. longa, 8-5-15 cm. lata, supra glabra, subtus pallide velutina, nervis 8-paribus subtus elevatis, nervulis transversis copiosis parallelis elevatis, reticulationibus obscuris; petioli apice incrassati, rufo-velutini, 5 cm. longi. *Panicula mascula* laxa, ramis 14 cm. longis, dense velutino-hirtis, ramulis dissitis 2 cm. longis, pedicellis 7 mm. longis. *Calyx* obconicus, pubescens, lobis linearibus incurvis 4 mm. longis, margine longe albo-hirtis. *Androecium* stipite gracili praeditum, antheris 5 oblongis in capitulo decurvo. *Flores feminei* non visi. *Folliculi* oblongi, sublignosi, 12 cm. longi. *Semina* oblonga, atra, 2 cm. longa, 1 cm. crassa.

SARAWAK. Near Kuching, small tree, *Haviland* 735.

This is allied to *S. macrophylla* Vent. and *S. javanica* Bl., but differs totally from both in the linear calyx-lobes incurved and long-hairy on the edges, and in the much larger fruit.

***Tarrietia albiflora* Ridley**, sp. nov., a *T. Curtisi* King, cui affinis, foliolis tribus glabris, floribus majoribus differt.

Arbor magna, ramorum apicibus cum perulis rufo-hirtis. *Folia* triphylla, glabra; foliola subaequalia, lanceolato-elliptica, obtusa vel obtuse acuminata, basi attenuata, 8-5-10 cm. longa, 4 cm. lata, coriacea, nervis 8-10-paribus tenuibus subtus elevatis, petiolulis 1-1.5 cm. longis; petioli 7 cm. longi. *Paniculae* ex axillis summis ortae, multiflorae, pilis stellatis dense tectae, 12-13 cm. longae, ramis 1 cm. longis. *Pedicelli* molliter hirti, 3 mm. longi. *Flores masculi*: *Calyx* campanulatus, extra et intus dense molliter hirtus, albus, usque ad trientem lobatus, lobis 5 oblongis acutis. *Androecii* stipes gracilis, brevis, glaber, e pulvino hirtus exortus, antheris minutis 5 in capitulo. *Flores feminei*: *Carpella* 5, semi-ellipsoidea, ferme libera, superne hirta, stigmatibus brevibus recurvis, antheris abortivis ad basin 5.

SARAWAK. Near Kuching, *Haviland* 2262: "Large tree, flowers white, badly scented."

This tree is very distinct in its large flowers and trifoliate leaves.

BUETTNERIACEAE.

***Buettneria scabrada* Ridley**, sp. nov., a *B. angulata* Hassk., cui affinis, floribus pluribus dense paniculatis, petalis multo brevioribus et cum ramis scabridis, processibus pubescentibus differt.

Frutex scandens, scabridus, processibus pubescentibus tectus. *Folia* ovato-rotundata, cordata, cuspidata, cuspidate obtusa 1 cm. longa, 9-13 cm. longa, 8-13 cm. lata, chartacea, nervis 10-paribus subtus in axillis fasciculis pilorum instructis elevatis subscabridis, nervulis transversis copiosis parallelis; petioli scabridi, 6-7 cm. longi. *Panicula* axillaris, valde scabrada, densa, multiflora, 6-11 cm. longa, ramulis velutinis. *Pedicelli* 1 mm. longi, velutini. *Flores* 2 mm. longi, alabastris conicis. *Sepala* 4, triangularia, extra et intus pubescentia. *Petala* 5, basi oblongo-truncata, superne spathulato-

lanceolata. *Stamina* 5, minutissima. *Ovarium* subrotundum, glabrum. *Stylus* brevis, stigmatе bilobo. *Capsula* globosa, 2 cm. diametro, processibus conicis acutis 3 mm. longis tecta.

SARAWAK. Rejang, Sibul, *Haviland* 2831, 2866 (type).

This much resembles *B. angulata* Hassk., of Java, but differs in the more numerous flowers, shorter petals and smaller fruit with conic thorn-like not acicular armature. The scabridity of the stem and petals is peculiar, consisting of innumerable short cylindric, blunt, pubescent processes.

TILIACEAE.

Brownlowia glabrata Stapf mss., descr. Ridley, sp. nov., a *B. Havilandii* Stapf, cui affinis, floribus majoribus, foliis haud peltatis squamatis differt.

Arbor parva, ramis glabris. *Folia* ovato-lanceolata vel ovato-oblonga, obtusa, basi rotundata subtruncata, coriacea, supra squamis denticulatis subtus squamis argenteis integris undique tecta, 11-20 cm. longa, 8-10.5 cm. lata, nervis subtus elevatis, basalibus 2-paribus, lateralibus e costa ortis 3-paribus, nervulis transversis parallelis undulatis reticulationibus parvis; petioli 6-9 cm. longi, apicibus incrassatis, squamati. *Panicula* laxa, elongata, 30 cm. longa, ramis squamatis 15 cm. longis, ramulis paucis remotis 5 cm. longis. *Flores* subumbellati, pedicellis squamatis 5 mm. longis. *Calyx* urceolatus, lobis 5 triangularibus acutis squamatis, 6 mm. longus. *Petala* alba, oblanceolata, integra, obtusa, 1 cm. longa, 4 mm. lata. *Stamina* multa, 7 mm. longa. *Ovarium* subglobosum, hirtum. *Stylus* elongatus, superne attenuatus.

SARAWAK. Mt. Buan, limestone, *Haviland* 1996 (type) and near Busau, *Haviland* "1996": "Small tree, petals white."

This beautiful large-flowered species resembles *B. Havilandii* Stapf, but the flowers are bigger and the leaves not peltate.

I have retained Stapf's ms. name for this plant, though it is hardly glabrous, being densely covered with silvery scales except on the upper side of the young leaves which bear numerous star-shaped scale-like bodies with many processes.

Brownlowia riparia Ridley, sp. nov., a *B. elata* Roxb., cui affinis, foliis lanceolato-ovatis, floribus minoribus in paniculis brevibus densis e ligno vetustiore ortis, calyce brevi lato basi truncato differt.

Arbor glabra. *Folia* lanceolato-ovata, cordata, acuminata, 15-21 cm. longa, 6-13 cm. lata, coriacea, glabra, esquamata, subtus pallida, nervis basalibus 4-paribus, lateralibus e costa ortis 4-paribus subtus elevatis, nervulis transversis parallelis saepe flexuosis 1 cm. distantibus; petioli apicibus incrassati, 9.5 cm. longi. *Paniculae* e ramis vetustioribus ortae, 9 cm. longae, densae, multiflorae. *Calyx* urceolatus, brevis, puberulus, basi truncatus, lobis 5 acutis. *Petala* lineari-oblonga, obtusa. *Stamina* copiosa, stylo breviora. *Staminodia* linearia, acuminata. *Ovarium* puberulum, globosum, 5-lobum. *Stylus* longus, basi crassus, superne attenuatus.

SARAWAK. Near Kuching, tidal river bank, *Haviland* 1674.

Perhaps as near *B. elata* Roxb., of Chittagong, as any species, but the leaves are more lanceolate, the flowers smaller and the calyx short, broad and flat at the base, and the panicles borne on the old wood.

Brownlowia elliptica Ridley, sp. nov., a *B. tabulari* Pierre, cui affinis, foliis ellipticis, nervis paucioribus supra depressis subtus elevatis, nervulis transversis paucis conspicuis, panicula longiore gracili differt.

Arbor glabra. *Folia* elliptico-lanceolata, basi acuminata, obtusa, coriacea, glabra, superne polita, 14-20 cm. longa, 5.5-10 cm. lata, nervis subtus elevatis, basalibus 1-paribus, lateralibus e costa ortis 4-paribus curvis, nervulis transversis paucis 5 mm.-1 cm. distantibus parallelis subtus elevatis supra depressis; petioli 2-5 cm. longi, superne incrassati. *Panicula* elongata, laxa, valida, furfuraceo-squamosa, 30 cm. longa. *Flores* 2-3 in ramis brevibus oppositis 2 mm. longis. *Pedicelli* 2 mm. longi, squamosi. *Calyx* campanulatus, lobis 5 brevibus acutis, 4 mm. longus, squamatus. *Petala* oblonga, basi paullo angustata, obtusa. *Stamina* copiosa, dimidio petalorum aequilonga. *Ovarii* carpidia 5, ovoidea vel elliptica, hirta, sublibera. *Stylus* elongatus, petalis brevior, apice decurvus, stigmatе minuto.

SARAWAK. Baram, *Haviland & Hose* 3739: "Single specimen."

This plant differs from all known species in the large elliptic leaves narrowed to the base with strongly elevated nerves. The carpels of the ovary are so slightly attached together that they separate at a touch. It seems to be most closely allied to *B. tabularis* Pierre, of Annam.

Brownlowia Riedelii Hemsl.

SARAWAK. Tidal river bank, *Haviland* 1640.

A new record for Borneo.

Pentace cordifolia Ridley, sp. nov., a *P. Curtisii* King, cui affinis, foliis cordatis, nervis pluribus, calyce campanulato lobis brevioribus differt.

Arbor, ramis juvenilibus furfuraceis. *Folia* elliptica, cordata, obtusa vel apice rotundata, coriacea, subtus pallida, 12-14 cm. longa, 6.6-8.4 cm. lata, nervis basalibus 3-paribus, lateralibus e costa ortis 3-paribus subtus elevatis, nervulis transversis parallelis 5 mm. distantibus elevatis, reticulationibus laxis; petioli 3.5 cm. longi, apice incrassati. *Panicula* terminalis, laxa, validula, 28 cm. longa, ramis 7-10 cm. longis crassiusculis furfuraceis. *Flores* 1-3 in ramulis 5 mm. longis. *Pedicelli* 4 mm. longi. *Calyx* campanulatus, lobis 5 triangularibus acutis brevibus furfuraceis 3 mm. latis. *Petala* longiora, oblonga, abrupte unguiculata, apicibus rotundatis glabris. *Stamina* breviora, copiosa. *Staminodia* pauca. *Ovarium* conicum, 5-costatum, hirtum. *Stylus* superne glaber, petalis brevior.

SARAWAK. Rejang, Sibul, *Haviland* 3403.

This is somewhat like *P. Curtisii* King, of the Malay Peninsula, but the leaves are cordate and the calyx much more shortly cleft.

Microcos Havilandii Ridley, sp. nov., a *M. latistipulata* Ridley, cui affinis, foliis tenuioribus, paniculis axillaribus laxioribus, floribus paucioribus, sepalis oblongis differt.

Arbor paniculis exceptis glaberrima. *Folia* elliptica, cuspidata, basi breviter attenuata, subcoriacea, 19-24 cm. longa, 8-10 cm. lata, nervis 5-paribus subtus elevatis, nervulis transversis subparallelis paucis, reticulationibus conspicuis; petioli 2.5 cm. longi. *Paniculae* axillares, furfuraceae, pauciflorae, 4-8 cm. longae, umbellis 2-3-floris. *Pedicelli* 2 mm. longi, puberuli. *Sepala* 5, oblonga, obtusa, velutina, 6 mm. longa, 3 mm. lata. *Petala* 5, subspathulato-lanceolata, acuta, glabra. *Stamina* 20, filamentis filiformibus glabris. *Androgynophorus* apice albo-hirtus. *Ovarium* globosum, glabrum. *Stylus* longus, gracilis.

SARAWAK. Rejang, Kapit, *Haviland* 2332.

Distinctly allied to *M. latistipulata* Ridley, of the Malay Peninsula and Sumatra, but the leaves are thinner and the few-flowered panicles laxer, also the sepals are oblong. There is no trace of the characteristic stipules of the allied plant.

Microcos laurifolia Burret.

SARAWAK. Sine loc. exact., *Beccari* 3473.

New record for Borneo. The specimen differs somewhat from the Penang plant in the thinner lanceolate leaves drawn out to a long point, and in the rather large flowers, but I do not think it can be separated specifically.

Microcos subepetala Stapf mss., descr. Ridley, sp. nov., a *M. anti-desmifolia* Burret, cui affinis, foliis minoribus ovatis, floribus pluribus minoribus, petalis minutis sericeis distincta.

Arbor subglabra, ramorum cortice pallido. *Folia* elliptico-ovata, obtusa, basi subacuta, subcoriacea, glabra, 8-8.5 cm. longa, 4-4.5 cm. lata, costa nervisque 4-paribus subtus parce hirtis; petioli 8 mm. -1 cm. longi, pubescentes. *Paniculae* terminales et ex axillis summis, numerosae, multiflorae, pilis stellatis pubescentes, 4-5 cm. longae. *Bractaeae* bilobae, lobis oblongis obtusis, tomentosae. *Flores* 3-4 in umbellulis dispositi. *Pedicelli* tomentosi, 1-2 mm. longi. *Sepala* 5 vel 6, oblonga, obtusa, cucullata, 3 mm. longa, extra tomentosa. *Petala* 5, minima, spathulata, hirta. *Stamina* 30, 2 mm. longa, filamentis filiformibus. *Androgynophorus* brevis, apice hirtus. *Ovarium* globosum, glabrum. *Stylus* crassiusculus, acuminatus, staminibus brevior, stigmatibus minuto.

SARAWAK. Kuching, *Haviland* 1885.

A very distinct plant in its small nearly ovate leaves and dense clusters of panicles of small flowers. The petals are very small and silky haired, about half as long as the ovary.

Microcos gracilis Stapf mss., descr. Ridley, sp. nov., a *M. hirsuta* Burret, cui affinis, foliis multo minoribus lanceolatis longe acuminatis, floribus minoribus differt.

Arbor parva, ramis gracilibus pilis stellatis tomentosis. *Folia* lanceolata, acuminata, basi rotundata, chartacea, supra glabra, subtus pilis stellatis tecta, 5.2-10 cm. longa, 2.7-4 cm. lata, costa nervisque 5-6-paribus subtus elevatis dense tomentosis intra margines inarcuantibus; petioli tomentosi, 2 mm. longi. *Panicula* terminalis, tomentosa, pauciflora, 2-4 cm. longa. *Pedicelli* tomentosi, 4 mm. longi. *Bractaeae* angustissime lineares, acuminatae, bifidae, tomentosae. *Sepala* 5, oblonga, obtusa, 4 mm. longa, dense tomentosa. *Petala* 5, breviora, oblonga, obtusa, glabra. *Stamina* 20, filamentis linearibus brevibus glabris, antheris subglobosis loculis disjunctis. *Ovarium* subglobosum, hirtum. *Stylus* filiformis, glaber, stamina superans. *Drupae* pyriformes vel globosae, pubescentes, flavae, 1.5 cm. diametro.

SARAWAK. Kuching, *Bartlett*; ibid., small tree, calyx green, petals yellow, berry yellow, *Haviland* 1509 (type), 1683, 1742.

Perhaps nearest to *M. hirsuta* Burret, but with very slender branches and very much smaller long acuminate leaves.

Grewia umbellata Roxb.

SARAWAK. *Beccari* 806, 1090. Busau, *Ridley* 12386.

DUTCH BORNEO. Banjarmasin. *Motley* 1165.

Grewia glabra Bl.

DUTCH BORNEO. Banjarmasin, small tree, *Motley* 240.

Triumfetta pseudo-cana Sprague.

SARAWAK. Lundu, *Ridley* 12379.

Corchorus acutangulus Lam.

DUTCH BORNEO. Banjarmasin, *Motley* 366.

Sloanea javanica Bl.

BRIT. N. BORNEO. Tawao, Elphinstone Province, *Elmer* 21791

ELAEOCARPACEAE.

Elaeocarpus polystachyus Wall. var. *borneensis* Ridley, var. nov., foliis basi angustatis, subtus omnino breviter hirtis, petiolis lanuginosis, sepalis et petalis 5 nec 4, distincta.

BRIT. N. BORNEO. East Coast, *Creagh* (type); Sandakan, Myburgh Province, *Elmer* 20280.

This plant is much more woolly-tomentose than the typical form of the Malay Peninsula; the leaves are hairy all over beneath instead of being nearly glabrous, and the petioles also are tomentose. The flowers are slightly smaller and have 5 instead of 4 petals and sepals. Still, I follow Brandis and Merrill in keeping it as a form of the common Malayan plant.

Elaeocarpus ochraceus Stapf mss., descr. Ridley, sp. nov., ab *E. polystachyo* Wall., cui affinis, floribus multo minoribus pubescentibus, staminibus 12-15 differt.

Arbor parva, ramis hirtulis. *Folia* lanceolata vel ovato-lanceolata, integra, cuspidata, cuspidate 1.5 cm. longa, basi rotundata vel obtusa, 10-12.5 cm. longa, 4-6 cm. lata, tenuiter coriacea, nervis 8-10-paribus subtus elevatis hirtulis, nervulis transversis copiosis; petioli pubescentes. *Racemi* subterminales, erecti, multiflori, pubescentes, 9 cm. longi. *Flores* parvi, nutantes, pallide flavi; alabastra globosa. *Pedicelli* 2 mm. longi, pubescentes. *Sepala* 5, lanceolata, 3 mm. longa, extra et intus pubescentia. *Petala* 5, lanceolata, integra, pubescentia. *Stamina* 12-15, brevia, antheris clavatis pubescentibus. *Discus* obscurus, hirtus. *Ovarium* trilobulare, subglobosum, hirtum. *Stylus* brevis, glaber.

SARAWAK. Penkulu Ampat, young jungle, dioecious, *Haviland* 33 (b.s.k.a.) (type); near Kuching, small tree, flowers pale yellow, *Haviland* 2230 (" = 49").

Allied to *E. polystachyus* Wall., but with smaller less densely velvety sepals, and only 12-15 stamens.

Elaeocarpus polyanthus Ridley, sp. nov., ab *E. polystachyo* Wall., cui affinis, foliis oblanceolatis acuminatis, nervis rufo-hirtis, floribus multo majoribus, rhachidibus rufo-tomentosis multo crassioribus, sepalis petalisque 5 differt.

Arbor 15-metralis. *Folia* oblanceolata, abrupte acute acuminata, basi cuneata, supra glabra, subtus sparse hirta, 16-18 cm. longa, 6-7 cm. lata, costa elevata dense rufo-tomentosa, nervis 12-paribus rufo-tomentosis, reticulationibus elevatis conspicuis; petioli 3-5 cm. longi, tomentosi, apice geniculati. *Racemi* subterminales, erecti, validi, multiflori, tomentosi, 18 cm. longi. *Bracteae* oblongae, tomentosae, 2 mm. longae. *Pedicelli* validi, tomentosi, 1 cm. longi. *Alabastra* globosa, tomentosa. *Sepala* 5, lanceolata, obtusa, dense tomentosa, 5 mm. longa, 2 mm. lata. *Petala* 5, lanceolata, obtusa, tomentosa, integra, intus albo-sericea, carinata, 5 mm. longa. *Stamina* circiter 30, glabra, antheris lineari-oblongis, filamentis aequilongis. *Discus* patelliformis, obscure lobatus. *Ovarium* appresse hirtum, ovoideum.

SARAWAK. Hill, 12th mile on Penrissen road, Kuching, 4 Jan. 1924, *Omar* 352. "Tree. Height about 45 feet. Girth, breast high, 3 feet. Bark $\frac{1}{2}$ inch thick. Wood light, used for firewood, planks, light construction." Native name: *Sanga Bukit*.

This fine tree is remarkable for its red-hairy leaf nerves and inflorescence, and its very large flowers for its affinity and more numerous stamens.

Elaeocarpus polycarpus Stapf mss., descr. Ridley, sp. nov., ab *E. polystachyo* Wall., cui affinis, foliis ellipticis subobtusis subtus tomentosis, petiolis tomentosis, racemis densioribus tomentosis, petalis sepalisque 5 nec 4, staminibus 50-60 differt.

Arbor parva, ramis lanuginosis. *Folia* elliptica, integra, breviter obtuse cuspidata, basi rotundata, coriacea, supra glabra laevia costa excepta, subtus hirta, 16-23 cm. longa, 8-16 cm. lata, nervis subtus elevatis 13-paribus tomentosis, nervulis parallelis elevatis; petioli 6-7 cm. longi, lanuginosi. *Racemi* subterminales, multiflori, lanuginosi, 15 cm. longi. *Bracteae* angustae, lanceolato-lineares, hirtae, 4 mm. longae. *Pedicelli* hirti, 7 mm. longi. *Flores* nutantes, parvi. *Sepala* 5, lanceolato-ovata, obtusa, 4 mm. longa. *Petala* 5, vix longiora, lanceolata, integra, hirta. *Stamina* 50-60, glabra, ovario multo breviora, antheris obtusis. *Discus* patelliformis; vix lobatus. *Ovarium* globosum, hirtum, 3- (rarius 2-) loculare. *Drupae* oblongae, obtusae, 1-6 cm. longae, 1 cm. diametro.

SARAWAK. Sine loc. exact., *Beccari* 2698; Kuching, *Haviland* 908 (type), 1637.

This is allied to *E. polystachyus* Wall., but the foliage is quite different and the whole plant much more tomentose. The leaf buds are covered with resin as in *E. paniculatus* Wall., not with pubescence. Dr. Haviland's specimens 1637 are all malformed, the inflorescence being condensed and paniced, and the flowers in umbels on long peduncles.

Elaeocarpus insignis Ridley, sp. nov., ab *E. rugoso* Roxb., cui affinis, ramis, costa, racemis tomentosis vel pubescentibus, foliis spinuloso-serratis laminis fere ad bases petiolorum decurrentibus differt.

Arbor, ramis crassis superne olivaceo-tomentosis. *Folia* oblanceolata, fere ad bases petiolorum decurrentia, apice obtusa, marginibus spinuloso-serratis, supra glabra, subtus hirta, 17 cm. longa, 6 cm. lata, costa et nervis elevatis 3-paribus subtus hirtis, reticulationibus conspicuis; petioli crassi, hirti, 1-5 cm. longi. *Racemi* 10 cm. longi, hirti, floribus dissitis. *Bracteae* obovatae, foliaceae, denticulatae, hirtae, 9 mm. longae, 4 mm. latae. *Pedicelli* graciles, 1-8 cm. longi, pubescentes. *Sepala* angusta, lanceolato-lineararia, pubescentia, 8 mm. longa. *Petala* delapsa, non visa. *Stamina* circiter 10, filamentis gracilibus glabris, antheris teretibus haud aristatis puberulis 5 mm. longis. *Discus* sinuatus, albo-sericeus. *Ovarium* conicum, dense breviter hirtum. *Stylus* longus, glaber.

SARAWAK. Sine loc. exact., *Beccari* 3194.

This remarkable species is allied to *E. rugosus* Roxb. and *E. monocera* Cav., from which it differs in the leaves being serrate and decurrent on the petiole nearly to the base, in the midrib tomentose on both sides in the young leaf, and in the hairy underside of the leaf and the raceme and tomentose shoots.

Elaeocarpus crassifolius Ridley, sp. nov., ab *E. Beccarii* DC., cui affinis, foliis majoribus ovatis rigidis, floribus majoribus hirtis, sepalis crassioribus latioribus, disco haud lobato, differt.

Arbor parva, ramis crassis glabris. *Folia* ovata, acuta, basi rotundata, rigide coriacea, glabra, 14-15 cm. longa, 10-15 cm. lata, nervis subtus elevatis 6-paribus, reticulationibus conspicuis minute glanduloso-punctatis; petioli validi, 8-13 cm. longi, apice incrassati. *Racemi* axillares, hirti, 14-flori, 7 cm. longi. *Bracteae* lanceolatae, hirtae, 3 mm. longae. *Pedicelli* hirti, 1 cm. longi. *Sepala* 5, triangulari-lanceolata, acuminata, extra hirta, intus glabra, carinata, 5 mm. longa. *Petala* oblonga, glabra, valde laciniata, breviora. *Stamina* circiter 12, antheris cylindricis minute pustulatis, ciliis apicalibus 2-3. *Discus* crassus, hirtus, margine undulato. *Ovarium* globosum, dense rufo-hirtum. *Stylus* basi incrassatus, hirtus, superne attenuatus, glaber.

SARAWAK. Mt. Bongo, near Tegora, small tree, *Haviland* 2051.

This striking tree is clearly allied to *E. Beccarii* A. DC., but differs in the large ovate stiffly coriaceous leaves with long petioles, and in the fewer and much larger flowers. Except for the inflorescence and leaf-buds it is quite glabrous.

***Elaeocarpus luridus* Stapf** mss., descr. *Ridley*, sp. nov., ab *E. Winkleri* Merrill, cui affinis, foliis ellipticis basi attenuatis subcoriaceis, staminibus 8, petalis subintegris differt.

Arbor, ramis crassiusculis dense hirtis. *Folia* elliptica, obtuse acuminata vel obtusa, basi attenuata, tenuiter coriacea, marginibus obscure crenatis, glabra (nervis juniorum exceptis), 11-13 cm. longa, 3-4.5 cm. lata, nervis 7-paribus subtus elevatis ascendentibus; petioli apice incrassati, 5 cm. longi. *Racemi* in axillis summis erecti, multiflori, sericeo-pubescentes, 8 cm. longi. *Pedicelli* hirti, 4 mm. longi. *Sepala* 4, lanceolata, hirta, 3 mm. longa. *Petala* oblonga, basi angustata, pubescentia, apicibus truncatis, laciniis paucis brevibus. *Stamina* 8, filamentis brevibus hirtis, antheris longis glabris cylindricis. *Discus* patelliformis, margine sinuatus, hirtus. *Ovarium* biloculare.

SARAWAK. Sine loc. exact., *Beccari* 3187.

The leaves of this plant dry reddish-brown beneath and fuscous above, hence I suppose Stapf's ms. name. All the flowers I have examined were males only with no trace of an ovary, but Stapf's note on the sheet gives the ovary as bilocular.

***Elaeocarpus lasionyx* Stapf** mss., descr. *Ridley*, sp. nov., ab *E. angustifolius* Bl., cui affinis, ramis pubescentibus, foliis brevipetiolatis approximatis, petalis basi hirtis, antheris pubescentibus differt.

Arbor parva, ramis gracilibus pubescentibus. *Folia* lanceolata, basi obtusa, apice acuminato obtuso, tenuiter coriacea, utraque pagina sparse hirta, 6-6.5 cm. longa, 2 cm. lata, nervis 7-paribus subtus elevatis cum costa pubescentibus; petioli hirti, 2 mm. longi. *Racemi* axillares, graciles, 5 cm. longi, rhachide tomentosa. *Flores* circiter 10. *Pedicelli* tomentosi, 2 mm. longi. *Sepala* 5, lanceolata, acuminata, sparse pubescentia, marginibus densius albo-tomentosis,

4 mm. longa, 1 mm. lata. *Petala* 5, obcuneata, laciniis multis basi longe pilosa, sepalis paullo breviora. *Stamina* 16, antheris pubescentibus apicibus ciliatis. *Ovarium* triloculare, hirtum. *Discus* vix lobatus, margine sinuata, carnosus, hirtus.

SARAWAK. Paku, Saribas, tidal river bank, small tree, *Haviland* 1555.

This is allied to *E. angustifolius* Bl., of Java, but has very close-set short-petioled leaves on slender hairy branches, the petals long hairy at the base and the anthers pubescent.

***Elaeocarpus sphaeroblastus* Stapf** mss., descr. *Ridley*, sp. nov., ab *E. Teysmanni* Koord. et Val., cui affinis, foliis glabris integris, floribus omnino glabris differt.

Arbor glabra. *Folia* lanceolata, basi angustata, apicibus deficientibus, chartacea, glabra, 10-13 cm. longa, 3.5-4 cm. lata, nervis gracilibus subtus elevatis 7-paribus; petioli 1-2 cm. longi. *Racemi* axillares, ex axillis foliorum delapsorum, patentes, glabri vel puberuli, 5-7 cm. longi. *Flores* dissiti, circiter 20, alabastro ovoideo-globosi. *Pedicelli* 3 mm. longi. *Sepala* 5, ovata, glabra, 3 mm. longa. *Petala* 5, breviora, glabra, obcuneata, laciniis paucis longis. *Stamina* 35, antheris brevibus cylindricis glabris, filamentis subaequilongis. *Ovarium* parvum, ovoideum, triloculare. *Discus* glaber, lobis rotundatis 5.

SARAWAK. Saribas, *Haviland* 1556.

Except for a little puberulousness on the leaf-buds, rhachis and pedicels when young, this tree appears to be quite glabrous. The small globose buds and short broadly ovate sepals are characteristic.

***Elaeocarpus stipularis* Bl. and *E. tomentosus* Bl.**, *Bijdr.* 121 (1825).

These two species were described together by Blume but are now known to be mere forms of the same tree, which is very common in the lowland woods of the Malay Peninsula and Borneo extending to Siam, Sumatra and Java. It is not really very variable though herbarium specimens often appear to differ in size of leaves, length of petiole, etc., whence it has received a number of specific and varietal names.

The typical form, *E. stipularis* Bl., has nearly entire stipules, small narrow lanceolate leaves, narrowed to the base, glabrous except for some hair on the midrib and nerves beneath. This appears to be confined to Java (Ngdisari and Chiboddas).

E. tomentosus Bl. has deeply lobed stipules with several teeth, and ovate leaves, thickly hairy especially beneath. This form is the common tree of the Malay Peninsula and Borneo, rather scarce in Java (Mt. Prahu, Arjuno and Chiboddas, Gedeh, Tengger, Bantam, *Forbes* 525) and is the plant known as *E. stipularis* Bl. in Hook. fil. *Fl. Brit. Ind.* 1, 404 (1874), King in *Journ. As. Soc. Beng.* 60 (2), 123 (1891), *Ridley*, *Fl. Mal. Pen.* 1, 311 (1922), and is also *E. Gambir* Becc. *Nelle Foreste di Borneo*, 594 (1902), *E. brevipes* Merr. in

Journ. As. Soc. Straits Br. 86, 327 (1922), *E. Scortechinii* King, l.c. 124. The last two species are based on broad-leaved specimens and Merrill's plant has short petioles. The variation in the number of loculi in the ovary and in the form of the fruit has been pointed out already by me in the Fl. Mal. Pen. l.c.

***Elaeocarpus Hullettii* King.**

SARAWAK. Beccari 3130, 3498; near Kuching, shrub, *Haviland* 1619, 1619B.

New record.

***Elaeocarpus parvifolius* Wall.**

SARAWAK. Beccari 1026, 3707; Matang, *Haviland* c.l.r.b., 1044, *Ridley* 12293.

BRUNEI. Limbang, *Haviland* 506.

BRIT. N. BORNEO. *Lowe*.

New record. The Bornean form is rather more pubescent than the Malay Peninsula plant.

***Elaeocarpus euneurus* Stapf** mss., nom. nov. *E. Beccarii* Warb. n Fedde, Repert. 18, 328 (1922), non A.D.C. (1903).

SARAWAK. Beccari 3093; near Kuching, *Haviland* 2126, 2129: 'sepals 4, petals 4, stamens 8, ovary cells 2.'

***Elaeocarpus glaber* Bl.**

SARAWAK. Beccari 1197; Matang, Sarawak river, *Haviland* b.z.d.a.

DUTCH BORNEO. Banjarmasin, *Motley* 194: "cultivated, common; flowers white; fruit ovoid, diameter 5 lines, deep blue, eatable."

Elaeocarpus microphyllus Warb. in Fedde, Repert. 18, 338 (1922), based on Beccari 3224, is I think only a mountain form of *E. Mastersii* King. An exactly similar form occurs on Mt. Ophir (*Griffith* 680), and other forms connect it with typical lowland *E. Mastersii*, e.g. on the top of Mt. Matang, Serapi, *Ridley* 12267; on Mt. Murud, *Moulton* 186; Gunong Klam, *Hallier* 2475.

***Elaeocarpus Jackianus* Wall.**

SARAWAK. Beccari 3490.

This common Malayan plant does not seem to have been recorded for Borneo before.

CHAILLETIACEAE

(see also K.B. 1930, 372).

***Dichapetalum tetramerum* Ridley**, sp. nov., a *D. Griffithii* Engl., cui affinis, floribus tetrameris, ramis nervisque molliter rufescenti-hirtis, petalis integris differt.

Frutex, ramis dense rufescenti-hirtis. Folia lanceolato-oblonga, acuminata, obtusa, basibus cuneatis, subcoriacea, supra laevia,

nervis depressis, 15 cm. longa, 4-5 cm. lata, nervis 6-paribus subtus elevatis inter se arcuantibus rufescenti-hirtis, nervulis et reticulationibus elevatis hirtis; petioli apice incrassati, dense hirti, 8 mm. longi. Flores 10-14, in axillis congesti, pedicellis 1 mm. longis vel subnullis. Sepala 4, linearia, obtusa, dense hirta, 2 mm. longa. Petala 4, linearia, obtusa, integra, extra dense hirta, 3 mm. longa. Stamina 4, filamentis linearibus hirsutis pistillo multo brevioribus, antherarum loculis connectivo latiusculo dissitis. Quarium ovoideum, dense hirtum. Stylus brevis, crassus, stigmate breviter trilobo.

SARAWAK. Matang woods, *Ridley* 12554.

This differs from any other species known to me in having tetramerous flowers. The style is so short and the ovarian hairs so long that all but the stigma is quite concealed. The petals in bud are quite entire.

CELASTRACEAE

(see also K.B. 1931, 36).

***Kurrimia minor* Ridley**, sp. nov., a *K. pulcherrima* Wall., cui affinis, foliis multo minoribus, paniculis brevioribus laxioribus, staminibus minoribus, floribus flavescentibus differt.

Arbor magna. Folia elliptica vel oblanceolata, obtusa, basibus angustatis, coriacea, glabra, 8-13 cm. longa, 4-5 cm. lata, nervis 8-16-paribus subtus elevatis, nervulis transversis parallelis copiosissimis; petioli 3 cm. longi, apicibus dilatatis. Paniculae laxae, patentes, pubescentes, 15 cm. longae, ramis dissitis. Flores pallide flavi vel virescentes, 3 mm. lati, pedicellis 2 mm. longis pubescentibus. Sepala 5, oblongo-ovata, apicibus rotundatis. Petala 5, oblonga, obtusa, glabra. Stamina 5, filamentis ovario aequilongis. Pistillum subglobosum, infra stigma albo-pilosum. Disci lobi 5, petalis oppositi. Ovarium biloculare, loculis biovulatis, ovulis erectis. Capsula fusiformis, 3 cm. longa.

SARAWAK. Beccari, 2624 (fruiting specimen). Kuching, large tree, flowers pale yellow, *Haviland* 644, 1788 (type), 2139. Buntal, *Haviland* 1843.

This differs from *K. pulcherrima* Wall. in the shorter panicles with more scattered pedicellate yellow flowers. The leaves also have more nerves and distinct and numerous transverse nervules.

***Kurrimia paniculata* Wall.**

DUTCH BORNEO. *Teysmann* 10876.

SARAWAK. Beccari 2974. Rock Road, 2nd Mile, Kuching, *Haviland* 644.

Not previously recorded from Borneo.

***Solenospermum apiculatum* Ridley**, sp. nov., a *S. littorali* (Laws.) Loes., cui affinis, foliis coriaceis integris obovatis vel ellipticis apicibus rotundatis differt.

Arbor glabra. Folia coriacea, obovata vel elliptica, apicibus rotundatis minute apiculatis, basibus cuneatis, marginibus integris,

5.5-9 cm. longa, 4-4.8 cm. lata, nervis 4-paribus obscuris; petioli crassi, 1 cm. longi. *Panicula* subterminalis, laxa, 10 cm. longa, pedicellis 4 mm. longis. *Sepala* ovata, obtusa, breviter. *Petala* ovata, subacuta, 2 mm. longa, supra carinata. *Stamina* 5, inclusa, filamentis linearibus. *Discus* pulviniformis, 2 mm. latus. *Capsula* oblongo-lanceolata, 7.3 cm. longa, valvis extra nigro-pustulatis intus laevibus politis castaneis. *Semina* alis oblongis instructa, 5.5 cm. longa, 1.5 cm. lata.

SARAWAK. Beccari 2639, 2893 (type).

Allied to *S. littorale* (Laws.) Loes. (*Kokoona littoralis* Laws.), but differing in the more coriaceous leaves, blunt except for a minute point, and with quite entire margins. The fruit resembles that of *S. littorale* but is not stalked as in that species.

***Solenospermum aquatile* Ridley, sp. nov., a *S. littoralis* (Laws.) Loes.,** cui affinis, foliis latis ellipticis apicibus rotundatis marginibus integris, nervis 8-paribus, floribus parvis in cymis dispositis, capsula minore lanceolata utrinque acuta differt.

Arbor elata, cortice nigro. *Folia* subcoriacea, elliptico-ovata, apicibus rotundatis, basibus cuneatis, marginibus undulatis, 8-9 cm. longa, 5-5.5 cm. lata, nervis 8-paribus inconspicuis; petioli 1.8 cm. longi. *Cyma* brevis, axillaris, pedunculo 2.5 cm. longo, ramis 3 patentibus 1 cm. longis, pedicellis 2 mm. longis. *Flores* parvi, 5 mm. lati. *Sepala* breviter, rotundata. *Petala* triangularia, subacuta, supra carinata. *Staminum* filamenta longiuscula, antheris ellipticis. *Capsula* lanceolata, acuminata, basi et apice angustata, 4.5 cm. longa.

DUTCH BORNEO. Banjarmasin, Motley 861: "A tall tree, always growing in the water, rarely more than a foot in diameter but tall and straight with few branches. Wood white with reddish veins, soft and easily worked, decaying wonderfully fast in the weather but durable when kept dry."

Allied to *S. littorale* (Laws.) Loes., but the leaves much broader, elliptic, blunt, with eight pairs of nerves, the panicles reduced to cymes of small flowers. The fruit is lanceolate in outline, pointed at both ends and not stalked.

***Kokoona ovato-lanceolata* Ridley, sp. nov., a *K. Scortechinii* King,** cui affinis, foliis ovato-lanceolatis minoribus, floribus minoribus, antherarum appendicibus brevioribus haud pustulatis differt.

Arbor glabra. *Folia* subopposita, ovato-lanceolata, acuminata, basibus rotundatis vel subacutis, tenuiter coriacea, marginibus incrassatis, 9.5 cm. longa, 4.5 cm. lata, nervis tenuibus inconspicuis 7-paribus, reticulationibus aequae conspicuis; petioli 5 mm. longi. *Panicula* elongata, gracilis, 13 cm. longa, pauciramosa, ramis brevibus 1.5 cm. longis vel brevioribus. *Flores* parvi. *Calyx* patelliformis, lobis 5 rotundatis. *Petala* 5, rotundato-ovata, obtusa. *Stamina* 5, filamentis brevibus & basi latiore, antheris longioribus

conicis appendiculatis haud pustulatis. *Stylus* cylindricus, stigmate capitato. *Ovula* plurima.

SARAWAK. Beccari 3471.

***Kokoona lanceolata* Ridley, sp. nov., a *K. coriacea* King,** cui affinis, foliis lanceolatis angustioribus, antheris appendiculatis pustulatis differt.

Arbor glabra. *Folia* alterna, coriacea, elliptica vel lanceolata, acuminata, basi angustata, 6-14 cm. longa, 2.5-4.5 cm. lata, nervis tenuibus 5-paribus intra marginem inarcuantibus; petioli 1-1.5 cm. longi. *Racemi* vel *paniculae* axillares, 6-9 cm. longi, pedicellis 5 mm. longis. *Bractaeae* ovatae, minutae. *Sepala* 5, rotundata. *Petala* 5, coriacea, oblonga, acuta, 3 mm. longa. *Discus* margine elevatus, sinuatus. *Stamina* 5, filamentis e disco ortis triangularibus acuminatis, antheris majoribus oblongis, appendicibus longiusculis pustulatis. *Ovarium* trilobulare. *Stigma* cylindricum.

SARAWAK. Beccari 2567.

This plant is undoubtedly allied to *Kokoona coriacea* King but differs entirely in the narrow lanceolate leaves and the pustulate anther appendages. This group of the genus is extremely non-typical in the large anthers with distinct appendages.

***Salacia megasperma* Ridley, sp. nov., a *S. latifolia* Wall.,** cui affinis, foliis oblongis cuspidatis, floribus minoribus, fructu magno, seminibus multo majoribus crassis differt.

Frutex, ramis fuscis verrucosis. *Folia* opposita, coriacea, elliptica, breviter cuspidata, basibus angustatis, sicca brunnea, 8-9 cm. longa, 3-4 cm. lata, nervis tenuibus 5-6-paribus; petioli 7 mm. longi. *Flores* bini, pedunculo brevissimo, pedicellis gracilibus 1 cm. longis. *Bractaeae* ovatae, acutae, coriaceae, minutae. *Sepala* ovata, ferme 1 mm. longa. *Petala* 5, coriacea, ovato-oblonga, 4 mm. longa. *Stamina* 3, filamentis teretibus 1 mm. longis e disco conico-globoso ortis. *Bacca* magna, ultra 6 cm. longa. *Semina* oblonga, dorso rotundata, ventre acuta, 3 cm. longa, 2 cm. lata.

SARAWAK. River bank, Tegora, Haviland 823.

This is allied to *S. latifolia* Wall., but differs in the form of the leaves, and in the very large fruit and hard seeds, the largest fruit I know in the genus. The branches of the shrub are angled and warty with lenticels.

***Salacia flavescens* Kurz.**

DUTCH BORNEO. Banjarmasin, Motley 522: "Large creeper; fruit spherical, 2 to 3 inches in diameter, eatable."

***Salacia latifolia* Wall.**

SARAWAK. Santubong, Haviland & Hose 3370; Miri river, Hose 537.

BRIT. N. BORNEO. Kudat, Tumbong Gunong, Fraser 141, 194. Not previously recorded from Borneo. This species is really quite distinct from *S. prinoides* DC., the type form of which is a

narrow-leaved plant from Madras. Intermediate forms I have found in the Malay Peninsula but no true *S. prinoides* DC. from Borneo. A plant labelled "*Hippocratea prinoides* DC., Java, legit Korthals" in Herb. Kew. is certainly Wallich's *S. latifolia* which occurs also in Timor Laut and Amboina.

Salacia leucoclada Ridley, sp. nov., a *S. grandiflora* King, cui affinis, foliis minoribus ellipticis, sepalis brevioribus, petalis oblongis, disco altiore cylindrico, stylo longiore differt.

Frutex robustus, scandens, ramorum cortice laevi albo. *Folia* coriacea, sicca nigra, elliptica, obtuse cuspidata, basibus angustatis, 8 cm. longa, 5 cm. lata, nervis subtus elevatis 5-paribus, reticulationibus laxis majusculis subtus elevatis; petioli crassi, rugosi, 2 mm. longi. *Flores* 2 vel 3 in glomerulo axillari, pedicellis 2 mm. longis. *Sepala* breviter ovata, obtusa, imbricata. *Petala* oblonga, obtusa, 3 mm. longa. *Discus* cylindricus, 1 mm. longus, crassus. *Stylus* breviusculus, crassus.

SARAWAK. Beccari 1885.

This is allied to *S. grandiflora* Kurz and in habit resembles a specimen of this species collected in Penang by Curtis (no. 249) which has similar white-barked horizontally spreading branches and small leaves, but the flowers are quite different. The sepals in the present species are much smaller, the petals oblong forming an oblong bud conspicuously different from the globose bud of round petals of *S. grandiflora* Kurz. The disc is much taller and cylindric and the style longer.

Both in *S. grandiflora* and in *S. flavescens* Kurz the leaves in herbarium specimens differ much in form and size according to what part of these great sarmentose shrubs the specimen is taken from.

Salacia minutiflora Ridley, sp. nov., a *S. viminea* Wall., cui affinis, foliis oppositis, petalis minoribus oblongis obtusis, disco cylindrico-conico differt.

Frutex scandens. *Folia* opposita, coriacea, sicca grisea, elliptica, breviter cuspidata, basibus rotundatis, 7-9 cm. longa, 3-4.5 cm. lata, nervis inconspicuis tenuibus 8-paribus; petioli 5-7 mm. longi. *Flores* minuti, in fasciculis parvis axillaribus, pedicellis gracilibus, 5 mm. longis. *Bracteae* plures, ovatae, acutae. *Sepala* ovato-rotundata. *Petala* 5, oblonga, obtusa, 2 mm. longa. *Discus* obtusus, cylindricus, conicus. *Stamina* 3, filamentis in disco immersis, antheris parvis, loculis divaricatis.

SARAWAK. Matang, climber, Haviland 1039.

This is one of the very small-flowered species near *S. viminea* Wall. but with the leaves always opposite and broader. The flowers are slightly smaller and the petals broader and rounder and the disc taller.

Salacia Beccarii Ridley, sp. nov., a *S. Wrayi* King, cui affinis, foliis multo majoribus ellipticis cuspidatis, petalis lineari-oblongis differt.

Frutex, ramis pallidis. *Folia* subcoriacea, sicca atro-brunnea, opposita, elliptica, breviter obtuse cuspidata, basibus breviter angustatis, 10-17 cm. longa, 4.5-7 cm. lata, nervis 6-paribus cum costa utrinque elevatis; petioli validuli, atri, 1 cm. longi. *Bracteae* ovatae, acutae, persistentes. *Racemi* vix 5 mm. longi, pedunculo brevissimo axillari, pedicellis crassis 1 mm. longis. *Sepala* 5, oblongo-ovata. *Petala* lineari-oblonga, obtusa, 2 mm. longa. *Discus* orbicularis. *Filamenta* inclusa.

SARAWAK. Beccari 1465, 1806 (type).

In habit this resembles *S. Wrayi* King, but the large leaves drying black are very different.

Salacia Bartlettii Ridley, sp. nov., a *S. Beccarii* Ridley, cui affinis, foliis alternis, pedicellis multo longioribus, floribus majoribus, disco undulato differt.

Frutex vel arbor, cortice ramorum albescente. *Folia* alterna, coriacea, oblonga vel elliptica, acuminata, obtusa, basibus cuneatis, 8-9 cm. longa, 3.5-4.5 cm. lata, nervis 6-paribus subtus elevatis, secundariis tenuibus inconspicuis; petioli 1 cm. longi. *Flores* in racemis crassis axillaribus 2 mm. longis. *Bracteae* rotundatae, persistentes. *Pedicelli* 5 cm. longi. *Calyx* patelliformis, margine integro, 1 mm. longus, 2 mm. latus. *Petala* coriacea, imbricata, oblonga, obtusa, 2 mm. longa. *Stamina* 3, antheris subsessilibus. *Ovarium* in disco margine undulato immersum. *Stylus* conicus, brevis. *Stigma* capitatum, trilobum.

SARAWAK. Kuching, 17 May 1893, E. Bartlett.

Salacia amentacea Ridley, sp. nov., a *S. oblongifolia* Bl., cui affinis, racemis florum in apice pedunculi brevis congestis increscentibus bracteis persistentibus tectis, foliis majoribus ellipticis crassioribus differt.

Frutex alte scandens, glaber. *Folia* opposita, coriacea, lanceolata vel elliptica, acuminata, basibus obtusis, marginibus serratis, 5.5-11 cm. longa, 2-6 cm. lata, nervis 6-8-paribus tenuibus subtus elevatis; petioli 5 mm.-1 cm. longi. *Racemi* breves, 2-4 in apice pedunculi 2 mm. longi, usque 1 cm. longi increscentes. *Bracteae* persistentes, ovatae. *Flores* parvuli, virides vel flavi, pedicellis 1 mm. longis. *Sepala* breviter ovata, coriacea, ovata, obtusa. *Petala* ovato-rotundata, 1 mm. longa. *Discus* tubulosus. *Filamenta* immersa. *Ovarium* conicum, trilobulare, ovulis 3-4 pro loculo. *Bacca* ovoidea, subglobosa, rubra vel saturate lutea, 5 cm. longa, 5 cm. lata. *Semina* plura, obconica, 1.5-2 cm. longa, 1 cm. lata.

SARAWAK. Kuching, Haviland 942, 1000, 1626, 2287, 2858; Haviland & Hose " = 2858 " (type).

Haviland describes this as a climber 20 feet long with the flowers green or pale yellow, the fruit dark yellow or red. It is rather a remarkable species, allied to *S. oblongifolia* Bl., of Java. The flowers, which are about the same size as those of that species, are borne in racemes two or three of which are carried on a short

peduncle. These racemes gradually elongate as the flowers are produced, from 2 mm. to 1 cm., the stiff ovate bracts persisting. The same type of inflorescence occurs in *S. oblongifolia* Bl. though curiously this is not mentioned by Blume or Miquel.

As often happens in the robust *Salacias* the lower leaves of the shrub are twice the size of the ones on the upper branches.

***Salacia litseifolia* Ridley**, sp. nov., a *S. laurifolia* Stapf, cui affinis, foliis ellipticis lanceolatis cuspidatis, nervis paucioribus, floribus 1-2 sessilibus in glomerulis, petalis oblongis obtusis differt.

Frutex, ramis albescentibus lenticellis copiosis. *Folia* opposita, coriacea, elliptico-lanceolata, cuspidata, cuspidate obtusa curva 1 cm. longa, basibus obtuse cuneatis, 4.5-9 cm. longa, 1.5-3.5 cm. lata, nervis 3-paribus subtus cum reticulationibus elevatis; petioli 2 mm. longi. *Flores* sessiles, 1 vel 2 in glomerulis parvis axillaribus, foliis suffulgentibus saepe delapsis. *Sepala* breviter ovato-rotundata. *Petala* 5, coriacea, oblonga, obtusa, 3 mm. longa. *Discus* ovoideus. *Stamina* 3, recurva.

SARAWAK. Lundu, *Haviland* 871.

This is allied to *S. laurifolia* Stapf, but the leaves are larger, stiffer and wider, cuspidate, with three pairs of nerves. The flowers are sessile and subsolitary, the petals broader, oblong and quite blunt, not lanceolate acute as in *laurifolia*. The pustular branches are very distinct.

***Salacia Klossii* Ridley**, sp. nov., a *S. oblongifolia* Bl., cui affinis, foliis ellipticis obtusis vel breviter acuminatis nec crenulatis, racemis brevibus, floribus minoribus, disco quinquelobo lobis pustulatis differt.

Frutex scandens, glaber. *Folia* subopposita, coriacea, elliptica, obtusa vel acuminata, basibus breviter angustatis vel obtusis rotundatis, 10-12 cm. longa, 5-5.5 cm. lata, nervis elevatis 8-paribus, reticulationibus laxis; petioli 1 cm. longi, teretes, rugosi. *Flores* in racemis 1 mm. longis, pedunculo axillari 2 mm. longo. *Bracteae* ovatae, acutae, coriaceae, persistentes. *Sepala* 5, ovata, imbricata, obtusa. *Petala* 5, oblonga, obtusa, 1 mm. longa. *Stamina* 3, filamentis triangularibus attenuatis, antheris parvis. *Discus* 5-lobus, lobis papillosis. *Ovarium* conicum.

SUMATRA. Island of Siberut, *Kloss* 14476.

In the "Spolia Mentawiensis" (Kew Bull. 1926, 62) I referred this plant to *S. prinoides* DC., but on re-examination I find it cannot be classed with any form previously identified with that *Madras* species. The inflorescence is of the same type as that of *S. oblongifolia* Bl. and *S. amentacea* Ridley, the flowers being borne on two short racemes covered with persistent bracts on an axillary peduncle, the racemes probably lengthening as the flowers expand as in *S. amentacea*. The flowers are bigger than those of *S. oblongifolia* Bl. and nearly as large as those of *S. amentacea*.

***Salacia castaneifolia* Ridley**, sp. nov., a *S. grandiflora* Wall., cui affinis, ramis quadrangulatis, foliis longis lanceolatis serratis, floribus paucis, petalis rotundatis differt.

Frutex? ramis validis quadrangulatis. *Folia* opposita, subcoriacea, elliptico-lanceolata, obtusa, basibus cuneatis, marginibus serratis, 14-15 cm. longa, 5-5.5 cm. lata, nervis 12-paribus tenuibus utrinque elevatis; petioli crassi, 1 cm. longi. *Flores* 1 vel 2 in axillis, pedicellis 4 mm. longis crassiusculis. *Bracteae* ovatae, obtusae. *Sepala* ovato-rotundata, coriacea. *Petala* 5, viridia, coriacea, rotundata, marginibus membranaceis, 3 mm. longa. *Discus* magnus, subglobosus, flavus. *Stamina* 3, filamentis linearibus brevibus, antheris parvis subrotundatis. *Ovarium* conicum, trilobulare, ovulis 2 pro loculo horizontalibus. *Stylus* validus, conicus.

SARAWAK. Near Kuching, *Haviland & Hose* 3361.

This plant is really very distinct from any other species known to me in its lanceolate serrate leaves drying green. The flowers to some extent resemble those of *S. grandiflora* in structure. There are only one or two in the axils, with hardly any peduncle.

***Hippocratea brachystachys* Ridley**, sp. nov., ab *H. macrantha* Korth., cui affinis, foliis minoribus, paniculis brevibus, petalis glabris, disco glabro brevi nec stipitato differt.

Frutex scandens, glaber. *Folia* subcoriacea vel coriacea, elliptica, acuminata, basibus rotundatis, marginibus crenulatis, 5-9.5 cm. longa, 2.5-5 cm. lata, nervis 7-paribus tenuibus cum reticulationibus conspicuis; petioli 5 mm. longi. *Panicula* brevis, axillaris, 1.5 cm. longa, pedunculo 1 cm. longo, ramis in apice congestis 5 mm. longis. *Bracteae* ovatae, acutae. *Sepala* 5, ovata, rotundata. *Petala* oblongo-lanceolata, extra puberula, intus glabra, 4 mm. longa, viridia. *Discus* pulvinatus, puberulus, haud stipitatus. *Filamenta* lineari-oblonga, 1.5 mm. longa. *Stylus* cylindricus, glaber. *Capsula* obovato-oblonga, multicostulata, valvis 6-6.5 cm. longis 1.5 cm. latis. *Semina* 1 cm. longa, ala terminali oblique oblanceolata 2.5 cm. longa 1 cm. lata.

SARAWAK. Mt. Buan, limestone, *Haviland* 2038; near Kuching, climber, flowers green, *Haviland* 2286 (type).

This is allied to the river-bank *H. macrantha* Korth., but the leaves are smaller and stiffer, the panicles short with smaller flowers, the petals glabrous inside and the ovary and disc not stipitate nor pubescent. The plant from the limestone rocks (no. 2038) has very thick stiff leaves but is otherwise similar to the type.

***Hippocratea trilobulata* Ridley**, sp. nov., ab *H. macrantha* Korth., cui affinis, foliis late ovato-ellipticis, floribus paucis, petalis acuminatis intus barbatis, disco hirsuto apice lobulis 3 semi-ovatis glabris staminibus alternantibus instructo, ovario stipitato differt.

Frutex. *Folia* opposita, coriacea, elliptico-ovata, obtuse cuspidata, basibus rotundatis, 9-16 cm. longa, 5-10.5 cm. lata, nervis 8-10-paribus cum reticulationibus in utraque pagina conspicua;

petioli crassi, 7 mm. lati. *Cymae* axillares, 2 cm. longae, ramis bifurcatis paucifloris 1 cm. longis. *Bracteae* ovatae, cymbiformes. *Pedicelli* 5 mm. longi. *Sepala* 5, lanceolata, obtusa. *Pelala* lanceolata, acuminata, extra puberula, intus barbata, 4 mm. longa, sordide alba. *Discus* stipitatus, hirtus, lobulis tribus semi-ovatis carnosus glabris. *Stamina* 3, filamentis late linearibus recurvis inter lobulos disci ortis. *Ovarium* in stipite crasso cylindrico, triloculare, ovulis in loculis pluribus. *Stylus* glaber, cylindricus.

SARAWAK. Kuching, *Haviland* 2859: "Calyx and corolla dirty white; ovary 3-celled with several ovules in each cell."

This plant is certainly closely allied to *H. macrantha* Korth., differing in the large size of the lower leaves, the biggest in any oriental species of the genus, and more remarkably in the structure of the flowers. The stamens and ovary are borne on a short thick stalk on the top of which is a hairy ring, the true disc, above which are three semicircular fleshy glabrous lobes between which appear the stamens alternating with them. I have not seen this structure in any other species.

Hippocratea macrantha Korth. occurs in SARAWAK: *Beccari* 4063; Rejang, Sibul, *Haviland* 2876.

Hippocratea indica Willd. does not appear to be common in Borneo, but has been found at Banjarmasin (DUTCH S. E. BORNEO) by *Motley* (no. 333).

XXXVI—NOTES ON CAREX: IV.* E. NELMES.

THE SECTION ELATAE IN TROPICAL AFRICA.

Of all the sections into which the genus *Carex* is divided in Kükenthal's comprehensive account in Engler's *Pflanzenreich*, 1909, Sect. *Elatae* is the most predominantly African. Ten of the 28 species and varieties there recognised by Kükenthal are from the mountains of Tropical Africa, 4 from the Azores, Madeira, and the Canaries, 3 from the Mascarene Islands, 2 from St. Helena, 2 from Tristan da Cunha, and 2 from South Africa; the remaining 5 being extra-African. It may be of interest to add that two of these are European, two Australian, and one is found in Assam. The proportion from Tropical Africa has grown larger in recent years, as the sedge flora of that area has become better known.

Assuming that the genus *Carex* was boreal in origin—an assumption supported by a consideration of all the available evidence—did the ancestors of the *Elatae* migrate to Africa from the north-west or from the north-east? The evidence appears to be in favour of the north-west, as not only are four species of the section found in the Azores, Madeira, and the Canaries, as mentioned above, but of the two European representatives one is confined to the Iberian Peninsula and the other is found only there and in western Europe. The nearest allied section, *Spirostachyae*, is also strongly represented in south-west Europe and north Africa.

*Continued from K.B. 1938, 110.

The point was made in the first of these Notes (K.B. 1937, 358) that about 10 per cent. of the 700 species comprising the subgenus *Eucarex* have the terminal spike gynaeandrous, that they mainly comprise the section *Atratae*, and that they mostly inhabit mountains, finding perhaps their greatest development in the Himalayas. On the whole they have darker glumes and utricles than have the rest of *Eucarex*.

It is interesting to compare the *Atratae* with the *Elatae* from the mountains of Tropical Africa. At least half of these species also are gynaeandrous, not only in the terminal spike but often to a less extent in the lateral spikes as well. Other species found there are androgynaeceous in all the spikes, an equally unusual condition in this subgenus.

Another interesting point, and one having a bearing on the connexion between high altitudes and the gynaeandrous state, is that the surrounding species of the *Elatae*, in Europe, the Azores, Madeira, the Canaries, St. Helena, Tristan da Cunha, South Africa, and the Mascarene Islands, are very rarely gynaeandrous, and often have up to three of their upper spikes wholly male, the remaining spikes being usually androgynaeceous.

A third striking thing is that whereas the gynaeandrous *Atratae* of the mountains of Europe, Asia, and North America are on the whole of similar size to *Carices* of lower lands, the gynaeandrous *Elatae* of the African mountains are of more than average size.

The *Elatae* in Tropical Africa form very homogeneous groups, and it is not surprising that, owing to this fact and to the paucity of their representation in herbaria, their members have not been very clearly defined.

This paper is an attempt to make these *Carices* better understood, as a preliminary to a general revision of the Tropical and South African species.

Carex vallis-rosetto K. Schum. Three gatherings were cited by Schumann at the end of his description under the above name in Engler's *Pflanzenw. Ost-Afr. G.* 130 (1895): *Holst* 3823, *Volkens* 1291 and 1342, but he omitted to mention which was the type.

Two, if not three, species seem to be represented by these three numbers and it is therefore necessary to ascertain which of them is the type of the name. As the description covers all three numbers and does not fit any one of them more than another, *Holst* 3823 is here accepted as lectotype for the following reasons. (1) It was collected in the Rosetto valley, Usambara, from which the specific epithet was taken, whereas the other specimens were collected elsewhere. (2) It was chosen as lectotype by Kükenthal in *Engl. Pflanzenr.* IV. 20, 647 (1909), where the two *Volkens* sheets were separated from it under the varietal epithet *purpurea*. It is generally agreed that the original choice of a lectotype should not be varied

by subsequent authors unless it can be shown to have been made against the weight of evidence.

Clarke gave a description (in Fl. Trop. Afr. 8, 521: 1902), under the name *C. vallis-rosetto*, based on *Volken* 1291 and 1342, apparently not suspecting that *Holst* 3823, which he had not seen, was not conspecific. This treatment by Clarke cannot be held to be equivalent to typification by exclusion, since he merely described what material was available to him.

Kükenthal, in the Notizbl. Bot. Gart. Berl. 9, 314 (1925), reunited his var. *purpurea* with *C. vallis-rosetto*, stating that further material having come to hand he was convinced that the two could not be kept distinct. However, from a careful examination of the two sheets on which Kükenthal's variety was based I consider that they are specifically distinct not only from *C. vallis-rosetto*, but also probably from each other. As *Volken* 1342 is incomplete and somewhat immature, the description which follows is that of a good specimen, of what may be the same species, collected by Mr. P. J. Greenway on Kilimanjaro. The other *Volken* gathering (1291) differs in a number of minor respects which may not be constant, and its precise determination must await further study.

C. Greenwayi Nelves, sp. nov.; affinis *C. vallis-rosetto* K. Schum., sed utriculis haud inflatis rectis nervosis praecipue differt.

Rhizoma caespitosum, lignosum. *Culmus* 1 m. altus, validus, superne gracilescens, triquetri, laevis, foliatus, basi vaginis aphyllis purpureo-brunneis circumdatus. *Folia* 7-11 mm. lata, plana, pallide viridia, subrigida, acuminata, inflorescentia breviora, marginibus superne scabra; vaginae inferiores fusco-purpureae. *Spicae* circiter 20, androgynaeceae, parte mascula brevi, cylindricae, pendulae, subtenuae, subaxilliflorae, plerumque ternae, inaequaliter pedunculatae, inferiores interdum basi compositae, ad 9 cm. longae, superiores subdistantes, inferiores distantes; pedunculi filiformes, angulis leviter hispiduli. *Bractee* inferiores foliaceae, inflorescentia breviores vel eam subaequant, longe vaginantes, superiores vix foliaceae. *Squamae* femineae oblongo-lanceolatae, fusco-brunneae, marginibus peranguste albo-hyalinae, late viridi-carinatae, in aristam acuminatae. *Utriculi* 5 mm. longi, elliptico-lanceolati, trigoni, haud inflati, pallide virides, castaneo-maculati, glabri, plurinerves, haud curvati, in rostrum sublongum ore bidentatum subsensim desinentes. *Nux* oblongo-ellipsoidea, trigona, lateribus concavis. *Stigmata* 3.

TANGANYIKA TERRITORY: Kilimanjaro; Bismarck Hill, damp places, with ferns, in dense shade of *Philippia excelsa*—*Hagenia abyssinica* and *Podocarpus* forest and woodland, 3000 m., 27 Feb., 1934, Greenway 3840 (type); Moshi-Marangu, 1000 m., on roadsides, 1 Jan., 1915, Grote (B. L. Inst. Amani) 5366 (Herb. Berol.).

Carex cyrtosaccus C. B. Clarke. This species was placed by Kükenthal, in his treatment of the *Elatae*, at some distance from

C. vallis-rosetto, but fifteen years later he wrote up the sheets of Clarke's species in the Berlin Herbarium, as "*C. vallis-rosetto* K. Schum. var. *cyrtosaccus* (Clarke) Kükenth." Of the three gatherings (made by Whyte in Nyasaland), two, from Mt. Malosa and Mt. Zomba, differ from *C. vallis-rosetto* in having the three upper spikes usually wholly male with a few female flowers at the base of the terminal one, the lateral spikes thicker and longer, and the utricles broader and distinctly nerved. The third specimen, from Mt. Milanji, also differs in the same characters except that its utricles are obsoletely nerved as in *C. vallis-rosetto*. Two of the three Nyasaland plants, therefore, are at least varietally distinct from *C. vallis-rosetto*, and the third apparently so, but I propose to leave the precise placing of Clarke's *C. cyrtosaccus* until more material is available.

C. Thomasii Nelves, sp. nov.; affinis *C. vallis-rosetto* K. Schum. sed spicis crassioribus et utriculis rectis nervosis aequaliter inflatis differt.

Culmi 120 cm. alti vel ultra, validi, superne gracilescens, triquetri, laevi. *Folia* longa, circiter 9 mm. lata, plana, pallide viridia, supra marginibus et nervis scabrida. *Spicae* 9, binae, superiores 2-3 basi et apice masculae medio femineae, caeterae omnino femineae vel interdum apice masculae, cylindricae, pendulae, crassae, densiflorae, 5-8 cm. longae (pedunculo excluso), superiores distantes, inferiores plus distantes, inaequaliter longipedunculatae; pedunculi filiformes, angulis hispiduli. *Bractee* inferiores foliaceae, inflorescentiam subaequant, longe vaginantes, superiores setaceae vel vix foliaceae. *Squamae* femineae elliptico-lanceolatae, laete rubro-brunneae, basi extremisque marginibus pallidiores, vitta mediana pallida, in aristam longe acuminatae. *Utriculi* squamis aequilongis, 5-6 mm. longi, inflati, recti, membranacei, ellipsoidei, obscure trigoni, straminei, nitidi, glabri, circiter 10-12-nerves, in stipitem brevissimum attenuati, in rostrum longum marginibus hispidulum ore bidentatum subabrupte attenuati. *Nux* elliptica, trigona, lateribus concavis, subaxe inclusa, brevissime stipitata. *Stigmata* 3.

ANGLO-EGYPTIAN SUDAN: Mongalla; Imatong Mountains, Lomuleng, forest, common, 4 ft., 2400 m., 29 Dec., 1935, A. S. Thomas 1794 (type); Imatong Mountains, Feb. 1936, H. B. Johnston 1408.

C. elgonensis Nelves, sp. nov.; affinis *C. Mildbraedianae* Kükenth., sed spicis paucis et singulatim dispositis praecipue differt.

Culmi ad 30 cm. alti, subvalidi, triquetri, laevi. *Folia* 5 mm. lata, rigida, inferne planiuscula, superne sulcata, acuminata, marginibus et supra scabrida, culmo multo breviora. *Spicae* 3-6, marginibus et supra scabrida, culmo multo breviora. *Spicae* 3-6, superiores 1-3 masculae, usque ad 2.5 cm. longae, sessiles, crassae et subobtusae, inferiores 2-3 androgynaeceae, 2.5-3 cm. longae (pedunculo excluso), parte mascula quam feminea brevior,

subdensiflorae, oblongo-ovatae, pedunculatae, cernuae. Bracteae inferiores foliaceae et longivaginantes, normaliter inflorescentia leviter breviores, rectae et rigidae, tantum superne marginibus scabridae, in apicem coriaceum acuminatae. Squamae femineae oblongo-ovatae, acuminatae, fusco-brunneae, in mucronem acuminatae. Utriculi 4 mm. longi, squamis subbreviores, obtuse trigoni, elliptico-obovoidei, glabri, membranacei, utrinque obsolete plurinervi, inferne pallidi, superne brunneo-purpurei, basi attenuati, obtusi, in rostrum sublongum teres latum parce hispidulum bidentatum (dentibus leviter divergentibus) subsensim desinentes. Nux sublaxe inclusa, elliptico-obovoidea, trigona, faciebus concavis. Stigmata 3.

KENYA COLONY: Nyanza Province; Mount Elgon, on banks of stream, 3240 m., 20 Feb. 1935, G. Taylor 3474.

C. Preussii K. Schum., from West Africa, which Kükenthal placed as a variety of *C. longipedunculata*, K. Schum. seems to me specifically distinct. It is closely related to *C. simensis* Hochst. ex A. Rich., *C. longipedunculata*, and *C. cuprea* (Kükenth.) Nelmes.

Another West Tropical African plant, Mann 2099, which Kükenthal cites under *C. simensis*, is for me varietally related to *C. Preussii*. There are three excellent sheets of Mann's gathering at Kew, but the two rather poor specimens of *C. Preussii* are at Berlin.

C. Preussii K. Schum., affinis *C. simensis* Hochst. ex A. Rich., sed vaginis aphyllis brunneis basilaribus, foliis angustioribus, spicis paucioribus brevioribus tenuioribus et minus densifloris, squamis femineis brunneis, utriculis brevioribus et minoribus praecipue differt.

Culmi ad 70 cm. alti, subvalidi, triquetri, angulis inferne laevibus superne scabridis, foliati, basi vaginis aphyllis brunneis circumdati. Folia 5-6 mm. lata, culmis breviora, plana vel leviter revoluta, attenuata, pallide viridia, vaginis basilaribus brunneis. Spicae 4-5, cylindricae, 3-4.5 cm. longae (pedunculo excluso), subdensiflorae, cernuae, gynaeandreae (terminalis fere 50 pro centum, caeterae breviter masculae), superiores pedunculatae et subdistantes, inferiores longi-pedunculatae et distantes; pedunculi filiformes, angulis scabridis. Bracteae inferiores foliaceae, inflorescentia breviores, longivaginantes, spicis superioribus vix bracteatis. Squamae femineae ovato-ellipticae, brunneae, subobtusae, carinatae, carina pallide viridi, in mucronem excurrentes. Utriculi squamis longiores, circiter 4.5 mm. longi, suberecti, membranacei, trigoni, elliptico-lanceolati, straminei, brunneo-maculati, glabri, prominenter plurinervi, basin versus attenuati, punctati, in rostrum longum laevem bidentatum (dentibus subdivergentibus), sensim desinentes. Nux oblongo-elliptica, trigona, arcte inclusa. Stigmata 3.

BRITISH CAMEROONS: Cameroons Mountain, slope near Mann's Spring, 2600 m., 4 Feb. 1891, Preuss. 727.

Spicae 4-6, 3-5.5 cm. longae. Utriculi circiter 5 mm. longi, haud maculati, basi contracti, in stipitem brevissimum desinentes.

BRITISH CAMEROONS: Cameroons Mountain, 2130-3000 m., Dec. 1862, Mann 2099. This number was included by Kükenthal in Engl. Pflanzenr., IV. 20, 654 (1909), under *C. simensis*.

C. longipedunculata, subsp. *cuprea* Kükenth., is, I consider, of specific rank, and is closely related both to *C. longipedunculata* itself and to *C. Preussii*. It has larger, broader utricles than these species, and the beak of the utricle also differs by being usually sparsely hispidulous. *C. simensis*, var. *stolonifera* (Boeck.) Kükenth., based on Schimper's no. 1298 from Abyssinia, also belongs here, as suggested by Kükenthal at a later date on the type sheet in the Berlin Herbarium, and in Notizbl. Bot. Gart. Berl., 9, 316 (1925).

Several other gatherings are more closely allied to *C. cuprea* than to any other species, but further study and more material are needed before their position can be exactly determined: (1) Stolz 2392, from N. of Lake Nyasa, is immature but seems to differ from *C. cuprea* only in having a longer beak to the utricle; (2) a very scrappy specimen collected by Sir Evan James on the Aberdare Mountains, Kenya, is a rather smaller-fruited *C. cuprea*; while, lastly, (3) Scott Elliot 7578, from the Ruwenzori district, and G. Taylor 1897 from the Virunga Mountains, Uganda, show a still further slight reduction in size and length of utricle. These appear to belong here rather than to *C. Preussii*, the utricle of which is narrower in proportion to its length, and has a smooth beak.

Owing to the contrast between the fuscous glumes of *C. longipedunculata* and the bright copper-coloured ones of *C. cuprea*, the colour difference between the two species is striking. This is enhanced by the relative size of the utricles. The smaller, duller utricles of *C. longipedunculata* are concealed by the glumes, while the larger, brighter ones of *C. cuprea* make their glumes look small. As the beak of the utricle in both these species is of a similar length (c. 1 mm.) it is relatively much shorter in *C. cuprea*, where the whole utricle is between 5 and 6 mm. long, while that of *C. longipedunculata* is only about 4 mm. The length and size of the culms, the width of the leaves, and the colour of the sheaths are similar in the two species.

C. cuprea (Kükenth.) Nelmes, comb. nov.; affinis *C. longipedunculatae* K. Schum. sed utriculis longioribus latioribus valde nervosis plerumque rostratis marginibus parce hispidulis praecipue differt.

C. aethiopica Schkuhr var. *stolonifera* Boeck. in Linnaea, 41, 286 (1877).

C. simensis Hochst. ex A. Rich. var. *stolonifera* (Boeck.) Kükenth. in Engl. Pflanzenr. IV. 20, 654 (1909).

C. longipedunculata K. Schum. subsp. *cuprea* Kükenth. in Notizbl. Bot. Gart. Berl. 9, 315 (1925).

Khazoma breviter-stoloniferum. Culmi 0.8-1 m. alti, modice validi, inferne scabridi, triquetri. Folia culmo multo breviora, 7-9 mm. lata, plana, superiora infra et marginibus scabrida, coriacea, in acumen acutum sensim desinentes. Spicae 4-6, gynaeandreae, terminalis longe caeterae brevius masculae, cylindricae, crassae, densiflorae, 3-5 cm. longae (pedunculo excluso), cernuae, superiores subapproximatae, subsessiles vel breviter pedunculatae, inferiores longe pedunculatae; pedunculi superne angulis scabridi, filiformes. Bractae inferiores foliaceae, inflorescentia breviores, longe vaginantes infra et marginibus scabridae. Squamae femineae oblongo-ovatae, utriculis breviores et saepe angustiores, cupreae, carinatae, carina in mucronem excurrente. Utriculi 6 mm. longi, conspicue trigoni, late ellipsoidei, demum subpatuli, membranacei, pallide virides, glabri, valde nervosi, basi subattenuati, in rostrum mediocriter bidentatum marginibus parce hispidulum subabrupte abeuntes. Nux arcte inclusa, trigona, lateribus concavis. Stigmata 3.

KENYA COLONY: Mount Kenya; Forest Station, in marsh, 2300 m., 27 Dec., 1921, Fries 405; ibid., in a grassy plain, 4 Jan., 1922, Fries 734; Mt. Aberdare; on the boundary between hill forest and bamboo region, 3 April, 1922, Fries 2763.

ABYSSINIA: near Gafat, 2700 m., 22 Aug., 1863, Schimper 1298.

XXXVII—RESEARCHES ON *SILENE MARITIMA* AND *S. VULGARIS*: XXI.* E. M. MARSDEN-JONES AND W. B. TURRILL. FURTHER RESEARCH ON THE GENETICS OF ANTHOCYANIN AND OTHER CHARACTERS IN *S. maritima*.

In K.B. 1929 descriptions were published of *S. maritima* stock-plant A. 12 (p. 150) and stock-plant A. 15 (p. 151). In K.B. 1932, 230, the results of selfing stock-plant A. 12, and in K.B. 1936, 446, the results of selfing stock-plant A. 15 were published. In K.B. 1932, 229 seq., and in K.B. 1935, 215, the results of breeding stock-plant A. 12 with certain other *S. maritima* stock-plants are recorded. The interesting ratios obtained and the difficulty of explaining them made it desirable to extend the research by crossing another anthocyanin-containing stock-plant with S.P. 12 (a plant wholly free from anthocyanin). The stock-plant chosen, A. 15, had very narrow leaves and very much anthocyanin in all parts, except for having white stigmata.

The following scheme shows the series of families made:—

- F₁ N. 33. A. 15 × A. 12
F₂ N. 131 = N. 33 plant 23 selfed. 75 plants.
N. 132 = N. 33 plant 23, female flowers pollinated from hermaphrodite flowers on the same plant. 21 plants.
N. 133 = N. 33 plant 22 selfed. 58 plants.
N. 134 = N. 33 plant 1 selfed. 56 plants.
N. 135 = N. 33 plant 5 selfed. 45 plants.

* Continued from K.B. 1937, 492.

N. 33. 43 plants in the family.

Habit: semi-prostrate, uniform.

Stems: up to 3.5 dm. high, with much anthocyanin.

Leaves: intermediate in shape and colour between those of the parents, uniform.

Inflorescence: with from 3 to 7 flowers, which are erect and actinomorphic.

Calyx: narrow-cylindric, with much anthocyanin.

Corolla: with the petals overlapping, segments not overlapping, or contiguous, all bilobed, lobed $\frac{1}{2}$, with good scales, 16 with blotch: 27 with no blotch.

Androecium: filaments all purple; anthers all purple; plants all with hermaphrodite flowers.

Gynoecium: stigmata 33 purple: 10 white; immature seeds all purple.

Fruits: 33 broadly ovoid: 5 obloid.

Seeds: all armadillo.

CHARACTERS OF F₁ PLANTS SELFED.

- Plant 1. No petal blotch; stigmata purple; fruits broadly ovoid.
5. No petal blotch; stigmata purple; fruits broadly ovoid.
22. No petal blotch; stigmata white; fruits broadly ovoid.
23. With petal blotch; stigmata white; fruits broadly ovoid.

F₂ FAMILIES.

Habit: semi-prostrate, uniform.

Leaves:

	As A. 15	Intermediate	As A. 12
N. 131 ...	15	49	8
N. 132 ...	1	19	1
N. 133 ...	3	54	0
N. 134 ...	8	47	0
N. 135 ...	3	38	0
Totals ...	30	207	9

Anthocyanin in vegetative parts:

	Very much	Much	Medium	Little	None	Presence : Absence
N. 131 ...	8	14	32	0	21	2.7 : 1
N. 132 ...	1	9	6	0	5	
N. 133 ...	0	30	11	0	17	2.4 : 1
N. 134 ...	6	26	20	0	4	13 : 1
N. 135 ...	6	21	6	0	12	2.75 : 1
Totals ...	21	100	75	0	59	3.3 : 1

	Very much	Much	Medium	Little	None
N. 131 ...	1	8	39	0	21
N. 132 ...	0	4	8	0	4
N. 133 ...	0	13	25	0	17
N. 134 ...	4	6	29	7	4
N. 135 ...	5	6	11	1	12
Totals ...	10	37	112	8	58

Calyx shape :

	Narrow-cylindric	Ellipsoid
N. 131 ...	36	29
N. 132 ...	5	10
N. 133 ...	31	19
N. 134 ...	38	10
N. 135 ...	29	2
Totals ...	139	70

Corolla : petals all bilobed, with $\frac{3}{4}$ lobing, and with well-developed scales.

	Petals overlap	Petals diverge	Segs. overlap	Segs. diverge	Blotch	No blotch
N. 131 ...	61	2	59	4	20	44
N. 132 ...	15	0	15	0	4	11
N. 133 ...	48	0	4	44	2	46
N. 134 ...	41	0	2	39	5	37
N. 135 ...	24	1	3	22	6	19
Totals ...	189	3	83	109	—	—

Androecium and sex :

	Anthers purple	Anthers yellow-green	Fila-ments purple	Fila-ments white	Flowers herma-phrodite	Flowers herma-phrodite and female	Flowers female
N. 131 ...	30	13	10	33	31	11	22
N. 132 ...	10	1	10	1	4	7	4
N. 133 ...	12	3	8	7	13	2	33
N. 134 ...	25	3	18	10	24	4	14
N. 135 ...	13	2	13	2	13	2	10
Totals ...	90	22	59	53	—	—	—

	Stigmata purple	Stigmata white	Immature seeds purple	Immature seeds white
N. 131 ...	29	35	41	19
N. 132 ...	9	6	12	4
N. 133 ...	24	23	35	12
N. 134 ...	26	15	40	4
N. 135 ...	17	8	18	11
Totals ...	—	—	146	50

Fruits and seeds :

N. 131 ...	Fruits all broadly ovoid ; seeds all armadillo.
N. 132 ...	Fruits all broadly ovoid ; seeds all armadillo.
N. 133 ...	Fruits all broadly ovoid ; seeds all armadillo.
N. 134 ...	Fruits all broadly ovoid, except 1 obloid ; seeds all armadillo.
N. 135 ...	Fruits all broadly ovoid ; seeds all armadillo.

DISCUSSION:

Habit : semi-prostrate, typical *S. maritima* habit was shown by all plants, parents, F_1 , and F_2 .

Leaves : a narrow-leaved and a relatively broad-leaved plant were crossed together ; the F_1 was intermediate and the F_2 showed segregation. Scoring in F_2 into classes was difficult, and only plants which could definitely be placed in one or other of the two grand parental classes were separated from the intermediate mass. The ratio for the total figures is 3.3 as A. 15 : 23 intermediate : 1 as A. 12. It may be noted that plants with leaves like A. 12 appeared only in the F_2 derived by selfing one plant (N. 33 plant 23).

Anthocyanin in vegetative parts : a plant with very much anthocyanin was crossed with a plant containing no anthocyanin in any of its parts. The F_1 was uniform, with an intermediate amount of anthocyanin in the vegetative parts. The figures given above are for plants raised to maturity. In addition, all seedlings were scored for presence or absence of anthocyanin. Adding the two sets of figures together the following results were obtained :

Family	Anthocyanin present	Anthocyanin absent	Ratio
N. 131 and N. 132 ...	335	116	2.9 : 1
N. 133 ...	159	87	1.8 : 1
N. 134 ...	319	94	3.4 : 1
N. 135 ...	195	42	4.6 : 1
Totals ...	1,008	339	3.0 : 1

The above figures, in spite of unexplained differences in the ratios for certain of the families, probably represent a 3 : 1 ratio.

in N.S. 1932, pp. 236-8 we published results that suggested that stock-plant A. 12 had the factorial composition, for anthocyanin absence in the vegetative parts, aaBBii—A and B being complementary factors, both necessary for the production of anthocyanin in the vegetative parts; and I an inhibitor for such colour production and distribution. The results published in this paper support this interpretation. Stock-plant A. 15 would, on the basis of the same experiments, and using the same set of symbols, have the composition AABBi. Thus on crossing A. 15 with A. 12, the F_1 should uniformly have anthocyanin, as it did, and the F_2 should segregate in the ratio 3 : 1, as it did for the total of the families.

A. 15 was known to segregate on selfing for degree of anthocyanin development, and segregation of a similar kind also occurred in the F_2 families from F_1 plants with somewhat diluted anthocyanin. There are probably two or more factors concerned with intensification and dilution of anthocyanin coloration in the vegetative parts.

The importance of large families, and preferably the scoring of all plants raised from seed, is indicated by the different ratios obtained when only adult plants were scored and when all seedlings were also included. It is difficult to avoid unconscious selection in planting out a sample from the seed boxes.

Anthocyanin in calyx: the figures suggest strongly that the same set of factors act, for anthocyanin presence or absence and for degree of development, in the calyces as in the vegetative parts. The differences in the actual figures are due to the fact that not all plants flowered and some could not, therefore, be scored for calyx characters, and probably a time (or position) factor is also involved. The totals for plants with coloured calyces show a less intensity of anthocyanin development compared with the totals for anthocyanin in vegetative parts. It is interesting to recall that when indumentum is present in *Silene vulgaris* (or hybrids) it "is most dense a few internodes above the base and ends completely below the last pair of foliage leaves. We have never seen pubescence in the inflorescence region or on the calyx" (K.B. 1931, p. 125). Our considerable additional experience since 1931 confirms this statement. Thus, though the genes for indumentum are present above their place of (or beyond their time of) action, since they are transmitted through the gametes, they cease action below the inflorescence region, or, as it may also be expressed, at a certain time in full life-history development. It is suggested that this compares with the action of the anthocyanin gene-complex, but that the action of the latter is less reduced.

Calyx shape: the original cross was between a plant with a narrow-cylindric calyx (A. 15) and one with an ellipsoid calyx (A. 12). F_1 had uniformly narrow-cylindric calyces. F_2 showed segregation in the ratio 2 : 1.

Corolla: the parents and F_1 had overlapping (or contiguous) petals. F_2 had 3 plants, out of a total of 192 scored, some, at least,

of whose flowers showed petals diverging (not overlapping or contiguous). These were probably fluctuations due to non-genetical factors. A. 15 had segments diverging, A. 12 had segments overlapping or contiguous. F_1 had segments all diverging. F_2 showed segregation in different (and obscure) ratios for the different families. A. 15 had an anthocyanin blotch, A. 12 had no blotch. F_1 showed segregation as did all F_2 families. Obviously an inhibiting effect must have been present in some F_1 plants.

Androecium: A. 15 had purple anthers and filaments, A. 12 had yellow-green anthers and white filaments. F_1 plants had all purple anthers and filaments. F_2 families all segregated, the plants with coloured androecium being predominant.

Sex: A. 15 and A. 12 were hermaphrodite, but segregated on selfing into hermaphrodite and female. All F_1 plants, at the time of scoring, were hermaphrodite. All F_2 families showed segregation. As data for sex genetics in *Silene* are being collected no further discussion of the subject is undertaken here.

Stigmata: A. 15 and A. 12 had white stigmata; A. 15 segregated for this character on selfing; A. 12 bred true on selfing. F_1 showed segregation, a cross between two plants with white stigmata giving 33 coloured : 10 white. F_2 families all showed segregation, whether obtained by selfing F_1 plants with purple or sibs with white stigmata. There appear to be both the action of complementary genes and inhibiting effects shown by the results.

Immature seed colour: A. 15 had purple and A. 12 white immature seeds, and bred true on selfing for this character pair. F_1 had all purple seeds. F_2 families all segregated and their summated figures gave a ratio of 3 coloured : 1 white.

Fruits: A. 15 had obloid and A. 12 broadly ovoid fruits. F_1 showed segregation. F_2 families, from broadly ovoid F_1 plants, showed all broadly ovoid capsules, except one plant in N. 134, with obloid capsules. As previously recorded, capsule shape shows much fluctuation and it is sometimes impossible to be certain of the exact class into which capsules from a given plant should be scored.

Mature seeds: parents, F_1 , and F_2 plants all showed the recessive character of armadillo seeds.

SUMMARY.

Two plants of *S. maritima* were crossed together. The ovule parent (A. 15) had very much anthocyanin in all parts, except the stigmata; the pollen-parent (A. 12) was entirely devoid of anthocyanin in all parts. The F_1 plants uniformly showed much anthocyanin in all parts, except for segregation in the stigmata. The F_2 families showed segregation for colour in all organs. From the results detailed in this paper and from results of other experiments previously published in this series it is clear that complementary and inhibiting genes are both involved in colour presence or absence. In addition, it now seems probable that one set of genes is basically

responsible for anthocyanin development wherever it occurs in the plant. Locally or temporally acting modifiers, however, intensifying, diluting, or inhibiting, prevent, when they are present, uniformity of action by this basic set in all parts developing successionally on a given shoot system of any one individual. Modifying effects are the product of: (1) genes of strictly circumscribed action; (2) genes whose action is less pronounced in later growth phases of a given shoot; and (3) factors environmental to gene action.

Other characters whose genetic inheritance is considered are: habit, leaf-shape, calyx-shape, overlapping of petals and segments, sex, fruit-shape, and sculpturing of testa.

The research on which this paper is based has been aided by a Royal Society Government Grant.

XXXVIII—EXTRA-FLORAL NECTARIES ON OSMANTHUS LEAVES. C. R. METCALFE.

Sir John Farmer, F.R.S., recently drew attention to the fact that drops of liquid are secreted from glands on the lower surfaces of the leaves of various species of *Osmanthus* where they are situated at the base of the lamina, just above the short petioles. He noted that the drops are not secreted very frequently during the winter months, and in the commonly cultivated species, *O. ilicifolius* Mouillef., the maximum secretion was observed during the summer when considerable numbers of wasps were attracted to the bushes.

The earliest account of the secretion of drops of liquid from the leaves of *Osmanthus* that has been traced is that written by Delpino in 1886 (1). His description is given under the name *Olea fragrans*, which is a synonym for the plant now known as *Osmanthus fragrans*. He states that numerous pits occur on all parts of the lower surface of the leaf, at the base of each of which there is generally a single glandular trichome. In a few of the pits two or three trichomes were present, whilst at the bases of the leaves there were six to ten or even greater numbers of trichomes. The larger aggregates of trichomes were classified as nectaries because they secreted drops of sugary liquid at certain times of year, notably in August. Delpino also mentions that no secretion from the solitary trichomes was apparent.

Since then the nectaries on the leaves of *Osmanthus* do not appear to have attracted much attention, although the existence of similar bodies has been recorded in a number of other genera of the *Oleaceae*. More recently Zimmermann (2) in a long account of the morphology of extra-floral nectaries and their occurrence amongst different families of Angiosperms, refers to Delpino's description of *Olea fragrans* without mentioning that this species is now known as *Osmanthus fragrans*.

In view of the fact that no first hand observations on the nature of the secretory glands and the time of year at which they are most

active, appear to have been recorded since Delpino's account was published, a number of *Osmanthus* bushes at the Royal Botanic Gardens, Kew, were kept under observation during 1937. The species to which most attention has been paid is *O. ilicifolius*, in which the nature and distribution of the nectaries so closely resemble those of *O. fragrans* that Delpino's remarks seem to be equally applicable to both species. It seemed worth while, however, to examine the glands in rather more detail and also to publish figures showing their microscopical structure, which has not previously been done.

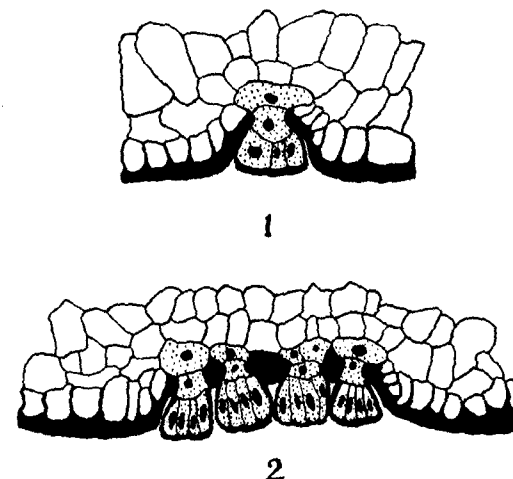


Fig. 1. Transverse section through solitary trichome on under surface of leaf of *Osmanthus ilicifolius*.

Fig. 2. Transverse section through group of trichomes forming a small nectary. Both $\times 265$.

A transverse section passing through one of the solitary trichomes on the under surface of a leaf of *Osmanthus ilicifolius* is illustrated in fig. 1, whilst part of a group of them constituting one of the smaller nectaries is shown in fig. 2. Each trichome consists of a head of parenchymatous cells with dense protoplasmic contents and large nuclei supported by a short stalk, usually consisting of one cell, which arises directly from a sunken part of the lower epidermis. Many of the mesophyll cells near the trichomes are also filled with dense protoplasmic contents and possess large nuclei, but this is not shown in the figures for the sake of simplicity. The outer walls of the epidermal cells are covered by a thick cuticle shown in black. Zimmermann (l.c.) states that the heads of the glandular trichomes of the *Oleaceae* differ from those in other families in having no cuticle. This does not seem to apply in the case of *Osmanthus ilicifolius*, where microchemical tests indicate the presence of cuticle in this region, although it is not so thick as on the outer walls of the adjacent epidermal cells. The cuticle on the stalk cells is so thick that it fills the spaces between neighbouring trichomes. Where the trichomes are not contiguous the epidermal cells between them are also provided with a thick cuticle.

It has been possible to confirm that at certain times of year the glands secrete drops of sugary liquid which are a great source of attraction to wasps. It is noteworthy, however, that although nectaries are always present on the leaves, those on some bushes secrete far more actively than those on others. Warm humid conditions appear to favour secretion, and it is interesting to watch the manner in which the wasps are attracted directly to the glands. They very rarely alight on the upper surfaces of the leaves where there are no glands, whilst on the lower surfaces they land as close to the nectaries as possible. They never search for them at the distal ends of the leaves. The proportion of leaves on which the glands are secreting varies from time to time throughout the day as well as on consecutive days. When secretion is not proceeding actively, very few or no wasps were to be seen near the bushes. It has not been found possible to stimulate secretion during the winter by placing cut shoots in water under bell jars in a warm greenhouse, although this treatment is often effective on summer days when secretion is not proceeding out of doors.

It is very tempting to speculate whether the visits of the wasps confer any benefit on the plants, but it seems more reasonable to suppose that the glands serve merely for the excretion of excess carbohydrate. The fact that wasps are attracted probably has no greater significance than the visits made by these insects to apple orchards to obtain nourishment from the fruit.

REFERENCES.

1. DELPINO, F. *Funzione mirmecofila nel Regno Vegetale*, part 1, 106, Bologna (1886).
2. ZIMMERMANN, J. G. "Über die extrafloralen Nektarien der Angiospermen," in *Beihfte Bot. Centralbl.* 49, Abt. 1, 99 (1932).

XXXIX—THE CORRECT NAME OF THE COMMON PARSLEY. H. K. AIRY-SHAW.

In H. Wolff's account of the genus *Petroselinum* (in Engl. Pflanzenr. iv. 228. Heft 90. 63: 1927), the name of the common parsley is given as *P. hortense* Hoffm. (Gen. Pl. Umbellif. 163, 166 [explic. iconum]: 1814). In synonymy, however, are quoted the earlier names *Apium vulgare* Lam. (Fl. Franç. 3, 444: 1778), *A. laetum* Salisb. (Prodr. Hort. Chap. Allert. 169: 1796), *A. romanum* Zuccagni (in Roem. Collect. 135: 1809), and further, under the varieties *latifolium* and *crispum*, the still earlier names *Apium latifolium* Mill. and *A. crispum* Mill. (Gard. Dict. ed. 8: 1768). It is thus evident that the adoption of the name *P. hortense* is contrary to the rule of priority (Art. 16). In any case the name was not validly published by Hoffmann,* being unaccompanied by any

* The name *Petroselinum sativum* Hoffm. l.c. 178 (in indice), on the other hand, is validly published, since a description is provided on the page (78) referred to.

synonym or "reference to a previously and effectively published description," and the figure consisting exclusively of dissections (not a "plate or figure with analyses": see Art. 37, Intern. Rules ed. 3, 10: 1935).

Miller (l.c.) described the parsley under three distinct species: *Apium Petroselinum* L., *A. crispum* Mill. and *A. latifolium* Mill. The first is not explicitly cited by Wolff either under the species *P. hortense* or under a variety. The Linnean epithet *Petroselinum* is unfortunately precluded from use under the tautonym rule. The specific epithet *latifolium* has apparently never yet been employed under the generic name *Petroselinum*. The epithet *crispum*, however, was (as noted by Wolff) employed under this genus in synonymy, for some unexplained reason, by Nyman, Consp. Fl. Eur. 309 (1879). This does not, of course, constitute valid publication: see Art. 40. But the combination has been taken up in the Kew Hand-List of Herbaceous Plants, ed. 3, 122 (1925), and attributed to Nyman; and it appears that it must be regarded as validly published in that place. (Cf. Sprague and Green on *implicit* citation in the case of the generic name *Epipogium*, in Kew Bull. 1937, 475).

The correct nomenclature and relevant synonymy of the parsley and of the varieties recognized by Wolff will therefore be as follows:—

***Petroselinum crispum* (Mill.) Nym.** [Consp. Fl. Eur. 309 (1879), pro syn. *P. sativi* Hoffm.] *ex auct. anon.* in Hand-List Herb. Pl. Kew, ed. 3, 122 (1925).

Apium Petroselinum L. Sp. Pl. ed. 1, 264 (1753); Mill. Gard. Dict. ed. 8 (1768).

A. Petroselinum α *angustifolium* Hayne, Getr. Darst. u. Beschr. Arn. Gebr. Gewächse, 7, t. 23 (1821).

Carum Petroselinum (L.) Benth. in Benth. et Hook. f. Gen. Pl. 1, 891 (1867).

Petroselinum Petroselinum (L.) Karst. Deutsche Fl. Pharm.-medic. Bot. 831 (1880-83).

Selinum Petroselinum (L.) E. H. L. Krause in Sturm's Fl. Deutschl. ed. 2, 12, 41 (1904).

var. ***crispum* (Mill.) Airy-Shaw**, comb. nov.

Apium crispum Mill. l.c.

A. Petroselinum var. *crispum* (Mill.) Willm. Alph. Enum. Pl. Hort. Kew. 16 (1798); Pers. Syn. 1, 324 (1805).

A. Petroselinum γ *crispifolium* Hayne, l.c.

Petroselinum vulgare S. F. Gray var. *crispum* (Mill.) S. F. Gray, Nat. Arr. Brit. Pl. 2, 524 (1821).

A. Petroselinum var. *vulgare* Nois. Man. Compl. 2, 421 (1825).

P. sativum Hoffm. var. *crispum* (Mill.) Gaud. Fl. Helv. 2, 423 (1828); DC. Prodr. 4, 102 (1830); Alef. Landwirthsch. Fl. 152 (1866).

P. sativum subvar. *crispum* (Mill.) Coss. et Germ. Fl. Env. Par. ed. 2, 254 (1861).

P. sativum var. *vulgare* (Nois.) Alef. l.c.
Carum Petroselinum var. *crispum* (Mill.) Beck, Fl. Niederösterr. 1, 621 (1892).

Petroselinum hortense Hoffm. var. *crispum* (Mill.) Bailey, Man. Cult. Pl. 564 (1924); Wolff in Engl. Pflanzenr. l.c. 65 (1927).

var. *latifolium* (Mill.) Airy-Shaw, comb. nov.

Apium latifolium Mill. l.c.

A. Petroselinum var. *latifolium* (Mill.) Hayne, l.c.

Petroselinum vulgare var. *latifolium* (Mill.) Gray, l.c.

P. sativum β *latifolium* (Mill.) Gaud. l.c.; Alef. l.c.

P. sativum subvar. *latifolium* (Mill.) Coss. et Germ. l.c.

P. sativum var. *silvestre* Alef. l.c.

Carum Petroselinum var. *typicum* Beck, l.c.

Petroselinum hortense var. *latifolium* (Mill.) Wolff, l.c.

var. *anatolicum* (Freyn et Sint.) Airy-Shaw, comb. nov.

Petroselinum anatolicum Freyn et Sint. ex Freyn in Österr. Bot. Zeitschr. 44, 99 (1894).

P. hortense var. *anatolicum* (Freyn et Sint.) Wolff, l.c.

XL—ANATOMY OF FRAXINUS OXYCARPA AND F. PALLISAE.* C. R. METCALFE.

The wood structure of the genus *Fraxinus* is so conservative that many of the species which are used commercially cannot be distinguished with certainty when only the timber is available for identification. This is shown by the descriptions and photomicrographs of the North American species of *Fraxinus* given by Professors Record (4) and Brown (1) in their respective books. Chalk and Rendle (2) also note that the structure of the various species of *Fraxinus* is very uniform. The wood structure of the genus has also been examined by Sax and Abbe (5). These authors state that the secondary xylem of *Fraxinus* exhibits characters which differentiate it rather sharply from that of various other genera of the *Oleaceae* which they examined. They give a single brief description of the wood structure to cover the various species which they examined, and they, like the authors already mentioned, found the interspecific differences to be small, and do not deal with them in detail in their account. It is not, therefore, surprising that no reliable anatomical characters have been found in the 5-year old stems (coll. H. G. Tedd, Thrace: Mesta Delta) of the closely related species *F. oxycarpa* and *F. Pallisae*, whereby they may be distinguished from one another. The stems are provided with a thin, smooth bark. The wood is whitish when freshly cut, but darkens to a light brown on exposure. Cross sections show that the wood is markedly ring-porous.

*This paper supplements the author's appendix to Anderson & Turrill's account in New Phyt. 37, 160 (1938).

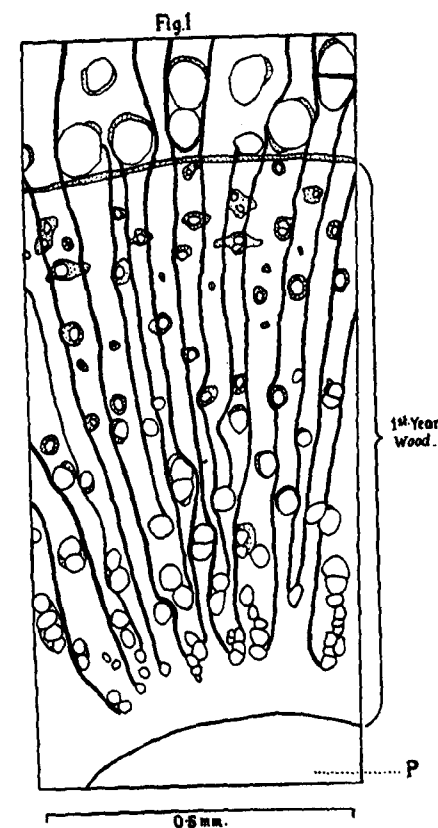


Fig. 1. Transverse section of first, and beginning of second year wood in a stem of *Fraxinus oxycarpa*. Dotted areas represent parenchyma. Solid black lines represent medullary rays.

MICROSCOPICAL STRUCTURE OF THE WOOD. (Fig. 1.) *Vessels*.—Radial diameter of solitary vessels in the early wood 40–108 μ , those in late wood 17–40 μ , but majority seldom exceeding 17 μ . Pores solitary or in multiples of 2 or rarely 3. Individual pores of a multiple usually radially disposed, although tangential multiples present in places. Mostly in irregular clusters. Vessels of late wood predominantly solitary, generally more or less completely surrounded by a single layer of parenchyma cells, thus having an appearance recalling that of secretory canals. Small vessels of late wood have thicker walls than the large vessels of the early wood. Vessels situated nearest to the pith mostly in radially disposed chains of 5 or more. Vessel perforations simple, mostly horizontal or slightly oblique. Pits between vessels small, circular, with horizontal apertures. Vessel-ray pits similar. *Fibres*.—Groundwork of wood composed of rather thin-walled fibre-tracheids, mostly hexagonal in transverse section, but the smaller ones quadrilateral. Pits numerous on radial walls, mostly with obliquely orientated apertures,

sometimes crossed. Apertures of pits sometimes extending beyond the border. *Parenchyma*.—Chiefly in concentric zones 1-3 cells broad at boundaries between consecutive seasons growth (terminal parenchyma). Paratracheal parenchyma also present, partly surrounding the larger vessels or vessel multiples of the early wood. Smaller vessels of late wood often completely surrounded by (vasicentric) parenchyma. The latter sometimes with short aliform extensions, the latter rarely uniting individual vessels or vessel-multiples. *Rays*.—Uniseriate and biseriate. Biseriate rays with uniseriate endings (tangential section). Heterogeneous, majority of cells procumbent. Upright cells mostly situated at the margins of rays. Rays 2-33 (mostly 4-20) cells high.

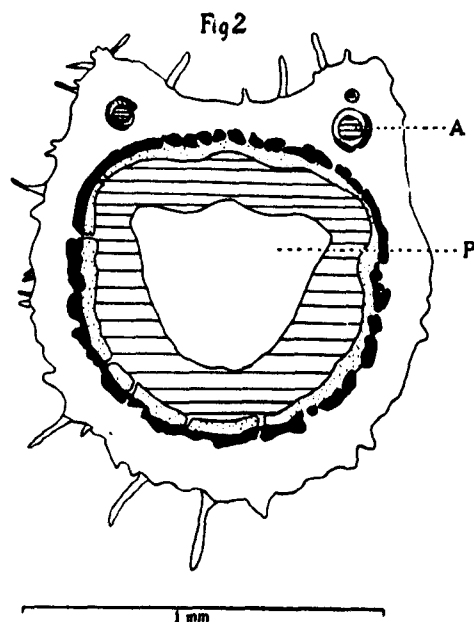
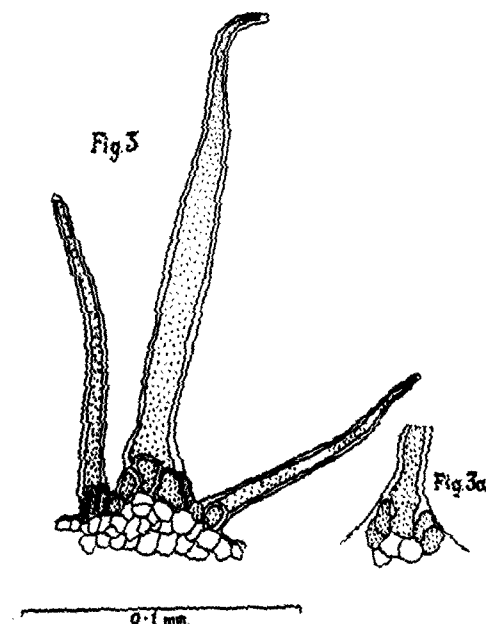


Fig. 2. Transverse section passing through the centre of the petiole of *Fraxinus Pallisae*. A. Accessory vascular strand. P. Pith. Xylem marked by parallel lines. Phloem marked by dots. Sclerenchyma solid black.

PETIOLE STRUCTURE.—Petit (3), referring to the petiole of *Fraxinus excelsior* says:—"Le système libéro-ligneux se compose d'un anneau central et de quatre petits anneaux latéro-supérieurs. Ces anneaux sont entourés de fibres scléreuses." The same type of structure is characteristic of the petiole of *F. oxycarpa* and *F. Pallisae*. In transverse section the adaxial surface is generally concave and the abaxial surface roughly circular (Fig. 2). Within the small-celled epidermis there are 3-4 layers of collenchymatous tissue, surrounding a cortex of rather loosely arranged parenchyma cells. Passing towards the centre, the stele is enclosed in a sheath of sclerenchyma external to the phloem. Some of the medullary rays extend from the xylem across the phloem to the

sclerenchyma. In some instances the ray cells tend to take up lignin stains, so that the phloem appears as if it were divided into separate compartments in double stained sections. Within the phloem is a continuous xylem ring, and the centre of the petiole is occupied by a solid parenchymatous pith. On the adaxial side of the petiole there are generally 2 or sometimes more separate vascular strands, consisting of xylem at the centre more or less completely surrounded by phloem. Outside the phloem a complete or interrupted ring of sclerenchyma is present. These subsidiary vascular strands, which arise as branches from the main central one, sometimes themselves give rise to further strands, so that in some parts of certain petioles several subsidiary strands may be seen in addition to the normal 2. From other petioles, on the contrary, subsidiary vascular strands are absent altogether.



Figs. 3 and 3a. Epidermal hairs from the petiole of *F. Pallisae*.

When sections of *F. oxyphylla* and *F. Pallisae* were first examined it was noted that the subsidiary strands in *F. Pallisae* were very considerably larger in diameter than those in *F. oxyphylla*, and it was hoped that this difference might serve as a diagnostic feature for the two species. Since then, however, sections of a number of petioles from both species have been examined, and it has been found that the size and number of the subsidiary vascular strands varies considerably. The only feature of the petiole which appears to be reliable for separating the two species is that unicellular hairs, with rather thick walls are present in *F. Pallisae* and absent from *F. oxycarpa*. These hairs are somewhat swollen at the base,

but taper to an apical point (Figs. 3 and 3a). Fig. 3 shows a group of these hairs with the bases, as seen in most sections, surrounded by rather enlarged epidermal cells, often with granular contents. Fig. 3a shows the appearance of the base of a single hair in a section passing through its centre. The hairs are specialized epidermal cells with thickened walls, and are generally filled to a greater or less extent with granular material.

LITERATURE

1. BROWN, H. P. and PANSHIN, A. J. "Identification of the Commercial Timbers of the United States." McGraw-Hill Book Co. (1934).
2. CHALK, L. and RENDLE, B. J. "British Hardwoods, their Structure and Identification." *Dept. Sci. and Industrial Res., For. Products Res. Bull. No. 3.* London, H.M. Stationery Office (1929).
3. PETIT, L. "Le Pétiole des Dicotylédones au point de vue de l'anatomie comparée et de la Taxonomie." *Thèse Fac. Sci. Paris* (1887).
4. RECORD, S. J. "Identification of the Timbers of Temperate N. America." New York, John Wiley and Sons (1934).
5. SAX, K. and ABBE, E. C. "Chromosome Numbers and the Anatomy of the secondary Xylem in the Oleaceae." *Journ. Arn. Arboretum*, 13, 37-48 (1932).

XLI—A NEW EUGENIA FROM ASSAM. KALIPADA BISWAS.

Eugenia assamica Biswas et Purkayastha, sp. nov.; foliis majoribus obovatis vel obovato-ellipticis coriaceis, venis lateralibus intra marginem arcuatim anastomosantibus, fructu magno ellipsoideo siccitate extus rugoso distinguenda.

Arbor magna, 20-22 m. alta, cortice rugoso. *Folia* breviter petiolata, obovata vel obovato-elliptica, superne late rotundata, abrupte breviter acute cuspidata, inferne deltoideo-angustata, 24-40 cm. longa, 11.5-19 cm. lata, integra, coriacea, glabra, venis lateralibus multis subhorizontalibus prominentibus 1-2.5 cm. remotis intra marginem arcuatim anastomosantibus; petioli 2-3 cm. longi. *Cymae* laxae, pauciflorae, e ligno vetere ortae, minute bracteatae, bracteis lanceolatis acutis 8 mm. longis 2 mm. latis. *Flores* pedicellati, pedicellis 0.5-1.5 cm. longis rugosis. *Calyx* 1-1.5 cm. longus, apice circiter 1 cm. latus, obconico-campanulatus, in sicco extus rugosus, 4-lobulatus, lobulis persistentibus crassis rotundatis vel obtusissimis concavis circiter 5-6 mm. diametro in sicco coriaceis. *Petala* 4, alba, decidua, concava, rotundata, 5-8 mm. diametro, membranacea, glabra. *Stamina* numerosa, 1.5-1.8 cm. longa. *Ovarium* 2-loculare, circiter 1.5 cm. longum, 1 cm. diametro; stylus elongatus, subulatus, circiter 2 cm. longus. *Bacca* oblongo-ellipsoidea, 4-5 cm. longa, 3 cm. lata, pericarpio in sicco extus rugoso. Semina singula, circiter 3 cm. longa, 1.5 cm. diametro, lignosa, brunnea, extus rugosa.



FB Das et SRC. (del.)

Eugenia assamica Biswas et Purkayastha.
1. Seedling, $\times \frac{1}{2}$. 2. Mature leaf with flowers, $\times \frac{1}{2}$. 3. Cyme with mature flowers, $\times \frac{1}{2}$. 4. Flower bud, $\times \frac{1}{2}$. 5. Flower bud cut open showing folded stamens, pistil and ovules, nat. size. 6. Stamen, nat. size. 7. Flower separated out, showing calyx lobes and petals, $\times \frac{1}{2}$. 8. Fruit, $\times \frac{1}{2}$.

Middle-sized tree attaining a height of up to 22 m., girth about 2 m.; bark grey, about 3 mm. thick, coming off in flakes. Older branchlets terete, younger compressed, somewhat quadrangular. *Leaves* shortly petioled, obovate or obovate-elliptic, widely rounded above, abruptly acutely cuspidate, base shortly narrowed, deltoid, 24–40 cm. long, 11.5–19 cm. broad at the widest portion, entire, coriaceous, lateral veins subhorizontal, prominent, many, up to 21 in larger leaves, placed at a distance of 1–2.5 cm. anastomosing about 1 cm. within the margin to form an intramarginal longitudinal prominent vein running from the base to the apex, sometimes flanked by a similar rather less prominent longitudinal vein in between the margin and the stronger intramarginal looping vein, the lateral veins joined by numerous thinner irregular anastomosing veinlets forming areoles, texture coriaceous, glabrous above, somewhat glaucous beneath; petioles thick, somewhat compressed quadrangular, 2–3 cm. long. *Cymes* lax, few-flowered, developing from the old wood in the axils of often fallen leaves, bracteate, bracts minute, lanceolate, acute. *Flowers* pedicellate, pedicels 0.5–1.5 cm. long, rather rough when dry. *Calyx* 1–1.5 cm. long, about 1 cm. broad at the apex, obconic-campanulate, rough when dry, 4-lobed, lobes persistent, succulent, very obtuse or rounded, concave, thicker in texture at the middle, acute, rather coriaceous when dry, nearly as long as broad, about 5–6 mm. in diameter. *Petals* 4, white, deciduous, concave, rather thick at the middle, membranous, rounded, almost as long as broad, 5–8 mm. in diameter, smooth. *Stamens* many, 1.5–1.8 cm. long. *Ovary* bilocular, about 1.5 cm. long, 1 cm. broad, few-ovuled; style elongate, about 2 cm. long. *Fruit* baccate, oblong-ellipsoid, 4–5 cm. long, 3 cm. in diameter, pericarp hard and rough when dry. *Seeds* single, oblong, often slightly depressed on one side, about 3 cm. long, 1.5 cm. in diameter, woody, brown, rather rough on the exterior.

ASSAM. Pasighat, near Pillung forests, June, 1936, C. S. *Purkayastha* 13491 (typus in Herb. Calcutt.); March 30, 1936, C. S. *Purkayastha* 13490 (Herb. Kew); July 23, 1935, C. S. *Purkayastha* 13070; Jorhat, a tree in shady river banks, flowers from old wood, February 1935, C. S. *Purkayastha* 13.

Eugenia assamica resembles the large-leaved species *E. xylantha* Greves (New Guinea) and *E. sarcocarpa* Merr. and *E. samerensis* Merr. (Philippines), but differs entirely from these in the characteristic shape, size and venation of its leaves, and in the structure of the flowers and fruits.

XLII—MISCELLANEOUS NOTES.

Mr. A. D. Cotton.—Mr. Cotton, Keeper of the Herbarium and Library, has been elected a corresponding member of the Botanical Society of Czechoslovakia.

King's Birthday Honours.—We have much pleasure in recording the conferment of the following Honours:—

C.M.G.—Mr. G. A. JONES, Commissioner of Agriculture, Imperial College of Tropical Agriculture, Trinidad. C.V.O.—Mr. T. HAY, M.V.O., Superintendent, Central London Parks (Hyde Park). O.B.E.—Dr. G. BRYCE, Assistant Director of Agriculture, Nigeria; Dr. S. E. CHANDLER, Principal of the Plant and Animal Products Department, Imperial Institute; Mr. H. M. GARDNER, Conservator of Forests, Kenya Colony. M.B.E.—Mr. W. G. LECKIE, Senior Agricultural Officer, Kenya Colony; K. RAMAYYA, Paddy Specialist at the Agricultural College and Research Institute, Coimbatore, Madras.

Chronica Botanica.—In K.B. 1937, 517, the proposed new method of issuing this periodical was described. The first two bi-monthly numbers (vol. 4, nos. 1 and 2) have now appeared and it is possible to form an opinion on the changes carried out.

There is no doubt that *Chronica Botanica* now forms an extremely valuable periodical which will appeal to a wide circle of botanical readers. The scientific communications reach a high level, while the discussion forum provides a welcome means of international botanical discussion. These sections, together with those giving news of institutions and individual botanists, combine to form a much needed focus for international co-operation in botanical science. Dr. Verdoorn and his collaborators are to be congratulated on their enterprise and initiative in carrying out a project which must entail a great deal of laborious work.

The Botanical Magazine.—"Curtis's Botanical Magazine" was first published in 1787 and continued to appear without a break until the year 1920, when the increasing cost of production led Messrs. Lovell Reeve to terminate publication with Volume 146. The following year a number of leading horticulturists purchased the copyright and presented it to the Royal Horticultural Society, under whose auspices publication was re-started in 1922 and has continued ever since. Entirely new arrangements had to be made for the production of the Magazine and a certain amount of delay was inevitable, so the Society decided to re-commence publication with the volume for 1922, that is Vol. 148, which meant that a gap was left in the series of volumes to be filled later on by the volume for 1921, Vol. 147. This volume the late Mr. Reginald Cory very generously offered to produce at his own expense, and now, after an interval of seventeen years, the long awaited Volume 147 has been published.*

The volume is dedicated, in accordance with Mr. Cory's wishes, to Sir Isaac Bayley Balfour, Lt.-Col. Sir David Prain, and Sir

* "Curtis's Botanical Magazine," vol. 147. Edited by John Ramsbottom, O.B.E., D.Sc., M.A., P.L.S. Bernard Quaritch, Ltd., London. Published May 2nd, 1938.

Frederick Moore. Previous volumes of the Botanical Magazine had been dedicated to each of them individually, and the dedication of this volume to them jointly was suggested by the fact that they all retired at about the same time from their posts as heads of the botanical establishments at Edinburgh, Kew and Glasnevin respectively. The volume is edited by Mr. J. Ramsbottom, and contains a preface by Mr. E. A. Bowles, in which the circumstances surrounding its production are outlined. No reference is made, however, to the part played by the late Dr. O. Stapf in the production of the volume, and we may therefore mention that Dr. Stapf was asked to take charge of the work in April 1928. The volume now published is just as it was planned by Dr. Stapf, except that three of the plates originally selected have been replaced by others. At the end of the year 1932, all the plates had been drawn and printed off, all the colour patterns had been prepared, a considerable part of the colouring of the plates had been done, and the text of the first half of the volume (the greater part written by Dr. Stapf himself), was in print. Unfortunately early in 1933 Dr. Stapf found he could no longer continue the work, so Mr. Cory handed over the Editorship to Mr. Ramsbottom under whose auspices, after some five years, the volume has now been published.

The volume contains 5 quarto and 50 octavo plates. Three of the plates (8891, 8901 and 8929), have been reproduced in colour by a photographic process; three other plates (8874-75, 8889-90 and 8915), have also been reproduced mechanically, as Mr. Cory had arranged to have them printed by a chromo-lithographic process, whilst the remainder are hand-coloured in the usual way. The presence of the mechanically reproduced plates is an innovation so far as the Botanical Magazine is concerned, and it cannot be regarded as a particularly successful one, for the plates mentioned do not compare very favourably with the usual standard of hand-coloured plates. The colouring of the latter in the copy before us is, however, noticeably unequal, and some are not very satisfactory; especially is this the case with plates 8895 and 8899, where the dull yellow colour of the flowers is incorrect, and in plates 8893 and 8918, where the colour of the flower is unpleasing; and again in 8908 and 8909, where the colour does not agree with the description. Plates 8921, 8925 and 8926-27 also suffer from poor colouring and do justice neither to the plants nor to Miss Snelling's original paintings, this being particularly noticeable in the plate of *Paulownia lilacina* (8926-27).

The colouring of the plates, however, was carried out in the face of very great difficulties, not the least of which was that of finding suitable colourists, and special arrangements had to be made in order to get the plates coloured at all.

Fifty-seven plants are figured, of which 15 are species of *Primula*, among them a number of very rare and interesting plants, some of which are no longer in cultivation; the species figured are:

P. nipponica Yatabe (8881 A), *P. tenella* King ex Hook. f. (8881 B), a dwarf species from the high mountains of Tibet; *P. kisoana* Miq. (8884), *P. blattariiformis* Franch. (8893) and *P. bathangensis* Petitm. (8895), two representatives of the *Malvacea* section from western China; *P. helodoxa* Balf. f. (8899), *P. eburnea* Balf. f. & Cooper (8901), *P. Reginella* Balf. f. (8202 A), *P. dryadifolia* Franch. (8902 B), *P. heucherifolia* Franch. (8908), *P. florida* Balf. f. (8914), a dainty species from high altitudes in Yunnan; *P. Menziesiana* Balf. f. & W. W. Sm. (8916), from Bhutan, *P. Prattii* Hemsl. (8918), *P. aerintha* Balf. f. & Purdom (8922), with soft lavender-blue flowers, from Kansu and *P. rupestris* Balf. f. & Farrer (8932). Eleven species of *Rhododendron* are figured, namely, *R. zaleucum* Balf. f. (8878), *R. villosum* Hemsl. & Wils. (8880), *R. aureum* Franch. (8882), *R. insigne* Hemsl. & Wils. (8885), *R. brevistylum* Franch. (8898), *R. Traillianum* Forrest & W. W. Smith (8900), *R. melinanthum* Balf. f. & Ward (8903), *R. vernicosum* Franch. (8904-5), *R. afghanicum* Aitch. & Hemsl. (8907), *R. concinnum* Hemsl. f. *laetevirens* (Balf. f. ex Hutch.) Cowan (8912), *R. dauricum* L. var. *sempervirens* Sims (8930). The volume also includes four gentians, *G. Farreri* Balf. f. (8874-75), *G. Veitchiorum* Hemsl. (8883), *G. stragulata* Balf. f. & Forrest (8897), *G. dahurica* Fischer (8911), and three interesting gesneriads, *Briggsia Agnesiae* (Forrest) Craib (8896), *Oreocharis aurantiaca* Franch. (8915) and *Isometrum Farreri* Craib (8917). The remaining plants illustrated are *Colchicum atropurpureum* Stapf ex Stearn (8876), a plant known only in gardens and first distinguished as a new species by Dr. Stapf: it has leaves reminiscent of *C. autumnale*, but relatively small purple to deep magenta flowers, which recall those of *C. turcicum* Janka; *Rosa Farreri* Stapf forma *persetosa* Stapf (8877), raised from hips collected by Farrer (no. 774) in S. Kansu, the form figured is the very spiny one known in gardens as the "Threepenny-bit rose"; *Codnopsis subglobosa* W. W. Sm. (8879); *Heliophila longifolia* DC. (8886) a South African crucifer with brilliant deep blue flowers; *Viburnum fragrans* Bunge (8887); *Erodium corsicum* Leman (8888); *Cowania plicata* D. Don (8889-90), a Mexican plant with bright red flowers, like those of a single rose in appearance; *Frasera Parryi* Torr. (8891); *Dracopcephalum calophyllum* Hand.-Mazz. (8892), a handsome free-flowering species with deeply and narrowly pinnatifid leaves and purplish-blue flowers crowded in a dense broad spike; *Rosa filipes* Rehd. & Wils. (8894) a rambler with large many-flowered panicles of white flowers, collected by Farrer in S. Kansu; *Lupinus saxatilis* Ulbr. (8906), from Peru; *Cyananthus neglectus* Marquand (8909), a new species known only from cultivated plants and probably originating from Yunnan, allied to *C. longiflorus* Franch. (Bot. Mag. t. 9387) but with smaller flowers; *Lysimachia phyllocephala* Hand.-Mazz. (8910); *Gerbera nivea* (DC.) Schultz (8913), a very attractive composite from the mountains of India and China, Nepal to Yunnan, with a neat basal rosette of leaves, white on the undersurface,

and a single large pendulous capitulum, which, in the plant figured, has pale rose ray-florets; *Schisandra sphenanthera* Rehd. & Wils. (8921); *Vaccinium glauco-album* Hook. f. ex C. B. Clarke (8924), a species of the eastern Himalaya from Sikkim to Burma, characterized, as is correctly stated in the text, by the vivid bluish-white undersurface of the leaves, the large glaucous-white bracts and pink flowers. None of these features, however, is shown in the plate, for the leaves are depicted pale green below, the bracts brown and the flowers deepest rose. Presumably the plant figured represents either a distinct form of the species, or the inflorescences had become discoloured before they were drawn. Whatever the explanation it is unfortunate that there is no reference to it in the text. *Veratrum Wilsonii* C. H. Wright ex Loes. f. (8925); *Paulownia lilacina* Sprague (8926-7), a new species figured from a plant grown at Kew, with large pale lilac flowers borne in erect pyramidal panicles, and large cordate leaves. *Kniphofia Galpinii* Baker (8928); *Pterocephalus Bretschneideri* (Batal.) Pritz. (8929); *Veltheimia Deasii* Barnes (8931), a South African species described in 1931, with undulate glaucous leaves and pink flowers which are flushed with green at the mouth; *Cirrhopetalum Farreri* W. W. Sm. (8933). Finally there two gladioli, *Gladiolus Blackwellii* L. Bolus (8919-20), a robust species with large pink-flushed flowers, and *G. crispulatus* L. Bolus (8923) a much smaller, slender species with 4-6 linear leaves and 1-3 deep rose flowers.

Of the articles that accompany the plates, 24 out of the 57 were written by the late Dr. Stapf, 11 are by Dr. J. M. Cowan, and the remainder were contributed by various members of the staffs at the British Museum, Edinburgh, and Kew.

BULLETIN OF MISCELLANEOUS INFORMATION No. 7 1938 ROYAL BOTANIC GARDENS, KEW

XLIII—ALCHEMILLAE NOVAE. W. ROTHMALER.

Aphanes andicola Rothm., sp. nov.

Planta annua, parva, 5-10 mm. alta, paulum ramosa, caulibus glabrescentibus, internodiis brevissimis. *Folia* sessilia, dense imbricata, basi angustata, cum stipulis connata, margine longe ciliata, 3-lobata, lobis lanceolatis obtusis, lobo mediano trifido vel 5-lobato, lobis lateralibus integris. *Stipulae* herbaceae, bifidae, margine longe ciliatae, lobis lanceolatis obtusis. *Flores* 4-6, in stipularum axillis glomerulati, stipulas multo superantes, breviter pedicellati, 1.5-1.75 mm. longi, .75 mm. lati, clausi, hypanthio ovato brunneo 4-costato, costis pilis longioribus obsitis, intervallis puberulis granulosisque; sepala 4-nervata, pilosa, apice pilo longiore obsita, triangularia, episepalis nullis. *Stamen* unicum. *Stylus* unicus, brevis. *Semen* acutum, basi excepta margine hyalino circumditum, facie granulosa.

PERUVIA: in pascuis alpinis inter Pisio et Ayacucho loco "Minas de plata de Sta. Inés," 4300-4400 m., fl. maio, 1910, *Weberbauer* 5454 (in Herb. Berol.).

Aphanes Berteroana Rothm., sp. nov.—*Alchemilla Berteroana* Briq. in sched.; ab omnibus affinibus indumento sericeo, foliorum hypanthiique forma differt.

Planta annua, 3-5 cm. (raro 10 cm. vel ultra, vide f. *vegetam*) alta, a basi paulum ramosa, caulibus rigidis erectis dense adpresse pilosis, internodiis sat elongatis. *Folia* plerumque subsessilia, 2-3 mm. longa et lata, e basi lata flabelliformia, vix ad mediam laminam incisa, 3-lobata, utrinque ut planta tota subsericea, lobis integris vel apice 2-3-dentatis, lobulis late lanceolatis obtusis. *Stipulae* 1-2 mm. longae, 2-3-fidae, utrinque subsericeae, dentibus obtusiusculis, cauli adpressae. *Flores* 6-9 in stipularum axillis glomerulati, stipulas superantes, sat longe pedicellati, 1.5-1.75 mm. longi, usque ad 1 mm. lati, hypanthio globoso pilis adpressis dense sericeo; sepala 0.5 mm. longa, paulum conniventia, glabrescentia, margine ac apice hirsuta, lanceolata, episepalis 4 minutis usque ad $\frac{1}{4}$ longitudinis sepalorum attingentibus vel raro partim deficientibus lineari-lanceolatis apice longe ciliatis barbatisve. *Stamen* unicum. *Stylus* unicus. *Semen* acutum.

Forma *vegeta*, f. nov., caulibus longioribus flexuosis, foliis usque ad 7 mm. longis latisque, stipulis 4-5 mm. longis 4-5-dentatis, indumento laxiore differt.

CHILE : in arenosis saxosisque secus torrentem Tagua-tagua, Bertero 31, typus in Herb. Genev. (f. *aprica* et f. *vegeta*) ; ad rupes in pascuis collium loco " La Punta de Cortes," Rancagua, Bertero 32, in Herb. Vindob. (f. *aprica*).

Aphanes pentamera Rothm., sp. nov. ; ab *A. australiana* Rothm.* ceterisque affinibus sepalorum numero quinque nec quatuor, characteribusque multis differt.

Planta annua, gracilis, 3-7 cm. alta, a basi ramosa, caulibus adscendentibus pilis flexuosis patentibus longis dense vestitis, internodiis elongatis. *Folia* longe petiolata, petiolis 3-4 mm. longis, basi cuneata, flabelliformia, margine longe ciliata, 6 mm. longa, 9 mm. lata, fere usque ad basin triloba, lobo mediano trifido, lobis lateralibus 2-3-fidis, lobulis integris vel dentibus 2 lanceolatis acutiusculis praeditis, supra sparse longe pilosa, subtus secus nervum longe ciliato-pilosa, mesophyllo glabro. *Stipulae* herbaceae, connatae et petiolo adnatae, 2-3 mm. longae, ad dimidium usque 4-5-fidae, lobis lanceolatis acutiusculis, foliorum indumento. *Flores* 6-8 in stipularum axillis glomerulati, stipulas superantes, breviter pedicellati, 2 mm. longi, aperti, hypanthio ovato brunneo basi rotundato 10-costato 1.25 mm. longo, intervallis pilis patentibus dense hirsutis ; sepala 5, margine et nervo longe ciliata, 0.75 longa, lanceolata, e basi angustata acuta, episepalis 0-5 brevissimis. *Stamen* unicum. *Stylus* unicus.

AUSTRALIA : Prov. Victoria ; Distr. Lowan, Jankard's Water-hole, 2 Dec. 1897, J. M. Reader (Herb. South Yarra, Australia).

Lachemilla arborescens Rothm., sp. nov. (sect. *Aphanoides*, subsect. *Nivales*) : species insignis non confundenda, fruticosa, unica sectionis atque maxima generis.

Frutex 1 m. altus, caulibus erectis apice ramosissimis cortice papyraceo obtectis, ramis 1-6 cm. longis dense foliosis $\pm$ adpresse pilosis. *Folia* (*radicalia* non vidi) *ramalia* cum stipulis conformibus connata, vaginas amplexicaules, infundibuliformes, apice laciniatas formantia, laciniis 7 aequalibus 3-5 mm. longis 0.5-0.75 mm. latis lineari-lanceolatis margine revolutis cauli laxè adpressis utrinque dense adpresse hirsutis. *Flores* in glomerulos apicem ramulorum superiorum versus aggregati, 4 mm. longi, aperti, extra hirsuti, hypanthio campanulato ; sepala 4, late ovato-lanceolata, 1.5 mm. longa, episepalis 4 paulo brevioribus multo angustioribus lanceolatis. *Stamina* duo, longa, $\frac{1}{2}$ longit. sepalorum attingentia. *Stylus* 1 (raro 2), longus, stigmate globoso.

COLOMBIA : Sa. Nevada de Sta. Marta, Paramo inter Simindená et Adurimeiná, circiter 3600 m. alt., copiose, fl. martio, 1928, A. Schultze 1317 (Herb. Berol.).

* **Aphanes australiana** Rothm., comb. nov.—*Alchemilla australiana* Rothm. in Fedde, Rep. Sp. Nov. 38, 42 (1935).

Lachemilla Trevirani Rothm., nom. nov.—*Alchemilla galioides* Treviranus in Bot. Zeit. 7, 215 (1849), non Benth. (1844) (sect. *Aphanoides*, subsect. *Subnivales*).

Descr. emend. : *Flos* 4 mm. longus, extra sericeus, hypanthio globoso intus piloso 2.5 mm. lato apice constricto, sepalis 4 conniventibus 1 mm. longis glabrescentibus, episepalis 4 iis paulo longioribus angustioribusque omnibus apice incrassatis. *Stamina* duo, brevia. *Styli* 10-12, stigmatibus subclavatis. - *Semina* 10.

VENEZUELA : Prov. de Mérida, Sa. Nevada, circiter 3700 m. alt., Linden 688 (Herb. Berol. ex Herb. Trev., typus.) ; Paramo de Mucuchies, Moritz 1115 p.p.m. (Herb. Berol.).

Nomen *A. galioides* Trev. propter homonymum Benthamianum* rejiciendum est. Planta notabilis floribus magnis, numero stylorum, pilositate faciei interioris hypanthii, ab omnibus speciebus sectionis diversa.

Lachemilla Mutellina Rothm., sp. nov. (sect. *Aphanoides*, subsect. *Pachyrrhizae*) ; forma petiolorum stipularumque ab omnibus speciebus diversa, inter species subsectionis singularis numero stylorum et localitate boreali (except. *L. pinnata*) insignis ; habitu proxima *L. frigidae*† sed diversissima characteribus notatis.

Planta habitu *Artemisiarum* alpinarum Europae, caespitosa, 5-15 cm. alta, caulibus erectis vel adscendentibus, radicibus incrassatis. *Folia* basalia 17 mm. lata, 12 mm. longa, petiolata, petiolis 6-7 mm. latis 15 mm. longis, stipulis hyalinis fere ad basin laminae usque adnatis (pars libera petioli 2-3 mm. attingens) apice liberis viridibus trifidis margine hirsuto-ciliatis, tripartita, partitionibus lateralibus ad med. incisus 3-lobis, lobis rhomboideis apice 3-7-dentatis, dentibus lanceolatis. *Lamina* utrinque glabra, subtus pallida glauca, supra viridis, margine hirsuto-ciliata. *Folia* caulina similia, minora, subsessilia, petiolis stipulisque subamplexicaulia. *Flores* in ramulis lateralibus glomerulati, 3 mm. longi, hypanthio glabro vel glabrescente, sepalis 4 triangulari-ovatis extra hirsutis, episepalis 4 lanceolatis sepalis brevioribus et dimidio angustioribus. *Stamina* duo, brevia. *Styli* 7-8, longi, stigmatibus clavatis. *Semina* parva, nigra, longe stipitata.

VENEZUELA : Mérida, Quebrada de Saisay, 3580 m. alt., fl. aprili, 1930, Gehrig 54 (Herb. Genev.).

Lachemilla Steinbachii Rothm., sp. nov. (sect. *Aphanoides*, subsect. *Radicantes*) ; ex affinitate *L. pseudovenustae*,‡ *L. Perryanae*,§

* **Lachemilla galioides** (Benth.) Rothm., comb. nov.—*Alchemilla galioides* Benth. Pl. Hartweg. 134 (1844).

† **Lachemilla frigida** (Wedd.) Rothm., comb. nov.—*Alchemilla frigida* Wedd. Chlor. And. 2, 245 (1857).

‡ **Lachemilla pseudovenusta** Rothm., comb. nov.—*Alchemilla pseudovenusta* Rothm. in Notizbl. Bot. Mus. Berlin-Dahlem, 12, 489 (1935).

§ **Lachemilla Perryana** Rothm., comb. nov.—*Alchemilla Perryana* Rothm. *Alchemilla* Columbianae, 35 (1935).

et *L. Hultenii*, * sed a primo foliorum lobis profunde incisis, a secundo stylis globosis, foliis reniformibus subtus villosis nec subsericeis, a tertio foliis minus profunde incisis, sepalis et variis notis differt.

Planta suffruticosa, habitu *L. pseudovenustae*, caulibus ad 60 cm. longis procumbentibus apice radicanibus, adultis glabris, juvenilibus dense villosis-hirsutis. *Folia* petiolata, petiolis 3–6 mm. longis, reniformia, 10–17 mm. lata, 7–10 mm. longa, fere ad basin usque tripartita, lobis lateralibus ad 2/3 bifidis, lobis cuneato-obovatis apice subtruncatis, dentibus 7–9 ovato-lanceolatis longis porrectis acutissimis penicillatisve; lamina supra viridis, glabra vel glabrescens, subtus pallida, pilis longis subvillosis dense pilosa. *Stipulae* 2–3-fidae, dentibus longis anguste lanceolatis. *Folia summa* subsessilia, stipulis irregulariter partitis reflexis. *Flores* breviter pedicellati, in axillis bractearum solitarii, in inflorescentiis racemoso-cymosis apicem ramorum floriferorum versus aggregati, 2.25 mm. longi. *Hypanthium* ovatum, 1 mm. longum, dense adpresse hirsutum, sepalis 4 late ovatis acutiusculis, episepalis 4 paulo brevioribus multo angustioribus ovato-lanceolatis acutiusculis apice incrassatis omnibus extra hirsutis. *Styli* 2, breves, stigmatibus globosis. *Stamina* 2, stylis aequilonga. *Semina* 2.

BOLIVIA: Yungas de San Mateo, Comarapa, Dep. Sta. Cruz, 2600 m. alt., Oct. 1928, Steinbach 8439 (Herb. Kew. et Berol.).

Alchemilla Trollii Rothm., sp. nov. (sect. *Brevicaules*, subsect. *Heliodrosium*, ser. *Vulgares*, subser. *Hirsutae*).

Planta mediocris, caulibus 3–15 (–30) cm. altis erectis flexuosis tota longitudine pilis recte patentibus vel paulum deorsum flexis dense pilosis. *Folia radicalia* 2–3.5 (–7) cm. lata, 1.5–3 (–5.5) cm. longa, subreniformia, sinu basali subcordato ± aperto, circumcirca ad 1/3 radii longitudinis usque palmatim incisa, incompl. 7- vel rarius incompl. 9-lobata, primaria supra glabra vel glabrescentia, aestivalia disperse longeque pilosa, subtus primaria nervis exceptis glabra, cetera dense longeque hirsuta, nervis pilis patentibus obsitis, petiolis 1–5 (–15) cm. longis, exterioribus raro glabrescentibus plerumque omnibus pilis paulo vel rarius conspicue deorsum flexis dense pilosis instructa; lobi foliorum primariorum cuneato-obovati vel semiorbiculares, apice subtruncati, dentibus utrinque 4–6 acutis lanceolatis vel lanceolato-ovatis longis porrectis apice incurvatis conniventibus penicillatis, dente apicali aequali digitato-dentato, basi incisura integra ± longa; lobi foliorum aestivalium parabolici, incisura integra nulla, circumcirca dentibus 6–7 latioribus ovato-lanceolatis acutis porrectis apice acutis incurvatis paulo conniventibus, dente apicali subaequali incisedentati. *Folia caulina* 3–4, mediocria, utrinque disperse pilosa vel glabrescentia. *Inflorescentia* contracta, paulo ramosa, ramis erectis

* *Lachemilla Hultenii* Rothm., comb. nov.—*Alchemilla Hultenii* Rothm. in Arkiv för Botanik, 28 A, no. 3, 5 (1935).

sparsae patentim pilosis, ramulis brevibus glabrescentibus instructa, e cymis glomerulatis densissimis paucifloris solitariis vel paucis saepe ± confluentibus composita, pedicellis glabris longitudine florum vel brevioribus praedita. *Flores* viridi-lutescentes, 2.75–3 mm. longi, 3 mm. lati, urceolis campanulato-conicis pilis patentibus sparsissime pilosis, sepalis ovatis, episepalis lineari-lanceolatis acutis, omnibus dorso et apice pilis paucis barbularis praediti.

W. HIMALAYA: Nanga-Parbat, Guricot-Alm, 3400 m. *C. Troll* 7525 (Typus, Herb. Berol.); Astor, *Duthie* (Herb. Kew.); Kashmir, Sango Sir, *Giles* 592 (Herb. Kew.); Sonamarg, *Stewart* 6463 (Herb. Kew.); Kashmir, *Falconer* (Herb. Kew., c. *A. chitamae*), id. *Falconer* 389 (Herb. Kew. mixt. *A. fusicalyx* Rothm. ined.).

Alchemilla ypsilotoma Rothm., sp. nov. (sect. *Brevicaules*, subsect. *Heliodrosium*, series *Vulgares*, subs. *Heteropodae*).

Planta mediocris, haud debilis, caulibus arcuato-adscendentibus flexuosis 10–20 cm. altis, internodio basali glabro, internodiis 2 et 3 sparse vel sparsissime pilis patentibus vel reflexis pilosis. *Folia radicalia* mediocria, 3–5 cm. longa, 4–6.3 cm. lata, reniformia, sinu basali rectangulatim vel plerumque amplius aperto, circumcirca ad 1/3–2/7 radii longitudinis usque palmatim incisa lobis divaricatis, 7- vel incompl. 9-loba utrinque disperse vel dispersissime pilosa aut glabra nervis subtus exceptis, petiolis 5–9 cm. longis flexuosis pilis patentibus vel reflexis haud dense pilosis aut glabrescentibus vel glabris instructa; lobi parabolici, basi incisura Y-formi integra brevi, versus apicem circumcirca dentibus utrinque 5–6 rarius ad 7 late ovatis mammilliformibus obtusis mucronulatis breviter penicillatis paulo inaequilateralibus porrectis inaequalibus medianis maximis dente apicali minore sed elongato et longiore dentati. *Folia caulina* 4–5 haud parva. *Inflorescentia* sat expansa, ramosa ramis flexuosis ramulis subpatentibus pedicellis longitudine florum glabris instructa, e cymis corymbosis sat densis composita. *Flores* 2–2.5 mm. longi, 3 mm. lati, urceolis conico-campanulatis glabris, sepalis ovato-oblongis, episepalis lanceolatis glabris vel raro apice pilis solitariis obsitis praediti.

W. HIMALAYA: Kashmir, Sonamarg, *Rich* 1176 (Typus, Herb. Kew.); Sonamarg, Sind Valley, *Duthie* 11 519 (Herb. Berol.); Baltistan, Satpur nullah, *Duthie* (Herb. Univ. Vindob. f. *aprica*).

Alchemilla cashmeriana Rothm., sp. nov. (sect. *Brevicaules*, subsect. *Heliodrosium*, ser. *Vulgares*, subser. *Subglabrae*).

Planta mediocris, sat robusta, caulibus nonnullis adscendenti-erectis, sat rigidis, 10–12 cm. altis, tota longitudine pilis subadpressis dense pilosis. *Folia radicalia* undulata mediocria 3 cm. longa, 3.5–4 cm. lata reniformia, sinu basali ± aperto plerumque rectangulato, circumcirca ad 1/4 radii longit. usque palmatim incisa, 7- vel incompl. 9-loba, utrinque pilosa, supra disperse,

subtus sat dense adpresse pilosa, petiolis 2-3 cm. longis dense subadpresse pilosis instructa; lobi basi sese obtegentes semi-elliptici vel triangulati parabolici circumcirca dentibus utrinque 5-7 longis lanceolato-ovatis acutis porrectis apicem versus incrementibus digitato-dentatis, dente apicali multo angustiore lanceolato, rarius brevior. *Folia caulina* multa, sat magna, 1-2 cm. lata, 0.8-1.3 cm. longa, reniformia, basi subtruncata vel cuneato-truncata, ad 1/4 longit. 5-lobata, lobis truncatis vel leviter arcuatis dentibus magnis acutis subconniventibus dentata, indumento foliorum radicalium. *Stipulae* ad 1/2 longitud. irregulariter incisae, lobis late ovato-lanceolatis incisae, sat parvae. *Inflorescentia* densa, ramis paucis brevibus paulo divaricatis pilis erectis vel subadpressis dense pilosis, ramulis pedunculisque glabris, pedicellis glabris quam floribus brevioribus, e cymis dense glomerulatis composita. *Flores* virides, glabri vel saepius pilis solitariis obsiti, 3 mm. longi, 3-3.5 mm. lati, urceolo pyriformi, sepalis late ovato-triangularibus, episepalis ovatis 3/4 longitud. sepalorum attingentibus, omnibus obtusis praediti.

W. HIMALAYA: Mali Khagan Valley, 3120 m., 19.vii.1896, Duthie (Typus, Herb. Vindob.); Nila Kagan, Hazara, Duthie (Herb. Kew., f. fol. glabrescentibus).

***Alchemilla chthamalea* Rothm., sp. nov.** (sect. *Brevicaules*, subsect. *Heliodrosium*, ser. *Vulgares*, subser. *Glabrae*).

Planta parva, caulibus decumbentibus vel flexuoso-adscentibus 3-7 cm. longis glaberrimis vel internodio primo (infimo) pilis adpressis sparse pilosis. *Folia radicalia* parva, 1-1.5 cm. longa, 1.5-2 cm. lata, reniformia sinu basali late aperto subcordato-truncato, circumcirca ad 1/4 radii longit. usque palmatim incisa incomp. 7-loba, utrinque glaberrima, nervis subtus prominulis apice sparse adpresse pilosis, petiolis 1-2 cm. longis glaberrimis; lobi cuneato-quadrati e basi brevi integra subcuneata, apice leviter arcuato-truncato, dentibus utrinque 3-6 brevibus acutis subporrectis apice paulo incurvato-subconniventibus breviter penicillatis crenato-dentati, dente apicali paulo minore nec brevior. *Folia caulina* 3-4, sat magna, circiter 1 cm. lata, 0.8 cm. longa, basi subtruncata semiorbicularia, vix incisa, circumcirca crenato-dentata, indumento foliorum radicalium, sed summa ut stipulae supra sparse et disperse pilosa; stipulae sat magnae, summae vix incisae, breviter dentatae. *Inflorescentiae* ad apices caulium glomeratim congestae, ramis nullis vel brevibus. *Flores* breviter pedicellati, pedicellis glabris, 2.5 mm. lati, glabri, sepalis late ovatis obtusis, episepalis brevibus, 1/2 sep. longit. vix attingentibus obtusis ovatis praediti. *Flores* maturi deficiunt, urceolus globoso-ovatus glaberrimus esse videtur.

W. HIMALAYA: Kashmir, Sumbliali, 3000-3300 m., Duthie 11147 (Typus, Herb. Kew.); sine loco et numero, Falconer (Herb. Kew.); Kashmir, Falconer 389, p.p. (Herb. Monach).

XLIV—ADDITIONS TO THE FLORA OF BORNEO AND OTHER MALAY ISLANDS: X.* H. N. RIDLEY.

CONNARACEAE.

The following are not recorded by Merrill in his list of Bornean plants.

***Santaloides Havilandii* Schellenb.**

SARAWAK. Rejang Sibü, Haviland 2880.

***Santaloides floridum* (Jack) Kuntze.**

DUTCH BORNEO. Korthals.

***Santaloides ovale* Schellenb.**

SARAWAK. Beccari 2731, 2831, 2899.

***Santaloides cordatum* Schellenb.**

SARAWAK. Beccari 2685; Rejang Sibü, Haviland 2882.

***Santaloides simplicifolium* (Bl.) Kuntze.**

SARAWAK. Beccari 3043.

***Roureopsis javanica* Planch.**

SARAWAK. Kuching, Haviland 2881.

***Cnestis palala* (Lour.) Merrill.**

SARAWAK. Beccari 1117; Saribas, Haviland 1604.

BRIT. N. BORNEO. Tawao, Elphinstone Province, Elmer 20995, 21482.

***Castanola insignis* Schellenb.**

SARAWAK. Near Kuching, Haviland 867; Sarawak river, Haviland c.d.c.c.

***Ellipanthus Kingii* Boerl. et Koord.**

SARAWAK. Beccari 2627.

***Ellipanthus sarawakensis* Schellenb.**

SARAWAK. Kuching, Haviland 496, 1815.

***Connarus euphlebius* Merrill.**

DUTCH BORNEO. Sungei Mandai, Hallier.

SARAWAK. Beccari 3806; Rejang Kapit, Haviland 2884.

BRIT. N. BORNEO. Tawao, Elphinstone Province, Elmer 20438, 21270; Sandakan, Ramos 1181.

***Connarus falcatus* Bl.**

DUTCH BORNEO. Korthals.

SARAWAK. Beccari 1244, 3579, 4058; Native Collector 2550.

***Connarus grandis* Jack.**

SARAWAK. Beccari 833, 1129, 3973, 3339; Kuching, Haviland 2285, 2883.

* Continued from K.B. 1938, 242.

BRIT. N. BORNEO. *Creagh*; Tawao, Elphinstone Province, *Elmer* 21039, 21347.

Connarus Jackianus Schellenb.
BRIT. N. BORNEO. *Creagh*.

Connarus mutabilis Bl.

DUTCH BORNEO. *Korthals*; Banjarmasin, *Motley* 47: "Scrambling shrub, not uncommon, flowers pearly white with scent of violets, very little used as a febrifuge. *Penawar hauta*."

SARAWAK. Lundu, *Ridley* 12460; Santubong, *Bartlett* in *Haviland* 1534K.

Connarus villosus Jack. *C. odoratus* Hook. fil.

SARAWAK. Brooketon, *Haviland* 1453; Mt. Singhi, large climber, petals white, *Haviland* 1998.

BRIT. N. BORNEO. *Fraser*; Labuan, *Motley*; Tawao, *Elmer* 21058, 21617.

Connarus Winkleri Schellenb.

DUTCH BORNEO. Hayup, *Winkler* 2567.

SARAWAK. Saribas, *Haviland* 1597.

BRIT. N. BORNEO. Tawao, *Elmer* 20770.

LEGUMINOSAE.

Crotalaria chinensis L.

SARAWAK. *Beccari* 3717; Miri, *Haviland & Hose* s.n. (single spec.).

BRIT. N. BORNEO. Kalumbini, sandy plains, *Burbidge*.

Crotalaria retusa L.

DUTCH BORNEO. Banjarmasin, *Motley* 394: "Cultivated, seeds eaten."

Indigofera tinctoria L.

SARAWAK. Saribas, *Haviland* 1566; near Kuching, escape from cultivation, *Haviland* 2887.

Tephrosia candida DC.

SARAWAK. *Beccari* 2180.

Abrus mollis Hance.

DUTCH BORNEO. Banjarmasin, *Motley* 1188.

SARAWAK. Bongsit, young jungle, slender climber, *Haviland* 57 (b.s.n.e.).

This is otherwise only known from China.

Canavalia rosea DC.

SARAWAK. Lundu, *Haviland* 1016; Miri, *Hose* 605.

BRIT. N. BORNEO. Mouth of Lahat River, *Burbidge*; Banguay Island, *Castro* 1498.

Canavalia turgida Grah.

BRIT. N. BORNEO. Kudat, *Fraser* 210.

Pueraria phaseoloides Benth.

SARAWAK. *Beccari* 2848.

Vigna lutea A. Gray.

SARAWAK. *Beccari* 1259, 1742.

BRIT. N. BORNEO. *Creagh*.

Mucuna monosperma Roxb.

SARAWAK. *Beccari* 2748.

Mucuna acuminata Grah.

SARAWAK. Kuching, *Haviland* 967.

Phaseolus luteus Bl.

DUTCH BORNEO. Banjarmasin, *Motley* 404.

Aeschynomene indica L.

DUTCH BORNEO. Banjarmasin, *Motley* 700.

Cyclocarpa stellaris Afzel.

DUTCH BORNEO. Banjarmasin, *Motley*.

This plant seems to be fairly abundant in West Tropical Africa, and has been met with in Queensland, Australia, but apparently nowhere else. Its occurrence in Borneo is most remarkable.

Desmodium cephalotes Wall.

DUTCH BORNEO. Banjarmasin, *Motley* 51.

Desmodium gangeticum DC.

DUTCH BORNEO. Banjarmasin, *Motley* 146.

Desmodium laxiflorum DC.

DUTCH BORNEO. Banjarmasin, *Motley* 426.

Desmodium ovalifolium Wall.

SARAWAK. *Beccari* 1017; Miri, *Hose* 515.

BRIT. N. BORNEO. Dent Province, *Gibbs* 2923.

Desmodium pulchellum Desr.

DUTCH BORNEO. Banjarmasin, *Motley* 144.

Desmodium reticulatum Champ.

SARAWAK. *Beccari* 1018.

Uraria lagopodoides DC.

DUTCH BORNEO. Banjarmasin, *Motley* 424.

Spatholobus littoralis Hassk.

DUTCH BORNEO. Banjarmasin, flowers white, *Motley* 749.

A native also of Java. New to Borneo.

Spatholobus persicinus Ridley, sp. nov., a *S. crassifolia* Benth., cui affinis, paniculis longioribus multifloris, calycis dentibus brevioribus, corolla rosea, vexillo integro differt.

Frutex scandens, ferrugineo-hirtus. *Folia* trifoliolata, petiolis 2-2.5 cm. longis, ferrugineo-hirtis; foliola coriacea, supra glabra, subtus nervis et costa hirtis, elliptica, acuminata, obtuse mucronulata, 7-8 cm. longa, 3.5-4 cm. lata, nervis 8-paribus inter se arcuato-anastomosantibus; petiolulis 4 mm. longis. *Stipulae* falcatae, acuminatae, pubescentes, 1 cm. longae, 4 mm. latae. *Paniculae* terminales et axillares, dense ferrugineo-hirtae, 15-29 cm. longae, ramis 3-8 cm. longis densifloris. *Bractaeae* lanceolatae, acuminatae, hirtae. *Bracteolae* lineari-lanceolatae, acuminatae, 2 mm. longae. *Flores* copiosi, fasciculati, pedicellis hirtis 1-2 mm. longis. *Calyx* cylindrico-urceolatus, intus et extra hirtus, 4 mm. longus, dentibus brevibus obtusis 2 supremis connatis. *Corolla* pallide rosea, glabra, 5 mm. longa, vexillo rotundato integro lato brevissime unguiculato, petalis carinae spathulatis obtusis unguiculatis. *Stamina* 10, glabra, alterna, breviora, filamentis linearibus basibus dilatatis, antheris oblongis. *Ovarium* cylindricum, hirtum. *Stylus* glaber, curvus, stigmatibus minuto.

DUTCH BORNEO. Banjarmasin, flowers light rose, *Motley* 734.

Saraca elegans Ridley, sp. nov., a *S. triandra* Bak., cui affinis, floribus multo minoribus flavis glabris, corymbis glabris laxioribus, foliolis longe acuminatis, nervis paucioribus differt.

Arbor. *Folia* bijuga; foliola tenuiter coriacea, elliptica vel lanceolata, longe acuminata, basi breviter attenuata, 13-16 cm. longa, 3-8.2 cm. lata, nervis 8-paribus, secundariis et reticulationibus laxis utraque pagina elevatis; petioluli crassi, transversim rugosi, 1 cm. longi. *Corymbi* axillares, laxi, patens, glabra, ramis gracilibus, 6 cm. longa, 10 cm. lata. *Bractaeae* lanceolatae, marginibus ciliatis, 1 mm. longae, ad bases ramorum latiores 3 mm. longae. *Bracteolae* ovato-rotundatae, 5 mm. longae, 3 mm. latae. *Calycis* tubus gracilis, superne sensim dilatatus, 1.5 cm. longus, lobis ovato-ellipticis rotundatis 5 mm. longis. *Stamina* 3, filamentis filiformibus 1 cm. longis. *Ovarium* glabrum.

SARAWAK. Rejang, Belaga, *Haviland* 2905 (type); Baram, Lio-Matu, flower yellow, *Moulton* 39.

This appears to take the place of *S. triandra* Baker, common in the Malay Peninsula and found also in Sumatra and the Anambas islands (*Henderson* 20125).

Saraca Hullettii Prain in Journ. As. Soc. Beng. 66, 492 (1897). Dr. Prain gives only a short incomplete diagnosis of this species, which is the commonest one in Borneo, and as the genus is a very critical one I supply herewith a more complete description.

Arbor parva, ramis albescentibus. *Folia* bijuga, raro trijuga; foliola glabra, coriaceo-chartacea, lanceolata vel ovato-lanceolata, acuminata, basibus angustatis, 15-18 cm. longa, 4-8 cm. lata,

nervis 7-paribus utraque pagina elevatis; petioluli crassi, rugosi, 8 mm. longi. *Corymbi* axillares, breviter pedunculati, laxi, multiflori, pubescentes, 9-10 cm. longi, 15 cm. lati. *Pedicelli* 1-2 cm. longi. *Bractea* basalis, oblonga, 7 mm. longa, 8 mm. lata. *Bracteolae* binae, ovato-rotundatae, 7 mm. longae, 4 mm. latae. *Calyx* kermesinus, tubo elongato-urniformi 6 mm. longo, lobis oblongis obtusis 5 mm. longis. *Stamina* 3 vel 4, glabra, 1.5 cm. longa, antheris oblongis. *Ovarium* hirtum, gynophoro gracili hirtum. *Legumen* (immaturum) oblongum, apiculatum, 6 cm. longum, 3 cm. latum.

SARAWAK. Beccari 759, 916, 2289, 7597. Kuching, Saheb 16318, Ridley 12384; 3 miles from Kuching, Haviland 829. Baram, Hose 23, 224.

BRIT. N. BORNEO. Sine loc. exact., Lowe.

It is allied to *S. macroptera* Miq., of Sumatra, but the leaflets are smaller and thinner and flowers half the size.

Saraca longistyla Ridley, sp. nov., a *S. Hullettii* Prain, cui affinis, foliis 4-jugatis, foliolis lanceolatis, floribus majoribus, staminibus 6, bracteis caducis lanceolatis denticulatis differt.

Arbor magna. *Folia* 4-jugata; foliola coriacea, oblongo-lanceolata, acuta vel acuminata, basibus angustatis, obtusa, 18 cm. longa, 5-8 cm. lata, nervis tenuibus 8-paribus, secundariis conspicuis pluribus; petioluli crassi, superne canaliculati, 1 cm. longi. *Corymbi* subsessiles, glabri, multiramosi, 14 cm. longi, 16 cm. lati. *Bractaeae* caducae, coriaceae, lanceolatae, marginibus denticulatis, 5 mm. longae. *Bracteolae* ovatae, obtusae, tenues, rubrae, 1 cm. longae, 5 mm. latae. *Calycis* tubus angustus, cylindricus, 1.5 cm. longus, lobis oblongo-obovatis 1 cm. longis 4 mm. latis rubris. *Stamina* 6, filamentis capillaribus 1 cm. longis, antheris oblongis minutis. *Ovarii* stipes pubescens, 2 mm. longus. *Stylus* tenuis, 1.5 cm. longus. *Legumen* oblongo-lineare, obtusum, lignosum, marginibus incrassatis, 34 cm. longum, 7 cm. latum.

SARAWAK. Lundu, Haviland 879, Anderson 130 (type); near Quop, Haviland 620.

A specimen collected by *Motley* (no. 1217) at Banjarmasin, DUTCH BORNEO, appears to be the same species, but the leaflets are rather more long pointed. He describes it as "a large shrubby tree; flowers scarlet, handsome," and indeed it is clearly a magnificent species.

Cynometra inaequalifolia A. Gray. C. Elmeri Merrill.

BRIT. N. BORNEO. Tawao, Elphinstone Province, Elmer 21386.

Albizzia stipulata Benth.

SARAWAK. Near Pengkulu Ampat, young jungle tree, Haviland 52, 295.

Acacia Farnesiana Willd.

DUTCH BORNEO. Banjarmasin, *Motley* 670.

BRIT. N. BORNEO. Kudat, Balajadia in For. Dept. 4047.

Mimosa sepiaria Benth.

SARAWAK. Kuching, *Haviland* 525 : "probably introduced."

This small tree was introduced into Singapore many years ago from Kew, as a hedge and firewood plant, and I believe sent thence to Sarawak. It was used in Singapore as a hedge plant, and when fresh the wood was easy to cut, but when dry the natives affirmed it became too hard for most axes to cut. Hence it was not popular, and has hardly spread in the Malay region at all.

Parkia speciosa Hassk.

SARAWAK. Saribas, *Hewitt* : "*Buah Putai* ; fruits eaten."

BRIT. N. BORNEO. Bundu, K. Penyu, *Goklin* in *For. Dept.* 2806 : "Tree 40 ft. high, 36 in. girth. Flower white. Edible fruit."

Baphia micrantha Ridley, sp. nov., a *B. borneënsis* Oliv., cui affinis, racemis accrescentibus parce hirtis, floribus minoribus, calyce bilobo lobis rotundato-oblongis, staminibus glabris differt.

Arbor vel frutex. Folia oblongo-elliptica, acuminata, basibus rotundatis, coriacea, glabra, 10–15 cm. longa, 4–8 cm. lata, nervis 7-paribus tenuibus anastomosantibus, cum nervulis et reticulationibus in utraque pagina elevatis ; petioli graciles, apice incrassati, rugosi, 2 cm. longi. *Racemi* 1–3, graciles, accrescentes, superne sparse hirti, 12.5 cm. longi. *Bractae* breves, ovatae, 1 mm. longae. *Pedicelli* 5 mm. longi, graciles, parce hirti. *Calyx* bilobus, lobis rotundato-oblongis sparse hirtis, dentibus quinque 5 mm. longis 3 mm. latis. *Corolla* : vexillum rotundato-ovatum, glabrum, unguiculatum, 1 cm. longum, 5 mm. latum ; alae oblongae, apicibus rotundatis, subaequilongae, unguiculatae ; carina oblanceolata. *Stamina* 5 mm. longa, glabra, antheris oblongis apiculatis multo brevioribus. *Ovarium* 5 mm. longum, basi attenuatum, quasi stipitatum, parce hirtum. *Stylus* glaber, 5 mm. longus.

SARAWAK. Baram, *Hose* 337 (type), 257.

A second species of the genus *Baphia* from Borneo, otherwise confined to Africa. From *B. borneënsis* Oliv. it is distinguished by the long slender elongating racemes, and the calyx dividing into two nearly equal lobes. The corolla is glabrous and the whole inflorescence is sparsely hairy, not velvety.

ROSACEAE.

Rubus alceifolius Poir.

BRIT. N. BORNEO. Labuan, hedges and thickets, *Burbridge* : "Fruits small, red."

Rubus angulosus Focke.

BRIT. N. BORNEO. Jesselton, *Mrs. Clemens* 9643 ; Tawao, Elphinstone Province, *Elmer* 21189.

The first specimen exactly resembles the Singapore plant on which Focke based his species. In Elmer's plant the bracts are more deeply lacinate than usual.

Rubus elongatus Sm.

SARAWAK. Bau, *Ridley* 11766.

Rubus Gardnerianus O. Kze.

BRIT. N. BORNEO. Tenom, bridle-path to Melalap, *Gibbs* 2856.

Rubus glomeratus Bl.

SARAWAK. *Beccari* 970 ; Bau, *Ridley* 11764 ; Kuching, *Ridley* ; Matang, *Haviland* 58/36.

Pygeum Hookerianum King var. **borneënsse** Ridley, var. nov., differt a planta peninsulari typica floribus minus hirtis, calyce scabrido-hirto, lobis ferrugineo-villosis.

SARAWAK. Long Lama, *Hose* 186.

This closely resembles *P. Hookerianum* King, of the Malay Peninsula, but the flowers are not all red-woolly as in the type, the calyx is only covered with appressed scabrid hairs, and only the lobes are red-woolly.

Pygeum Havilandii Ridley, sp. nov., a *P. lanceolato* Hook. fil., cui affine, floribus minoribus parce pubescentibus, lobis calycis intus lanuginosis differt.

Arbor glabra. *Folia* tenuiter coriacea, laevia, lanceolata, obtuse cuspidata, basibus obtusis, 6 cm. longa, 2.5 cm. lata, nervis 5-paribus inconspicuis haud elevatis, costa subtus elevata ; petioli 8 mm. longi. *Racemi* axillares, pauciflori, hirti, 1 cm. longi. *Bractae* ovatae, acutae, vix 1 mm. longae. *Pedicelli* 2 mm. longi. *Calyx* campanulatus, sparse hirtus, lobis 8 lanceolatis intus lanuginosis. *Stamina* circiter 16, glabra, 2 mm. longa. *Ovarium* parvum, conicum, glabrum. *Stylus* glaber, stigmatibus capitato bilobo.

SARAWAK. Near Kuching, flowers slightly scented, *Haviland* 2063.

This is undoubtedly closely allied to *P. lanceolatum* Hook. fil., of Penang Hill, but the flowers are smaller and the calyx except for the woolly sepals has but few hairs.

Pygeum Beccarii Ridley, sp. nov., a *P. parvifloro* Miq., cui affine, foliis rotundatis obtusis glabris, nervis paucioribus, stylo longiore differt.

Frutex altus, ramis junioribus pubescentibus. *Folia* coriacea, glabra, obovata, apicibus rotundatis, basibus acuminatis, 11 cm. longa, 7.5–9 cm. lata, nervis supra depressis subtus elevatis 5-paribus ; petioli 1–2 cm. longi. *Stipulae* ovato-oblongae, subrotundatae, coriaceae, glabrae, marginibus dense velutinis. *Racemi* axillares, infra folia orti, hirti, 3–4 cm. longi, densiflori. *Bractae* oblongae, obtusae, hirtae, 1 mm. longae. *Pedicelli* 1 mm. longi. *Calyx* obconicus, 3 mm. longus, dense hirtus, lobis 8 ovatis extra dense hirtis. *Stamina* numerosa, gracilia, 3 mm. longa, glabra. *Ovarium* ovoideum, glabrum, serie pilorum circa basin instructum. *Stylus* validus, 4 mm. longus, stigmatibus orbiculari.

SARAWAK. *Beccari* 3516; Penkulu Ampat, Sarawak River, *Haviland* "b.r.o.b." (type), 755.

The flowers of this plant resemble those of *P. parviflorum* Miq. but the style is distinctly longer. The foliage is much more like that of *P. polystachyum* Hook. fil. but without the basal glands on the leaf.

***Pygeum parviflorum* Miq.**

SARAWAK. *Beccari* 3895.

Exactly like Miquel's plant from Java.

***Pygeum lampongum* Miq.**

SARAWAK. Kuching, *Haviland* 2011, 2144; *Haviland & Hose* 104. A native also of Sumatra.

***Pygeum stipulaceum* King.**

SARAWAK. Near Kuching, a small tree, *Haviland & Hose* 3378.

Also known from Bangka, Sungei Liat, M. Boei, *Teysmann*, and the Malay Peninsula. The fruits in *Teysmann*'s specimen are pisiform, about 4 mm. through and sparsely hairy.

RHIZOPHORACEAE.

***Pellacalyx cristatus* Hemsl.**

SARAWAK. *Beccari* 1258.

***Pellacalyx Lobbil* Schimp.**

BRUNEI. Hills, *Lobb*.

***Carallia cuprea* Ridley**, sp. nov., a *C. eugenioidea* King, cui affinis, floribus brevissime racemosis, foliis ellipticis cuspidatis differt.

Arbor parva. Folia coriacea, supra laevia, subtus cuprea, elliptica, breviter obtuse cuspidata, basibus attenuatis, 5-6 cm. longa, 2.5-3 cm. lata, nervis tenuibus inconspicuis parallelis 10-paribus, secundariis parallelis anastomosantibus; petioli crassiusculi, rugosi, 5-6 mm. longi. *Flores* sessiles, pauci, in racemis axillaribus 5 mm. longis. *Bracteae* minutae, orbiculares. *Calyx* globoso-campanulatus, lobis 5-brevibus obtusis, ovalis, 3 mm. longus. *Petala* 5, alba, paullo longiora, spathulata, apicibus dilatatis ovatis laciniatis stamina involventibus. *Stamina* 10, 5 petalis subaequilonga, 5 longiora. *Stylus* crassiusculus, vix longior.

SARAWAK. Kuching, *Haviland* 2915: "Small tree, petals white hooding larger stamens."

***Carallia confinis* Bl. var. *pauciflora* Bl.**

SARAWAK. *Beccari* 2780.

***Carallia viridiflora* Ridley**, sp. nov., a *C. integerrima* DC., cui affinis, foliis ellipticis vel ovatis, floribus minoribus in umbellis longipedunculatis differt.

Arbor. Folia coriacea, integra, supra nitida, elliptica vel ovata, breviter obtuse cuspidata, basibus cuneatis, 5-8 cm. longa,

2-4 cm. lata, nervis plurimis parallelis intra margines arcuantibus; petioli 5 mm. longi. *Cymae* axillares, pedunculis 2.5 cm. longis, ramis 3 patentibus 1 cm. longis. *Flores* virescentes, sessiles vel brevissime pedicellati, 3-4 in apice rami. *Bracteae* binae, ovatae, rotundatae. *Bracteolae* rotundatae. *Calyx* campanulatus, 2 mm. longus, lobis 5 ovatis 1 mm. longis. *Petala* 5, vix longiora, unguiculata, lamina rotundata denticulata. *Stamina* 10, filamentis teretibus 2 mm. longis. *Ovarium* uniloculare, ovulis 10 ab apice pendulis. *Stylus* validulus, stigmate capitato quinquelobo.

SARAWAK. *Beccari* 3367; near Kuching, flower greenish, *Haviland* 2085 (type).

This is allied to *C. integerrima* DC., but the flowers are in long-pedunculate cymes and much smaller and the leaves more elliptic.

***Carallia coriifolia* Ridley**, sp. nov., a *C. suffruticosa* Ridley, cui affinis, foliis crasse coriaceis subintegris, floribus majoribus differt.

Arbor parva. Folia rigide coriacea, elliptica, abrupte acuminata, cuspidata, basibus cuneatis, marginibus obscure serratis, 12 cm. longa, 5 cm. lata, nervis subtus elevatis 10-paribus intra margines inarcuatis, nervis secundariis anastomosantibus; petioli crassi, 5 mm. longi. *Flores* 1 usque complures, in axillis sessiles. *Bracteae* ovatae, coriaceae, persistentes, 2 mm. longae. *Calyx* subcylindricus, 2 mm. longus, lobis 5 lanceolatis acuminatis coriaceis 2 mm. longis. *Petala* 5, unguiculata, panduriformi-oblonga, basi limbi dilatata laciniata, medio angustato integro, apice oblongo dilatato laciniato, stamina involventia. *Stamina* 10, longiora, antheris dorsifixis ovatis subacutis. *Discus* lobatus, margine elevato. *Ovarium* triloculare, ovulis 4 pendulis, uno fertili. *Stylus* staminibus longior, stigmate capitato.

SARAWAK. *Beccari* 1174, 1613; near Kuching, small tree, *Haviland* 1797 (type), 2310.

This is allied to *C. suffruticosa* Ridley, having the same type of inflorescence, a sessile cone-like cluster of flowers in the axil, but the leaves are rigidly coriaceous, very like those of *Gynotroches*.

COMBRETACEAE.

***Combretum sundaicum* Miq.**

SARAWAK. *Beccari* 2187; Rejang, Sibuan, *Haviland* 2918.

BRIT. N. BORNEO. Labuan, *Molley* 227.

***Combretum chinense* Roxb. var. *pubescens* King.**

SARAWAK. Rejang, Sibuan, shrub, *Haviland* 802.

This closely resembles the Malay peninsula plant, but the petioles are rather longer.

***Terminalia borneensis* Ridley**, sp. nov., a *T. pyrifolia* Kurz, cui affinis, foliis majoribus, petiolis brevibus, calyce vix lobato differt.

Arbor parva. Folia chartacea, elliptica, cuspidata, obtusa, basibus attenuatis obtusis, opposita, 16 cm. longa, 6.5 cm. lata,

nervis 10-paribus tenuibus, nervulis transversis remotis undulatis, costa subtus elevata pubescente; petioli pubescentes, 5 mm. longi. *Racemi* axillares, hirsuti, 6 cm. longi, pedunculis nudis 2 cm. longis, parte florifera densa 4 cm. longa. *Flores* albi, plurimi, pedicellis 1 mm. longis hirsutis. *Calyx* campanulatus, intus et extra pubescens, obscure 5-dentatus, 2 mm. longus. *Stamina* 10, glabra, filamentis filiformibus 3 mm. longis, antheris subglobosis. *Stylus* subaequilongus.

DUTCH BORNEO. Banjarmasin, Motley 380: "Small tree, flowers white."

This species is perhaps nearest *T. pyrifolia* Kurz, but the leaves are larger, elliptic, with very short petioles, the calyx also is not distinctly lobed but has five obscure short teeth and is much less hairy.

LECYTHIDACEAE.

Barringtonia anacardifolia Ridley, sp. nov., a *B. macrostachya* Kurz, cui affinis, foliis rigide coriaceis oblanceolatis, nervis paucis, rhachide spicae crasso, floribus majoribus differt.

Arbor magna. *Folia* rigide coriacea, integra, oblanceolata, obtusa, basibus sensim attenuatis, 28 cm. longa, 10.5 cm. lata, nervis ad 15-paribus subtus elevatis supra subdepressis; petioli 10 cm. longi, costulati et superne canaliculati, basi incrassati. *Spica* ultra 15 cm. longa, rhachide 5 mm. crassa pallida angulata. *Flores* sessiles. *Calyx* latus, campanulatus, 1.2 cm. longus, lobis 4 rotundatis coriaceis 1.2 cm. longis. *Petala* alba, coriacea, obovato-oblonga, 2 cm. longa, 1.5 cm. lata. *Stamina* copiosa, alba, filamentis linearibus 3.5 cm. longis, antheris flavis oblongis. *Ovarium* 4-loculare, ovulis pro loculo 6-7. *Stylus* roseus, 3 cm. longus.

SARAWAK. Near Kuching, Haviland 2934: "Large tree; petals and filaments white, anthers yellow, style pink, ovary 4-celled with 6 or 7 ovules in each cell."

Allied to *B. macrostachya* Kurz, but the stiffer leaves with more nerves, stouter spike-rhachis and larger flowers easily distinguish it.

Barringtonia Havilandii Ridley, sp. nov., a *B. fusiformi* King, cui affinis, foliis elongatis multinerviis oblanceolatis, pedicellis brevioribus differt.

Frutex vel *arbor*. *Folia* oblanceolata, longe acuminata, basin versus sensim attenuata, decurrentia, marginibus in junioribus minute serratis, 30-31 cm. longa, 6-9 cm. lata, chartacea, nervis ad 30-paribus supra et subtus elevatis, secundariis pluribus gracilibus, nervulis transversis undulatis; petioli crassi, 1 cm. longi. *Racemus* gracilis, 35 cm. longus, rhachide 3 mm. crassa. *Flores* remoti, pedicellis 5 mm. longis. *Calyx* urceolatus, 5 mm. longus, lobis ovatis rotundatis 4 mm. longis. *Petala* alba, oblongo-ovata, 1 cm. longa. *Stamina* 2.5 cm. longa, filamentis capillaribus roseis basi per 4 mm. connatis, antheris ellipticis, connectivis latis. *Ovarium* triloculare, ovulis pro loculo 3 vel 4. *Stylus* capillaris, 3 cm. longus.

SARAWAK. Near Kuching, Haviland 2935: "Petals white, filaments pink, ovary three-celled with 3 or 4 ovules in a cell."

Careya lanceolata Ridley, sp. nov., a *C. jambosoides* Lauterbach, cui affinis, foliis lanceolatis integris tenuioribus differt.

Arbor vel *frutex*. *Folia* coriacea, lanceolata, acuminata, acuta, basibus angustatis, margine integro, 16-18 cm. longa, 5.5-6 cm. lata, nervis 12-paribus gracilibus inarcuantibus subtus elevatis, nervulis transversis undulatis; petioli 2.5-3.5 cm. longi, basi incrassati. *Racemi* infra folia axillares, rhachidibus crassis, 1.5 cm. longi, 5 mm. crassi. *Flores* circiter 12, sessiles, congesti. *Calyx* urniformis, 1 cm. longus, lobis 4 ovato-rotundatis 5 mm. longis. *Petala* 4, oblongo-ovata, obtusa, 2 cm. longa, 1 cm. lata, rosea. *Stamina* plurima, exteriora ananthera, filamentis linearibus 3.5 mm. longis basibus per 5 mm. connatis, interiora antheris praedita, thecis reniformibus. *Ovarium* 4-loculare. *Stylus* gracilis, 3 cm. longus.

SARAWAK. Beccari 1515; Kuching, Haviland 537, 2933 (type): "Flowers crowded in heads of about 12 flowers sessile on a short thick common receptacle, bracteate. Corolla and calyx partly pink. Petals caducous, 4, pink. Ovary 4-celled, placentas small, ovules large, few."

This is a very distinct species only resembling *C. jambosoides* Lauterb., of New Guinea, in the entire leaves. In Beccari's specimen the leaves are smaller and more ovate, 6 cm. long and 4 cm. wide, but it appears to be from a young branch.

XLV—THREE NEW SPECIES FROM TIBET.

C. E. C. FISCHER.

Vicia tibetica C. E. C. Fischer, sp. nov. [Papilionaceae]; *V. chinensi* Franch. peraffinis, sed stipulis flabellatis valde dentatis, vexillo haud unguiculato differt.

A rambling woody *undershrub*, 25-50 cm. long; stems quadrangular and often twisted above, glabrous or more or less pubescent. *Leaves* alternate, pari-pinnate; rhachis (excluding the terminal tendril) 1.5-8 cm. long, channelled above, glabrous or puberulous; leaflets from near the base, 6-16, elliptic to elliptic-oblong, 5-21 mm. long, 2-7 mm. wide, apex acute, truncate or shallowly emarginate, apiculate, glabrous or puberulous on the nerves beneath, lateral nerves 8-12 pairs, elevated on both surfaces, forked near the margins and joining the next above and below; petioles minute, pubescent; tendrils 2-3 cm. long, simple, forked, tripartite or twice forked. *Stipules* usually flabellate with 5-6 large, acuminate or caudate-acuminate teeth, up to 5 mm. long and 12 mm. wide, the upper side often much the longer, sometimes obliquely lanceolate with a single tooth. *Racemes* axillary; peduncles 3-6 cm. long, angular, glabrous; rhachis pubescent, 10-20-flowered; bracteoles minute, pubescent, deciduous; pedicels 1-2 mm. long, pubescent. *Calyx* obliquely cupular, mouth oblique, sparsely hairy; tube 3 mm.

long; teeth 5, lanceolate to ovate, acuminate or caudate-acuminate, upper 1 mm. long, lowest 2.8 mm. long. *Corolla* blue to mauve; *standard* oblong, 1-1.25 cm. long, 3.5-5 mm. wide, widest just below the rounded 2-lobed apex, not clawed; *wings* as long, narrowly oblong, rounded, claw 5.5 mm. long, with a falcate, acute spur 2.6-3 mm. long above the claw; *keel* boat-shaped, 0.8-1 cm. long, anterior end rounded, apex subacute, the petals cohering in the upper half, claw 5 mm. long, lateral lobe small, rounded, disk with a semicircular fold embracing the edge of the wing. *Vexillary stamen* with a broad filament. *Anthers* very small, oblong. *Ovary* elliptic-oblong, compressed, 5-6 mm. long on a carpophore 2 mm. long, glabrous; *ovules* 6-7; *style* 2.6 mm. long, curved upwards, glabrous below, hairy about the apex; *stigma* capitate, pubescent. *Legume* (immature) obliquely elliptic, compressed, acute at both ends, 1.8 cm. long, 6.5 mm. wide, apparently only 1-2 seeds developing; *carpophore* 2.6 mm. long.

TIBET: Kyi Chu valley near Lhasa, fls. Aug., *H. J. Walton* (type, in Kew Herb.); Lhasa, fls. & young frt. Sept., *H. J. Walton*; Gyantse, fls. July-Sept., *H. J. Walton* (these three were collected during the Tibet Frontier Commission of 1904); Kharta, 3700 m., on stony ground, fls. June, *E. Norton* 103 (Mt. Everest Expedition 1922); Tsering-me (Dzakar Chu), 4000 m., among rocks above the river, *E. O. Shebbeare* 123; Orpa, near Kharta Shika, 3400 m., *L. R. Wager* 238 (the last two collected in flower in July—Mt. Everest Expedition 1933); Gobshi, 4000 m., fls. Aug., *F. Spencer Chapman* 228.

CHINA: Szechuan, Ta-tsien-lou (Kiala District), *J. A. Soulié* 759, 797.

The plants collected by Walton cited above were recognised by Sir D. Prain as a new species for which he proposed the name adopted.

Aster Gouldii C. E. C. Fischer, sp. nov. [Compositae]; ab *A. molliusculo* Wall. foliis minoribus linearibus, capitulis minoribus, bracteis involucribus hirsutioribus papilloisque, achaeniis albidis differt.

Perennial, much branched from the base; rootstock vertical, woody, up to 10 cm. long; branches few to numerous, woody below in older plants, up to 20 cm. high, pubescent, sometimes purplish, leafy to near the capitula. *Leaves* sessile, linear-spathulate, obtuse, 5-30 mm. long, 1-4 mm. wide, hispid, midrib prominent below, lateral nerves very obscure. *Capitula* solitary, terminal on the branchlets, rayed, 1 cm. diam., or up to 3.5 cm. including the ligules. *Involucre* hemispheric; bracts usually 2-seriate, sometimes a few below, equal or the outer somewhat shorter, linear or ensiform, acuminate, membranous, often with very narrow scarious margins, hispid and minutely papillose without, 3-6 mm. long. *Receptacle* flat, pitted, the edges of the pits more or less papillose. *Ray florets* many, ligulate; *ovary* oblong-obcuneate, 1-1.6 mm. long, appressed

hairy; *pappus* white or brownish, of barbellate hairs 2.5-3 mm. long, sometimes a few very short outside; *ligules* strap-shaped, apex rounded, 1-2 cm. long; *style* short, lobes short, flat. *Disk florets* very many, tubular, yellow; *ovary* and *pappus* as in the ray florets; *corolla* 3.5 mm. long, lobes short, triangular, acute, sparingly bristly without in bud, glabrous later; *anthers* 1.5-2 mm. long, terminated by a distinct, lanceolate, acute, empty appendage; *style* arms flat or slightly plano-convex, acute, minutely puberulous. *Achenes* obovate, compressed, apex rounded, base acute, 2-2.2 mm. long, 1-1.2 mm. wide, dark brown, subpatently white-hairy; *pappus* reddish, 2.6-4 mm. long.

TIBET: Mountain behind Drepung, north-west of Lhasa, 5400 m., fls. & frt. Sept., *F. Spencer Chapman* 21 (type, in Kew Herb.); Ralung, 4150 m., fls. Aug., *F. Spencer Chapman* 1053; above Singma Khangchung, 3550 m., fls. Aug., *F. Spencer Chapman* 1175; south of Rakhas Tal, 4450 m., fls. and frt. Sept., *R. Strachey* and *J. E. Winterbottom* 3 (1754); Tingri, 45 miles north-west of Everest, fls. July, *A. F. R. Wollaston* 106, 113 (Mount Everest Expedition 1921); Numa and Gyantse Hills, fls. Sept., *H. M. Stewart*; Lhasa, 3700 m., fls. Aug.-Sept., *L. A. Waddell*.

Saussurea Chapmanii C. E. C. Fischer, sp. nov. [Compositae]; *S. Kunthianae* C. B. Clarke proxima, sed caule elongato folioso, foliis majoribus subtus haud albo-tomentosis recedit.

Herb; stems slender, solitary or twin, 10-22 cm. long, glabrous or sparsely cottony upwards, base clothed with the dark, fibrous remains of old petioles. *Leaves* mostly radical, few to many, narrowly oblong or oblanceolate-oblong in outline, 4-18 cm. long, 1.3-3 cm. wide, deeply runcinate-pinnatifid to 1-3 mm. from the midrib, lobes opposite, especially towards the acute, apiculate apex, or alternate, very varied in shape and size, from narrow triangular-falcate to semi-circular, up to 1.2 cm. broad and long, decreasing in size from apex to base, margins apiculate-lobulate or dentate, midrib rather broad and usually striate below, glabrous or sparsely crispately hairy on the midrib and margins above, and on the midrib and nerves below; petioles 1-7 cm. long; cauline leaves 1 or 2, similar but smaller. *Capitulum* solitary at the end of the stem, campanulate, 2-2.5 cm. long, 1.5 cm. diam., sometimes with 1 or 2 foliaceous bracts at the base. *Involucri bracts* 5-6-seriate, outer oblong-lanceolate, acute, 1 cm. long, 4 mm. wide, stiffly chartaceous, yellowish brown and more or less plicate in the lower half, membranous, dark-green or purplish-olivaceous (when dry) upwards, the terminal part often reflexed, the next 2 or 3 rows dark purple in upper half, inner becoming more scarious, innermost scarious throughout, up to 1.9 cm. long, 3 mm. wide, acute or acuminate, apex more or less apiculate-denticulate. *Receptacle* flat, bristly; bristles pale-brown, smooth, in groups of unequal length, 7-10 mm. long. *Florets* numerous. *Ovary* oblong, truncate, crowned with a

minute, fleshy, lobulate ring, compressed, 3.5–4.5 mm. long with an apical projection 0.7–1 mm. long terminated by a cup into which the style articulates, glabrous. *Pappus* 2-seriate, brown, outer bristles slender, inner stout and somewhat longer, up to 1.8 cm. long, all plumose. *Corolla* purple, 0.5 mm. diam. for about 1 cm., slightly expanded at the base to accommodate the apical projection of the ovary, then rather abruptly widened to 1.5 mm. diam. for 3–4.5 mm.; lobes linear, acute, 4.5–7 mm. long. *Anthers* purple, 6–7 mm. long excluding the 2–3 mm. long, white-hairy tails. *Style-arms* slender, acuminate, 2.5–4 mm. long, very minutely papillose. *Achenes* not seen.

TIBET: near Gantsa, 3700 m., fls. Aug., *F. Spencer Chapman* 262, 266 (type, in Kew Herb.); road from Natu La to Champitang, 4200–3700 m., fls. Aug., *F. Spencer Chapman* 428; Champitang, 3700 m., fls. Aug., *F. Spencer Chapman* 1113; Phari, 4200 m., fls. Aug., *F. Spencer Chapman* 1176; Yatung, 27° 51' N., 88° 35' E., *H. E. Hobson*.

None of the labels bears any further details, and the colours given above are taken from the dried specimens.

XLVI—NOTES ON XYLOCARPUS. H. N. RIDLEY.

The genus *Xylocarpus* Koen. comprises about seven species of seashore trees occurring chiefly in mangroves, but in some cases on more sandy spots in maritime localities, in the old world tropics, ranging from the east coast of Africa to Polynesia. There has been a good deal of confusion in the names of the two commonest species, *X. Granatum* Koen. and *X. moluccensis* (Lam.) Roem., owing to descriptions published by Lamarck based on Rumphius' very bad drawings and descriptions of the Amboina species. The confusion was cleared up by Merrill, *Interpr. Rumph. Herb. Amboin.* 306 (1917). Besides the two common species and *X. gangeticus* Parkinson, I find three other undescribed species.

X. Granatum Koen. [*Nireh batu* (Malay). *Carapa obovata* Bl. *C. carnosulus* Zoll. et Mor. *Nat. en Geneesk. Arch. Neerl. Ind.* 2, 582 (1845)] occurs in the Sunderbuns, Burmah, Mergui, Ceylon, Siam, Cochinchina, Malay peninsula, Borneo, Celebes, Java, Philippines, Papua (a variety), Australia, Fiji, Tonga and other Polynesian islands, Madagascar and Seychelles. I have not seen any specimen from East Africa, but Sim, *Forest Flora Portuguese E. Africa*, p. 27, t. xvi (1909), figures a plant under the name *X. moluccensis* which has the stamen tube of *X. Granatum* with retuse lobes, not the dentate form of *X. benadirensis* Matt. He records it from tidal mud in all the rivers at and north of Quelimane.

Xylocarpus benadirensis Mattei in *Boll. Ort. Bot. Palermo*, 7, 99 (1908), descr. amplif. *Ridley*.

Carapa moluccensis Lam. sec. *Oliv. Fl. Trop. Afr.* 1, 337 (1868), non Lam.

A *X. Granato* Koen., cui affinis, foliis tenuioribus, tubi staminei lobis unidentatis nec bifidis, pericarpio crassiore, seminibus vix acutangulis differt.

Arbor 7-metralis, ramosus, caulibus 2 vel pluribus, cortice laevi. *Folia* 4 cm. longa; foliola 4, coriacea, oblanceolata vel obovata, apicibus obtusis, ad bases attenuata, basibus inferiorum saepe inaequilateralibus, 7–11 cm. longa, 3–4 cm. lata, nervis circiter 10-paribus gracilibus inarcuantibus, secundariis et reticulationibus aequae conspicuis; petioli 2 mm. longi. *Paniculae* 4–5 cm. longae, patentes, ramis paucis dissitis 2 cm. longis, pedicellis 1 cm. longis. *Bractaeae* minutissimae, acutae, caducae. *Sepala* 4 (raro 5), ovato-rotundata, 1 mm. longa. *Petala* 4, oblonga, obtusa, alba vel pallide rosea, 4 mm. longa. *Tubus staminalis* 3.5 mm. longus, campanulatus, lobis 8 truncatis haud retusis dentibus acutis singulis, antheris oblongis sessilibus introrsis aurantiacis. *Ovarium* in disco rubro immersum, 4-loculare, ovulis 2 pro loculo. *Stylus* superne attenuatus, subconicus, stigmate discoideo. *Fructus* magnus, globosus, 12–20 cm. crassus, 4-valvis, pericarpio carnosio crasso albo-punctato. *Semina* irregularia, suberosa.

MADAGASCAR. Nossi Bé Island, *Boivin*. Aldabra Island, *Fryer* 72.

ITALIAN SOMALILAND. Benadir Coast, Jumbo (Goscia), by the Juba River, *Macaluso* (type).

KENYA COLONY. Vanga, on creek-banks especially where water flows into the swamps, but also in pure salt creeks, flowers January, *R. M. Graham* in *For. Herb.* no. 2236.

ZANZIBAR. Without locality, *J. H. Vaughan* 1798. Makongwe Island, Pemba, in mangrove formations, *Greenway* 2732.

PORTUGUESE EAST AFRICA. River Luabo, at mouth of R. Zambezi, *Kirk*. Savana River, common in tidal waters, *Honey* 655. Beira, *Kuntze*. In mangrove at Catembe opposite Lorenzo Marques on the Rio do Espirito Santo and at Matolla River Bridge, 8 miles from Lorenzo Marques, *Muir* 4809.

Native names: *Mjava* (Honey); *Mkomafi* (Swahili, Graham).

The flowers of this were not described by Mattei, who only had the fruit. *Kirk* describes the tree as 20 feet tall, usually branchy, often 2 or more stems from one rootstock, twigs red-brown, bark smooth or yellowish. *Greenway* says the timber newly cut is pink. It grows among the mud near the coast. The base of the trunk divides into many flat plates which radiate towards the roots coming from the stem (*Kirk*). In this the tree resembles *X. Granatum* the bark of which however is flaky, not smooth. The pericarp of the fruit is thicker and the seeds less distinctly angled. Mattei describes the fruit as 20 cm. through.

Xylocarpus minor *Ridley*, sp. nov., a *X. Granato* Koen., cui affinis, foliis minoribus oblanceolatis, floribus minoribus, stylo conico, fructu multo minore differt.

? *Carapa borneensis* Becc. Nelle Foreste di Borneo, 574 (1902).

Arbor 7.5-metralis. *Foliola* rigide coriacea, oblanceolata, obtusa, apicibus rotundatis vel emarginatis, basibus angustatis, 6-9 cm. longa, 2.5 cm. lata, nervis tenuibus 7-paribus; petioli crassi, 3 mm. longi. *Paniculae* 1 cm. longae, pauciramosae, pauciflorae. *Bracteae* minutissimae, ovatae, acutae. *Pedicelli* 1 mm. longi. *Sepala* 4, ovata, obtusa, 2 mm. longa. *Petala* 4, oblonga, obtusa, alba, 3 mm. longa, 1 mm. lata. *Tubus staminalis* cylindricus, lobis 8 brevibus emarginatis, antheris 8 ellipticis. *Ovarium* in disco conico immersum, stylo crasso superne attenuato, stigmate peltato. *Fructus* globosus, pericarpio 3 mm. crasso.

SIAM. Trang, Pungah, *For. Dept. Siam* 723.

MALAY PENINSULA. Malacca, Maingay, Griffith (type). Perak, Scortechini.

BRIT. N. BORNEO. Gundangan, near the river, Goklin in *B.N.B. For. Dept.* 2232: "Tree, 25 ft. high, 30 ft. girth. Flower white."

This tree is known to the Malays as *Nireh Bunga* as opposed to *Nireh Batu* (*X. Granatum* Koen.). It was described by me in the Flora of the Malay Peninsula as *Carapa obovata* Bl. (*X. Granatum* Koen.). *X. minor* Ridl. is absent from Java. It is less common than *X. Granatum* and not valued as a timber, being a rather smaller tree with narrower stiffer oblanceolate leaves, smaller flowers and fruit the size of an orange only. The ovary included in the disc is conic, tapering to the mushroom-shaped stigma. In *X. Granatum* the disc is stout with a broad top and a short cylindric style, the stigma much broader and ribbed. The staminal tube is very similar in both species but in this the lobes are rather more deeply cut. *Carapa borneensis* Becc. (no. 3995 of his collection) from Sarawak may be this species, but I have seen no specimen and the description is quite inadequate.

***Xylocarpus parvifolius* Ridley**, sp. nov., a *X. gangetico* Parkinson, cui affinis, foliis perparvis, floribus multo minoribus in paniculis brevibus compactis differt.

Arbor 4-metralis, ramis gracilibus, ramulis gracillimis. *Folia* 6 cm. longa; foliola 4, subcoriacea, elliptica, obtusa, basibus brevissime cuneatis saepe obscure inaequilateralibus, 4-6 cm. longa, 2-3 cm. lata, nervis tenuibus 6-paribus, secundariis et reticulationibus aequae conspicuis; petioluli 1 mm. longi. *Paniculae* 2-3 cm. longae, racemiformes, ramis 3 mm. longis. *Bracteae* minutissimae, lanceolatae, acuminatae. *Pedicelli* 2 mm. longi. *Sepala* 4, ovata, obtusa, 1 mm. longa. *Petala* 4, oblonga, obtusa, 4 mm. longa. *Tubus staminalis* globoso-urniformis, basi angustatus, lobis brevibus oblongis truncatis integris, antheris 8 oblongis. *Discus* cum ovario crassus, cylindricus, papilloso-costatus. *Stylus* crassus, conicus, stigmate magno discoideo. *Fructus* (immaturus) globosus, 4 cm. crassus, 4-valvis, pustulosus.

SIAM. Koh Lak Laiburi, April 1919, Hamid in *C. F. Field* no. 3804 (flowers). Patenam, tidal swamps, 10 April 1924, Kerr 8198 (fruit): "Small tree, 4 m. high."

Very distinct in its small leaves and short dense panicles, and its nearly globose stamen-tube with short broad processes. The flowers are about half the size of those of *X. gangeticus* Park.

***X. gangeticus* Parkinson** occurs in Bengal, where it is apparently rare, and in Burmah and the Andamans.

***X. moluccensis* (Lam.) Roem. sec. Merr.** [*Carapa indica* Juss. in Dict. Sci. Nat. 7, 32 (1817). *X. Forstenii* Miq. in Ann. Mus. Bot. Lugd.-Bat. 4, 62 (1868), probably. *X. Granatum* Miq. l.c. is certainly this species. *X. mekongensis* Pierre, Fl. For. Cochinch. t. 359 (1897).]

This tree seems to prefer sandy beaches to the tidal mud of the mangroves, which is perhaps the reason why it is so scarce in the Malay Peninsula where much of the shores is tidal mud. The fruit is only as large as an orange and the thinner ovate acuminate leaves, green when dry, and the lax panicle, readily distinguish it. The staminal tube has an undulate margin. It occurs in Burmah, Siam and Cochinchina, Malay Peninsula, Malacca, Pulau Tioman and Terutau island, Karimata, Philippines, Amboina, Buru, Ceram, Timor-Laut, Papua, Fiji, Samoa, Tonga and other islands, Madagascar, Nossibé, Aldabra, Seychelles, East Africa at Mombasa.

***Xylocarpus australasica* Ridley**, sp. nov., a *X. moluccensi* (Lam.) Roem., cui affinis, foliis multo minoribus, paniculis brevioribus compactis, floribus multo minoribus differt.

Arbor. *Folia* 6-7 cm. longa; foliola 4-6, opposita, subcoriacea, ovata, obtusa, basibus rotundatis, vel lanceolata apicibus et basibus angustatis, 6.5-9 cm. longa, 4.5-5 cm. lata, sicca viridescens, nervis gracilibus 6-paribus apicibus furcatis utrinque elevatis; petioluli crassi, 2 mm. longi. *Panicula* brevis, racemiformis, dense multiflora, 2-4 cm. longa, ramis 6 vel 7 gracilibus 5 mm. longis. *Pedicelli* 2 mm. longi. *Calyx* patelliformis, vix 1 mm. longus, dentibus minutis 5. *Petala* oblonga, obtusa, 2 mm. longa. *Tubus staminalis* basi dilatatus, superne cylindricus, lobis truncatis cuspidatis, antheris oblongis majusculis. *Discus* brevis, crassus. *Stylus* breviusculus, crassus, cylindricus. *Stigma* magnum, discoideum.

QUEENSLAND. Howick's Group, F. Mueller. Salt water creek near McAdam Range, F. Mueller. Cairn Cross islands, F. Mueller (type). Endeavour River, A. Cunningham 157. Flowers July-August.

This plant is allied to *X. moluccensis* Roem., but very distinct in the small leaves, dense short panicle, much smaller flowers. The petals are spotted on the back, apparently with glandular dots. The staminal tube resembles that of *X. moluccensis* but is dilated over the disc and narrowed above. Cunningham's specimens have

lanceolate leaves narrowed at both ends, but ovate forms occur on the same spray. The calyx in these specimens is more distinctly lobed also.

EXCLUDED SPECIES.

X. guineensis Roem. Syn. Hesp. 124, *X. procerus* Steud. Nom. ed. 2, 2, 793 and *X. touloucouana* Steud. l.c. are all *Carapa procera* DC. Prodr. 1, 626.

XLVII—CONTRIBUTIONS TO THE FLORA OF TROPICAL AMERICA: XXXVI.*

PLANTAE HINTONIANAE: VIII.*

NEW MEXICAN GESNERIACEAE. C. V. MORTON (Washington).†

Phinaea multiflora Morton, sp. nov., foliis ovatis vel rhombeis simpliciter dentatis supra parce pilosulis, floribus numerosis, pedicellis albido-villosis, calycis lobis magnis, corollis externe pilosis, antheris apice connatis, ovario villosis.

Herba, caulibus haud ramosis circiter 13 cm. longis pilosulis. *Folia* pauca, opposita, subaequalia, petiolis usque ad 2.2 cm. longis pilosis; laminae ovatae vel rhombeae, usque ad 8 cm. longae et 5 cm. latae, acutae, basi obtusae vel rotundatae, tenuiter membranaceae, supra medium simpliciter dentatae, supra parce pilosulae, subtus praecipue in venis pilosulae, venis primariis 5-7-jugis. *Flores* numerosi, apice caulis fasciculati, pedicellis circiter 1.5 cm. longis albido-villosis. *Calycis tubus* brevissimus, villosus, lobis oblongis 6 mm. longis 2.7 mm. latis viridibus integris obtusiusculis utrinque pilosis. *Corolla* alba, rotata, circiter 1 cm. longa, tubo circiter 6 mm. longo externe piloso, lobis aequalibus rotundatis externe glandulas numerosas sessiles gerentibus. *Stamina* 4, filamentis contortis circiter 3 mm. longis gracilibus glabris, antheris apice connatis circiter 1 mm. longis, loculis oblongis discretis. *Ovarium* (pars libera) villosum, stylo 3 mm. longo basi puberulo, stigmate stomatomorpho, disco nullo.

STATE OF GUERRERO. Vallecitos, District of Montes de Oca, oak woods, 24 July, 1937, *Hinton* 10626 (type in Kew Herb.).

No species of this genus has been known previously from Mexico.

Achimenes (Dicyrta) brevifolia Morton, sp. nov., herba foliorum marginibus exceptis omnino glabra, foliis late ovatis subsessilibus chartaceis, calycis lobis brevibus, corollae lobis eroso-denticulatis, dentibus margine glanduliferis.

Herba 15-30 cm. alta, caulibus teretibus haud ramosis brunneis circiter 1 mm. crassis. *Folia* opposita vel ternata, subaequalia subsessilia, petiolis vix 1 mm. longis; laminae late ovatae

13-26 mm. longae, 8-23 mm. latae, breviter acuminatae, basi rotundatae, supra medium serratae, dentibus 3-5 utroque latere acutis, chartaceae, supra atro-virides, subtus rubescentes, utrinque marginibus scabris exceptis omnino glabrae, venis primariis 3- vel 4-jugis. *Flores* axillares, solitarii, pedicellis circiter 15 mm. longis gracilibus glabris ebracteatis. *Calycis tubus* obconicus, 1.5 mm. longus, glaber, lobis 5 ovato-oblongis 1.5 mm. longis 1 mm. latis obtusiusculis glabris. *Corolla* alba, infundibuliformis, 12 mm. longa, tubo 2.5 mm. lato plus minusve maculato sursum ampliato et 6.5 mm. lato, limbo circiter 10 mm. lato, lobis eroso-denticulatis, dentibus margine glanduliferis. *Stamina* 4, didynama, basi corollae tubi affixa, filamentis glabris gracilibus 3-4.5 mm. longis, antheris liberis quadratis 0.25 mm. longis 0.5 mm. latis, loculis contiguis haud confluentibus. *Ovarium* ellipsoideum, glabrum, stylo 3 mm. longo glanduloso-puberulo, stigmate stomatomorpho, disco annulari glabro integro.

STATE OF GUERRERO. Pasi6n, District of Montes de Oca, 1000 m., oak and pine forest, 5 Oct., 1937, *Hinton* 10766 (type in Kew Herb.).

The most closely related species is *Achimenes fimbriata* Rose, which is similar in its nearly glabrous leaves and eroso-denticulate corolla lobes with glandular-margined teeth. The two may be distinguished as follows:—

Leaves subsessile, the petiole not over 1 mm. long; leaf blades chartaceous, broadly ovate, almost as broad as long, acutely serrate; calyx lobes ovate-oblong, 1.5 mm. long; style glandular-puberulous.....*A. brevifolia*.

Leaves relatively long-petiolate, the petiole 1-2.5 cm. long; leaf blades thin-membranous, ovate or ovate-lanceolate, about twice as long as broad, obtusely serrate; calyx lobes linear-lanceolate, 2-5 mm. long; style glabrous.....*A. fimbriata*.

Achimenes flava Morton* var. **puberula** Morton, var. nov., a typo foliis subtus rubescentibus in mesophyllo puberulis differt.

STATE OF GUERRERO. San Antonio, District of Montes de Oca, 10 July, 1937, *Hinton* 10583 (type in Kew Herb.).

In the typical form of the species the leaves are pale green beneath and the leaf surface itself is glabrous, the veins however being sparingly pilosulous. Probably not much importance is to be attached to the reddish coloration of the under leaf surface in the var. *puberula*, but the very much closer pubescence, evenly distributed over the whole surface, is distinctive.

Achimenes (Scheeria) dulcis Morton, sp. nov., caulibus minute puberulis, foliis dentatis subtus puberulis, pedunculis solitariis, calycis lobis pilosulis, corollis oblique infundibuliformibus albis ecalcaratis nutantibus, limbo regulari patente, filamentis pilosulis,

* Continued from K.B. 1938, 168.

† Published by permission of the Secretary of the Smithsonian Institution.

* See Morton in K.B. 1936, 13.

antheris quadratis, stigmatē stomatomorpho, disco annulari integro.

Herba tenera, caulibus haud ramosis usque ad 50 cm. longis minute puberulis. *Folia* opposita, subaequalia, longe petiolata, petiolo usque ad 3 cm. longo; laminae ovato-lanceolatae, usque ad 11 cm. longae et 5 cm. latae, acutae, basi obtusae, tenuiter membranaceae, regulariter dentatae, dentibus utroque latere plus quam 30, supra appresso-pilosulae, subtus haud rubescentes, minute puberulae, venis primariis 6-8-jugis. *Flores* solitarii, axillares, pedunculo 2-2.5 cm. longo minute puberulo supra basin bibracteolato. *Calycis* *tubus* late obconicus, 2.5 mm. longus, apice 3 mm. latus, dense pilosulus, lobis oblongo-lanceolatis inaequalibus, majoribus 7 mm. longis et 3 mm. latis, minoribus 5 mm. longis et 2 mm. latis, omnibus acutis integris viridibus utrinque pilosulis. *Corolla* alba, 4-5 cm. longa, in calyce horizontalis, nutans, basi ecalcarata, paullum saccata, tubo basi 5 mm. lato sursum valde ampliato fauce 2 mm. lato externe parce piloso intus glabro, limbo patente 3 cm. lato, lobis subaequalibus circiter 6 mm. longis eciliatis intus eglanduliferis. *Stamina* 4, didynama, filamentis brevibus 17 mm. longis pilosulis haud contortis subteretibus, antheris transverse oblongis 1 mm. longis 1.5 mm. latis, loculis orbicularibus. *Ovarium* semi-inferum, placentae lamellis utrinque ovuliferis, disco annulari integro, stylo glabro glandulifero, stigmatē stomatomorpho. *Fructus* capsularis.

STATE OF MEXICO. Luvianos, District of Temascaltepec, on cliffs, 23 Aug. 1935, *Hinton* 8207 (type in Kew Herb.).

From the two previously known species of the subgenus *Scheeria*, *A. mexicana* (Seem.) Fritsch and *A. bella* Morton,* the present species is distinguished by its minutely puberulous rather than hirsute or lanate-villous stems, its white corollas, and its pilosulous filaments.

XLVIII—CONTRIBUTIONS TO THE FLORA OF BURMA: XIV.†

The localities in brackets after the name of the species are those from which it has been previously recorded.

***Clematis Buchananiana* DC.** [Ranunculaceae].

(Temperate Himalaya and Mishmi).

Wa States: Maingling, fls. Dec., *Maung Po Khant* 15235. "Climber with yellow flowers."

***Clematis Kerriana* Drumm. et Craib** [Ranunculaceae].

(Siam).

Wa States: Maingling Ywa, fls. Dec., *Maung Po Khant* 15234. Vernacular name: *Satgyoyit*. "Climber with yellow flowers"

* See Morton in K.B. 1936, 11.

† Continued from K.B. 1937, 440.

***Clematis subpeltata* Wall.** [Ranunculaceae].

This species has been conjoined with *C. smilacifolia* Wall. in Fl. Br. Ind., but there are good grounds for keeping them apart, as pointed out by Craib in Enum. Pl. Siam. The type specimen was obtained at Taong Dong near Ava (Wall. Cat. No. 4684, fls. Nov.)

Wa States: Nanlwe Chaung, fls. Dec., *Maung Po Khant* 15244. Vernacular name: *Kwanyogyi*. "Climber with brown flowers." In some specimens the petiole is attached up to 1 cm. within the basal margin which is then subcordate.

***Crotalaria assamica* Benth.** [Papilionaceae].

(Assam; Philippines).

Wa States: Nanlwe Chaung, fls. and young frt. Dec., *Maung Po Khant* 15245. "Shrub up to 1.5 m. tall with yellow flowers."

***Echinops niveus* Wall.** [Compositae].

(N.W. Himalayas).

Shan Hills: Pwehla, 1230 m., fls. May, *Collett* 655. S. Shan States: Loilem, above 1250 m., *W. A. Robertson* 4. Upper Burma, *D. Burke* without particulars or number; Shan name: *Pak lin ngenth*, Burmese name: *Taw soo bin*. Meiktila District: Yedwingtaung, at the foot of Sabapontaung, 1075 m., fls. Oct., blue, *H. C. Smith* 13703.

***Senecio nudicaulis* Ham.** [Compositae].

(W. and E. Himalayas).

Meiktila District: Yedwingtaung, 1075 m., fls. Oct., *H. C. Smith* 16291.

***Vernonia cylindriceps* C. B. Clarke** [Compositae].

(Manipur, China, Indo-China).

Wa States: Laukchan Ywa, fls. Jan., *Maung Po Khant* 15276. "Shrub up to 5 m. tall."

***Symplocos spectabilis* Brand** [Symplocaceae].

(Yunnan).

Wa States: Lwelonkwe taung, *Maung Po Khant* 15296. "Tree up to 8 m. tall, flowers yellow."

***Beaumontia breviflora* Oliv.** [Apocynaceae].

(China).

Thaungmyin Valley, fls. March, *J. H. Lace* 4690. Wa States: Nanpan Chaung, fls. April, *Maung Po Khant* 15332. "Creeper with white flowers."

***Paravallis macrophylla* Pierre** [Apocynaceae].

Dr. A. H. G. Kerr has pointed out that this is the correct identification for the plant that has been variously named *Trachelospermum anceps* Dunn et Will. in Kew Bull. 1920, 343; *Vallis arborea* C. E. C. Fischer in Kew Bull. 1925, 92, and *Vallis anceps* (Dunn et Will.) C. E. C. Fischer in Kew Bull. 1931, 28. It has also

recently been placed in *Kibatalia* by Woodson. An additional locality is Tavoy : Kalamunsi Chaung, frt. Jan., *R. N. Parker* 2440.

Gentiana serra *Franch.* [Gentianaceae].

(W. China).

Wa States : Laukchan Ywa, fls. Dec., *Maung Po Khant* 15259.

Tournefortia Roxburghii *C. B. Clarke* [Boraginaceae].

(Chittagong).

Maymyo plateau, 1075 m., fls. Aug., *J. H. Lace* 4142. Wa States : Nanhaw Ywa, Nankaw Chaung, fls. Dec., *Maung Po Khant* 15211. Shan name : *Marnan*. "Shrub with yellow flowers."

Trichodesma sinicum *Brand* [Boraginaceae].

(Yunnan).

Wa States : Laukchan Ywa, fls. Jan., *Maung Po Khant* 15275. "Tree up to 6 m. high ; flowers white."

Hypoestes triflora *Roem. et Sch.* [Acanthaceae].

(N.E. Himalaya ; W. China).

Wa States : Katmaw taung, fls. white, Dec., *Maung Po Khant* 15219. Shan name : *Maukhaung tein*.

Phlogacanthus pubinervius *T. And.* [Acanthaceae].

(Sikkim to Assam).

Wa States : Minesaw, fls. brown, Jan., *Maung Po Khant* 15289.

Ceratanthus calcaratus (*Hemsl.*) *G. Taylor* [Labiatae].

(China).

S. Shan States, fls. March-April, *R. W. MacGregor* 841.

Craniotome versicolor *Reichb.* [Labiatae].

(Himalayas from Simla to the Khasia Hills).

Meiktila District : Thauangbaw-yo, 615 m., fls. Oct., *H. C. Smith* 16272. Vernacular name : *Ziyo*.

Pogostemon Wattii *C. B. Clarke* [Labiatae].

(Manipur).

Wa States : Linglaing taung, fls. Dec., *Maung Po Khant* 15214. "Shrub with purple flowers. Leaves used medicinally by the Wa people."

XLIX—NEOPORTERIA AND CHILENIA. A. A. BULLOCK.

The genus *Neoporteria* was established by Britton and Rose (Cactaceae, 3, 94: 1922), to accommodate seven species of Cactaceae found along the coast and in the highlands of Chile. All had been previously referred to the aggregate genus *Echinocactus*.

Britton and Rose stated that the type-species was *Neoporteria subgibbosa* (Haw.) Britt. et Rose, and unless it can be shown that this statement was due to a taxonomic or some other error, their

choice must be accepted, and the name *Neoporteria* will remain permanently attached to *Echinocactus subgibbosus* Haw.

The generic diagnosis given by Britton and Rose includes the phrase, "stigma-lobes cream-colored to reddish," whereas in the key two species, including the type, are separated on the character "stigma-lobes greenish." It is evident that Britton and Rose were well aware of more variation in the colour of the stigma-lobes than is mentioned in their generic description, and a slight amendment, such as the insertion of the word "usually" is all that is required to cover the type. In these circumstances there is no justification for discarding Britton and Rose's type.

It is clear that Backeberg (*Blätter Kakteenforsch.* 1935, pt. 6 [p. 5], et in Backeb. et F. M. Knuth, *Kaktus-ABC*, 258: 1935), has taken the opposite view. In his "Blätter" he says of *Neoporteria*, "The styles are all cream coloured to pink" and in the "Kaktus-ABC" he includes among others, five of the species enumerated by Britton and Rose, and relegates the two with green stigma-lobes to the new genus *Chilenia* Backeb. (l.c. 299), which also includes two species which Britton and Rose had either reduced or regarded as doubtful, and three new species.

Chilenia Backeb. is thus a superfluous name for *Neoporteria* Britt. et Rose, and *Neoporteria* sensu Backeb. requires a new generic name.

The following enumeration includes the relevant synonymy:—

1. *Neoporteria* *Britt. et Rose*, Cactaceae, 3, 94 (1922), emend. Bullock.—*Chilenia* Backeb. in Backeb. et F. M. Knuth, *Kaktus-ABC*, 299 (1935), et *Blätter Kakteenforsch.* 1936, p. 3 [p. 5].

This genus includes *N. subgibbosa* (Haw.) Britt. et Rose, the type-species, and *N. chilensis* (Hildm.) Britt. et Rose, and such other species of *Chilenia* Backeb. as may be taxonomically distinct from these two.

2. *Nichelia** *Bullock*, nom. nov.—*Neoporteria* Britt. et Rose emend. Backeb. *Blätter Kakteenforsch.* 1935, pt. 6 [p. 5], et in Backeb. et F. M. Knuth, *Kaktus-ABC*, 258 (1935).

Nichelia Jussieu (*Monville*) *Bullock*, comb. nov.—*Echinocactus Jussieu* *Monville* in Salm-Dyck, *Cact. Hort. Dyck*. 1849, 170 (1850). —*Neoporteria Jussieu* (*Monville*) Britt. et Rose, Cactaceae, 3, 96 (1922); Backeb. in Backeb. et F. M. Knuth, *Kaktus-ABC*, 259 (1935).

The writer has chosen this species as lectotype of the generic name, not because it agrees better with the generic characters than any other species, but because it is the oldest species to which Backeberg and Britton and Rose assign the same limits.

Nichelia nidus (*Söhrrens*) *Bullock*, comb. nov.—*Echinocactus nidus* *Söhrrens* in *K. Schum. Monatsschr. Kakteenk.* 10, 122 (1900).—

*Anagram of *Chilenia*.

Neoporteria nidus (Söhrrens) Britt. et Rose, Cactaceae, 3, 94 (1922); Backeb. in Backeb. et F. M. Knuth, Kaktus-ABC, 260 (1935).—*Neopteria senilis* (Philippi) Backeb. l.c. 262.

Echinocactus nidus and *E. senilis* are now generally regarded as conspecific but Backeberg treats them as different species.

Nichelia occulta (Philippi) Bullock, comb. nov.—*Echinocactus occultus* Philippi, Fl. Atac. 23 (1860).—*Neoporteria occulta* Philippi (Britt. et Rose, Cactaceae, 3, 95 (1922); Backeb. in Backeb. et F. M. Knuth, Kaktus-ABC, 261 (1935).

Nichelia nigricans (Linke) Bullock, comb. nov.—*Echinopsis nigricans* Linke in Allg. Gartenz. 25, 239 (1857).—*Neoporteria nigricans* (Linke) Britt. et Rose, Cactaceae, 3, 95 (1922); Backeb. in Backeb. et F. M. Knuth, Kaktus-ABC, 261 (1935).

Nichelia fusca (Mühlenpfordt) Bullock, comb. nov.—*Echinocactus fuscus* Mühlenpfordt in Allg. Gartenz. 16, 10 (1848).—*Neoporteria fusca* (Mühlenpfordt) Britt. et Rose, Cactaceae, 3, 99 (1922); Backeb. in Backeb. et F. M. Knuth, Kaktus-ABC, 259 (1935).

Backeberg places eight other species under *Neoporteria*; one of these (*N. senilis*) has been dealt with already under *Nichelia nidus*. Of the remaining seven, one, *Echinocactus Aspillagai* was described by Söhrrens in 1929; the remainder were disposed of by Britton and Rose as follows:—

1. *Echinocactus ambiguus* Hildm. (1898)—in synonymy under *Copiapoa cinerascens* (Salm-Dyck) Britt. et Rose, Cactaceae, 3, 88 (1922).

2. *Echinocactus Fobeanum* Miesckley (1907)—a doubtful species, possibly belonging to the genus *Copiapoa* Britt. et Rose (l.c. 89).

3. *Echinocactus Kunzii* Först. (1846)—a doubtful species, possibly belonging to *Neoporteria* Britt. et Rose, sens. lat. (l.c. 99). Since the colour of the stigma is not given, it is not possible to decide whether this plant should be placed under *Nichelia* or *Neoporteria* Britt. et Rose, sens. restrict.

4. *Echinocactus Reichei* K. Schum. (1903)—as *Malacocarpus Reichei* (K. Schum.) Britt. et Rose (l.c. 191).

5. *Echinocactus napinus* Philippi (1872)—as *Malacocarpus napinus* (Philippi) Britt. et Rose (l.c. 191).

Owing to lack of material, the writer is not in a position to judge the correctness of the opposing views expressed by Britton and Rose and Backeberg, and the new combinations under *Nichelia* will not be made until the taxonomic position of the species concerned has been finally settled.

L—FOUR NEW SPECIES OF VERNONIEAE COLLECTED BY GLAZIOU IN BRASIL. W. R. PHILIPSON.

Eremanthus curumbensis Philipson, sp. nov. *Herba* perennis, rhizomate tuberoso, caule simplici striato tomentoso. *Folia* sessilia

vel alato-petiolata, caulis basi congesta; lamina obovata, obtusa, usque ad 15×8 cm., utrinque tomentosa, margine serrato, venulis subtus prominulis. *Pedunculus* 30 cm. longus, glomus 2×4 cm. solitarium gerens. *Capitula* 2×1 cm.; involucri squamae circa 20 imbricatae, lanceolatae, acutae, fuscae. *Flosculi* pauci; corolla tubulosa 12 mm. longa, lobis longis angustatis; antherae basi auriculatae; styli rami lineares. *Achenia* 8 mm. longa, cylindrica, 5-costata, tomentosa; pappus duplex, setis exterioribus 1 mm. longis, persistentibus, interioribus 15 mm. longis, planis, deciduis.

BRASIL: State of Goyaz, valley of the Rio Curumba, in the plains between the mountains, Glaziou 21645 (type in Kew Herb.).

Similar in habit to *E. scapigerus* Baker ex Mart. but differing in the shape and margin of the leaf and in the details of the glomerules.

Eremanthus pinnatifidus Philipson, sp. nov. *Herba* perennis, caule striato glabro foliato. *Folia* petiolata; petiolus usque ad 3 cm. longus; lamina ovata 20×10 cm., leviter tomentosa, valde pinnatifida, loborum marginibus sinuatis. *Glomera* 2×3 cm., 3–10 ad ramorum apices in corymbos disposita. *Capitula* 2×0.5 cm.; involucri squamae circa 15, imbricatae, lanceolatae, acutae, rosaceae, nitentes. *Flosculi* pauci; corolla tubulosa, 20 mm. longa, lobis angustatis; antherae auriculatae; styli rami lineares. *Achenia* turbinata, tomentosa; pappus duplex, setis exterioribus 2 mm. longis persistentibus, interioribus 15 mm. longis deciduis.

BRASIL: State of Rio Janeiro, environs of Rio de Janeiro, Glaziou 14033 (type in Kew Herb.); 12812.

This species is very distinct in the genus because of its deeply pinnatifid leaves. In this respect it approaches closely to the monotypic genus *Pithecoseris*, which differs from *Eremanthus* only in the elongated common receptacle.

Proteopsis insculpta Philipson, sp. nov. *Frutex* ramis robustis foliatis. *Folia* sessilia, basi vaginata; lamina 12×2.5 cm., ovato-lanceolata, acuta utrinque cinereo-tomentosa, costa nervisque subtus canaliculatis, margine integro. *Capitula* 4–5, 2×2 cm., subsessilia et in inflorescentiam terminalem foliis circumdatam aggregata; involucri squamae numerosae, lanceolatae, acutae, fuscae. *Flosculi* numerosi; corolla tubulosa, 12 mm. longa, lobis longis angustatis; antherae basi auriculatae; styli rami lineares. *Achenia* cylindrica, 10-costata; pappi setae copiosae, 1-seriatae 10 mm. longae, planae, deciduae.

BRASIL: State of Rio Janeiro, environs of Rio de Janeiro and D'Ouro Preto, Glaziou 14974 (type in Kew Herb.).

This species closely resembles *P. argentea* Mart. et Zucc. ex Sch. Bip. in its leaves and tomentum, but is very distinct because of its more woody and branched stems, and its involucre bracts which lack spreading spines.

Proteopsis Ekmaniana Philipson, sp. nov. Frutex 2-3 m. altus, omnino dense lanatus, ramis robustis foliatis. Folia breviter petiolata, basi vaginata; lamina 25×8 cm., ovata, ad apicem acutam angustata, margine integro, nervis venulisque subtus reticulatis prominulis. Pedunculi axillares usque 20 cm. longi, bracteis 2-3 gerentes; bracteis capitula terminalia cingentibus. Capitula 2×2 cm.; involucri squamae numerosae, acutae, fuscae. Flosculi numerosi, hermaphroditi; corolla tubulosa, 18 mm. longa, lobis longis angustatis ad apicem tomentosis; antherae basi auriculatae; styli rami lineares. Achenia 4 mm. longa, cylindrica, 10-costata; pappi setae 14 mm. longae, planae, deciduae.

BRASIL: State of Goyaz, Caxoeira da Vargem Grande (Serra da Baloza), between rocks, Glaziov 21668 (type in Kew Herb.). Flowers rose coloured.

This species is very distinct in habit but shows affinity to *P. Sellovii* Sch. Bip. In floral characters it is, perhaps, closest to *Sipolisia lanuginosa* Glaziov ex Oliv. which also has hairy tips to its corolla lobes. The supposed monotypic genus *Sipolisia* differs in no essential characters from *Proteopsis argentea* Mart. et Zucc. ex Sch. Bip. (the type species of the genus *Proteopsis*) and approaches extremely closely to *P. Sellovii* in habit. These two genera are best united so I propose the necessary combination **Proteopsis lanuginosa** (Glaziov ex Oliv.), comb. nov.

The present species is named in honour of E. L. Ekman who determined the specimen as a new species of *Sipolisia*.

LI—CHILENIOPSIS AND BRIDGESIA. A. A. BULLOCK.

The name *Bridgesia* Backeb. was first published as a *nomen nudum* in 1934 (Backeb. Blätter Kakteenforsch. 1934, pt. 3 [p. 5]), as follows:—

"[Genus] 71. *Bridgesia* Bckb. (*Bridgesia* (Echus., Lob.) Cumingii)." It may be assumed that the genus *Bridgesia* was erected with *Echinocactus Cumingii* Hopffer in Allg. Gartenz. 11, 225 (1843), as the type. This species was placed under *Lobivia* Britt. et Rose by the authors (Cactaceae, 3, 39: 1922) of that genus.

In Blätter Kakteenforsch. 1935, pt. 12 [p. 1], Backeberg gave a brief description of *Bridgesia*, and cited *Chileniopsis* Backeb. as a synonym. The latter name had not previously appeared in print. He says, "The genus was named after Thomas Bridges who collected in the Andes of South America just one hundred years ago. He brought over *Echinocactus* (Spegazzinia) Cumingii, for which this genus was first established (. . .) till its relationship could be cleared up. Instead of his plant, '*Echinocactus villosus*' is to-day placed in this new genus."

The first point which emerges is that *Bridgesia* of 1934 is not synonymous with *Bridgesia* of 1935: the first is a *nomen nudum* and is a synonym of *Spegazzinia* Backeb. (in Kakteenfreund, 2,

Nos. 9, 10: 1933, et Blätter Kakteenforsch. 1934, pt. 4 [p. 3], et in Backeb. et F. M. Knuth, Kaktus-ABC, 298: 1935); the second is based on *Cactus villosus* Monville (Hort. Univ. 1, 223: 1839) which was regarded as a doubtful species, probably belonging to their genus *Matucana* by Britton and Rose (Cactaceae, 3, 103: 1922). Both names are homonyms of *Bridgesia* Hook. (Bot. Misc. 2, 222: 1832), and must be rejected.

In the Kaktus-ABC, which was published on 31 Dec. 1935, Backeberg (p. 283) published the new generic name *Chileniopsis* citing as a synonym "*Bridgesia* Bckb. nom. nud." As Backeberg cites *Cactus villosa* Monville as one of the constituent species, he evidently intended the *Bridgesia* of 1935 as the synonym. No reason was given for the name-change, which, however, was nomenclaturally correct.

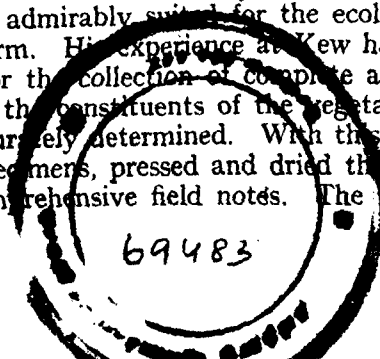
LII—MISCELLANEOUS NOTES.

BERNARD DEARMAN BURTT.—It is with the deepest regret that we record the death of Mr. B. D. Burtt, Botanist on the staff of the Department of Tsetse Research, Tanganyika Territory, who, together with his chief, Mr. C. F. M. Swynnerton, was killed in an aeroplane accident on 9th June, 1938, whilst on a survey flight in the neighbourhood of Singida, Tanganyika Territory.

Burt was the son of the late Dr. A. H. Burtt, himself a botanist, and was born at York on 14th June, 1902. He was educated at the Friends' School, Ackworth and at University College, Aberystwyth. Always fond of nature, he won for several years in succession the Prize for Natural History open for competition among the Friends' Schools in this country. At College he pursued biological studies for two years, leaving in 1922. Burtt then spent a few years working in the Herbarium of the Royal Botanic Gardens, Kew, some of which time he was assisting his cousin, Dr. J. Burtt Davy, in the compilation of part of the "Manual of the Flowering Plants and Ferns of the Transvaal." In 1925 he was selected by the Director of Game Preservation, Tanganyika Territory, Mr. C. F. M. Swynnerton, as District Reclamation Officer in the Tsetse Research branch of the Game Preservation Department. Later when Mr. Swynnerton became Director of Tsetse Research, Burtt became Botanist in his Department, a post which he held until his death.

Burt's great love of natural history and keen powers of observation made him admirably suited for the ecological survey duties he was to perform. His experience at Kew had made him realize the necessity for the collection of complete and well-dried material in order that the constituents of the vegetation he was studying might be accurately determined. With this end in view, Burtt collected fine specimens, pressed and dried them admirably and supplied most comprehensive field notes. The more difficult

3L
Im 56, N38
N3A



the group, the more attention it received from Burtt. For instance the abundant material which he collected of the ecologically important genus, *Commiphora* Jacq., enabled him, whilst at Kew during a period of leave, to work out the taxonomy of the species found in Tanganyika, a research which resulted in the publication of "Observations on the genus *Commiphora*, and its distribution in Tanganyika Territory,"* a paper which included a most useful field key to the commoner species, descriptions of several new species and many reductions to synonymy. Other complex and important genera which Burtt collected intensively are *Acacia* Willd., *Aloe* L., *Brachystegia* Benth., *Combretum* Loebl., and *Monotes* A. DC., his gatherings of which run into several hundred numbers, and will be a great help towards the ultimate revisions of these genera.

A considerable number of new species have been described from Burtt's collections, many of them having the epithet *Burtii*, whilst a most beautiful Connaraceous shrub with flowers resembling cherry blossom, an important constituent of the Itegi thicket vegetation of central Tanganyika Territory, is most fittingly dedicated to its collector and bears the name *Burtia prunoides* Bak. f. et Exell.† Many more species collected by Burtt remain to be described in years to come, for almost every genus of East African plants at Kew is enriched by some of his specimens.

More important, perhaps, than Burtt's discovery of new species was his re-collecting of hitherto rare or imperfectly known species, his fine specimens of which have enabled their taxonomic position to be accurately ascertained. He also added to our British herbaria many species which previously had been represented only on the Continent.

A Fellow of the Royal Geographical Society, Burtt was interested in the topography of tropical Africa especially in connexion with vegetation and plant-distribution. He used to spend many months of his leave travelling and exploring places other than those associated with his work. In 1930 he visited the Virunga Mountains and climbed all the eight principal peaks, at the same time making a fine collection of plants. A description of this expedition, with special reference to the mountain vegetation, was published by him in 1934.‡ On other occasions he explored the little-known mountains of northern Tanganyika collecting much useful material on each occasion. Quite recently Burtt was sent on a mission to Nyasaland to investigate the spread of tsetse-fly in that territory. Travelling from Shinyanga by road, Burtt passed through Abercorn in Northern Rhodesia and through country in which Carson had collected towards the end of last century. The prodigious collection Burtt made on this journey resulted in the

* Kew Bull. 1935, 101-117.

† Journ. Bot. Brit. For. 69, 249 (1931).

‡ Kew Bull. 1934, 145-165.

rediscovery of many species, known only from Carson's specimens. Shortly before his death, Burtt had curtailed his leave in England in order to return to his base at Shinyanga, Tanganyika Territory, by road from Nigeria, a route which led him through very varied country. A graphic account of this journey was contained in one of the last letters received from Burtt, which will be published elsewhere.

Burtt was a man of exceptionally fine physique and he possessed almost unfailing energy. Added to this he had a tremendous and infectious enthusiasm for his work, and a great capacity for endurance under the most exacting conditions. When it is remembered that a very large part of his 6500 odd gatherings of plants were collected, dried and annotated in his spare time, often after a hard day of trekking and surveying, it will be realized that few could have approached achievements such as his. Burtt possessed a charming personality, as is so often the case with great naturalists; he was large-hearted and generous, very fond of children and a lover of animals. Of his native servants he used to speak with real affection, and their length of service with him is a sure sign of their devotion to their master. One native "boy" who used to help Burtt write up his labels, had copied his handwriting so faithfully that the two hands are difficult to distinguish.

Burtt's loss will be keenly felt not only in the small community of fellow workers at Shinyanga, but by all those who were privileged to know him. Tsetse-fly research and African field botany are robbed of a great contributor, Kew of an enthusiastic collector of the highest rank, and those who knew him well of a lovable friend and charming companion.

E. MILNE-REDHEAD

HENRY NILUS THOMPSON.—We record with great regret the death on 9th July of Mr. H. N. Thompson, C.M.G., late Director of Forests, Nigeria. We are indebted to Captain W. A. Ross, C.M.G., and Mr. J. R. Ainslie for the following notes on Mr. Thompson's life and work.

In the death of Henry Nilus Thompson, C.M.G., the world has lost a great authority on the Flora and Fauna of Tropical Africa, and his friends a very generous and lovable man.

He was the son of R. H. Thompson of the Indian Forest Service and was born in Burma, where as a child he was rescued from a leopard which had entered his parents' tent in the forest. He was educated at Cooper's Hill and in Germany, and in 1889 he joined the Forestry Department of Burma. He was appointed to Southern Nigeria in 1902 and in 1906 became Director of Forests and Agriculture in the Amalgamated Southern Nigeria. In 1914 he was promoted Director of Forests for the whole of Nigeria, retiring in 1929.

"Timber" Thompson, as he was affectionately and widely known, was a great student and a very versatile man. He was a first-class shot, but he enjoyed more watching and studying elephants and other game both big and small at close quarters. In Nigeria he made long tours exploring the timber resources of the Colony. He had a wonderful memory and power of observation and his reports were full of discovery. Unfortunately he could not be prevailed upon in later days to record the unique knowledge of which his numerous treatise and reports contained but a tithe. He knew intimately the habits of the big and small game, the birds and insects, to say nothing of the flora. His earlier bulletins from the botanical station at Olokemeji contained prints of exquisite paintings of pests and flowers done under the microscope. Two new species, *Guarea Thompsonii* and *Landolphia Thompsonii*, were named in his honour. He was the most modest of men and it was only when with great friends that he uncovered a corner of his storehouse of knowledge on innumerable subjects.

He was a keen musician and no mean performer on the violin, banjo and piano, so that it was a joy to dine with him and have a musical evening. He was never idle. In spite of his eighteen stone he was untiring as a walker. When others slept he amused himself with Einstein or some scientific work in German, French or English.

He was devoted to the interests of the people and it was due to his influence that vast areas of forest were preserved by and for the natives without any friction or antagonism. In this he was wise in reserving to the native administrations the revenue and responsibility under his benign guidance.

So great was his love of Nigeria that he remained on retirement in the little forest home at Ibadan where, surrounded by his books, microscopes and an armoury of rifles, he was sought by subaltern and Governor and beloved by all who knew him.

When health failed, he had to come home for an operation, but he retained his steward and house in Ibadan and always cherished the hope that he might return and devote the remainder of his years to scientific investigation and to the enjoyment of the wonderful country that grips most men who are fortunate enough to serve there.

Thompson was also instrumental in establishing the administrations of the Botanic Garden at Victoria, Cameroons, on a proper basis. In a memorandum to the Government of Nigeria in 1925, he strongly supported the proposals I put forward after my visit to the Cameroons in 1921, and the scheme which was subsequently adopted owed much to his advocacy. A. W. H.

ALEXANDER ZAHLBRUCKNER.—We regret to record the death in Vienna of the eminent lichenologist Dr. Alexander Zahlbruckner. He died on the 8th May in his 78th year.

Zahlbruckner was born in St. Georgen near Pressburg, and after preliminary schooling in his native town he studied under Professor Wiesner at the University of Vienna. Having graduated as Doctor of Philosophy at the age of 23, he went to work under Beck-Mannagetta in the Vienna Natural History Museum. His promotion was rapid and when in 1899 Beck was appointed to the University of Prague, Zahlbruckner succeeded him as Keeper of the Botanical Section of the Museum. In 1918 he became its first director.

Lichen studies were among his first publications, and they were his chief interest for the rest of his life. Nevertheless he had a number of phanerogamic works to his credit, such as the account of the Penther collection of South African plants and his systematic studies of *Lobeliaceae*. Zahlbruckner seized every opportunity for travel, making himself acquainted with all important European herbaria. Working assiduously on lichen collections from all parts of the world, he published an important series of papers beginning about 1890, and as a result of these painstaking researches there appeared in Engler and Prantl's "Die Natürlichen Pflanzenfamilien" a modern system of lichen classification, now used as the basis of all systematic work on this group of plants. We are indebted to Zahlbruckner for the "Catalogus Lichenum Universalis," an outstanding work of reference started in 1921 and completed in 1934, and also for the very useful lichen bibliography in "Just's Botanischer Jahresbericht," which he produced with unfailing regularity from 1887 to the time of his death. Amidst these multifarious activities he yet found time in the last few years of his life to edit the second edition of "Rabenhorst's Kryptogamenflora von Deutschland, Oesterreich und der Schweiz."

Zahlbruckner had an astonishing capacity for work, and a pleasing personality, so that in every way his death is a very great loss to the botanical world. C. I. DICKINSON.

ROBERT SELBY HOLE.—It is with great regret that we record the death of Mr. R. S. Hole, C.I.E., F.C.H., F.L.S., in his 64th year on the 28th June, 1938. He was the son of the late Rev. Robert Hole and a relative of the famous Dean Hole. He was educated at Clifton College and at the Royal Indian Engineering College, into which he passed at the head of the list of probationers for the Indian Forest Service in 1893. After a successful scholastic career he passed out first of his year and was awarded the Fellowship of the College. He joined the Indian Forest Service in 1896, as Assistant Conservator of Forests in the Central Provinces. Having had the benefit of Professor Marshall Ward's teaching at Cooper's Hill, he soon showed his proficiency in botanical science and in 1904 was posted as Instructor to the Forest School at Dehra Dun. In May 1907 he succeeded Mr. H. H. Haines as Imperial Forest Botanist at the Forest Research Institute and held that post

until his retirement in 1925. His services were recognized by the Government by the award of the C.I.E. in 1919. He officiated for a short time as President of the Forest Research Institute and College in 1913 and was elected President of the Botanical Section of the Indian Science Congress in 1918. During his service in India he kept in touch with Kew and many botanical specimens sent by him are housed in the Kew Herbarium.

He had a wide outlook on scientific subjects, especially in connexion with forestry, and contributed a number of papers to the "Indian Forester" and other journals. He originated in India the effort to collate the ground flora with the quality of the soil as an index to its forest potentiality. Perhaps his best piece of work was that "On some Indian forest grasses and their oecology" published in 1911 as part I, vol. I of the "Indian Forest Memoirs." He also compiled "A Manual of Botany for Indian Forest Students," published in 1909, being the expanded text of his lectures at the Forest College at Dehra Dun.

His wife, the daughter of General B. P. Rooke, M.D., survives him and to her we extend our sympathy. C. E. C. FISCHER.

Botanical Monkeys.—In the Annual Report for 1937 of the Director of Gardens, Straits Settlements, an account is given by Mr. E. J. H. Corner, Acting Director of the Singapore Gardens, of the training of berok-monkeys (*Macacus nemestrina*) for the collecting of botanical specimens from high trees. The berok is the coconut or pig-tailed monkey which is widely used in the East by Malays for gathering coconuts.

The first monkey to be trained was Merah, obtained in April 1937 from Kelantan by Mr. Corner. Unfortunately Merah died after five months' work and the present team consists of two young beroks, Jambul and Puteh, who are both shaping well, though not yet as clever as Merah.

These monkeys understand twelve words of Kelantanese (Merah knew eighteen), and have been trained, in answer to the various commands, to pick specific twigs, drop them to the ground, descend and finally place them into the hands of the botanist. If the string to which they are attached becomes tangled they can untie almost any type of knot. Mr. Corner, in his report, says: "A berok upon the shoulder can be likened, in effect, to a falcon on the wrist; and its employment is recommended both to amateurs for its charm and cheapness and to keepers of Reserves where it is desirable to collect specimens repeatedly from the same trees without damage to them." He adds that Jambul and Puteh are to be congratulated on being the first apes to enter Government Service.

Contributions to the Flora of Borneo, etc. : V : a correction.—Dr. H. J. Lam, who kindly identified the *Sapotaceae* collected by the Oxford University Expedition to Sarawak in 1932 (see K.B. 1936,

17), authorises me to publish a correction to one of the numbers. The record of "*Palaquium* sp. aff. *P. rivulari* H. J. Lam" (l.c. 18), based upon Richards 1107, must be deleted, as a recent re-examination of the material at Kew has shown it to be a species of *Knema* (*Myristicaceae*), probably *K. glauca* (Bl.) Warb. I should point out that I was originally responsible for sending this specimen to Dr. Lam as a supposed *Sapotacea*, being at that time without experience of the Malayan flora. H. K. AIRY-SHAW.

Herbals.*—The first edition of Dr. Agnes Arber's book on Herbals appeared just over a quarter of a century ago, and has long been out of print. The second edition, which appeared in May of this year, will be welcomed by all who are interested in the subject. Starting with a chapter on the Early History of Botany, the author deals successively with the Earliest Printed Herbals (Fifteenth Century), the Early History of the Herbal in England, and the Botanical Renaissance of the Sixteenth and Seventeenth Centuries. Then follow chapters on the Evolution of the Art of Plant Description, the Evolution of Plant Classification, the Evolution of the Art of Botanical Illustration, and the Doctrine of Signatures and Astrological Botany. A ninth chapter summarizes the author's conclusions. "Perhaps the most obvious of these is the incalculable debt which botany owes to medicine. An overwhelming majority of the herbalists were physicians, who were led to the study of botany on account of its connexion with the art of healing Second only to the debt of botany to medicine is its debt to certain branches of the arts, especially printing and wood-engraving. . . . The draughtsman and engraver, indeed, did more than merely disseminate existing knowledge; they lent the botanist their acute and highly trained powers of observation, and their work must often have revealed to him much that, without their help, he would never have seen."

The most active life-period of the printed herbal covered about two centuries, from 1470 to 1670, the finest period falling between 1530 and 1614, that is, between the woodcuts after Hans Weiditz in Brunfels's "*Herbarum Vivae Eicones*," and the copperplates of Crispian de Passe in his "*Hortus Floridus*." Artistically, plant illustration culminated in the woodcuts in Fuchs's herbals, and scientifically, in those of Gesner published in works by Camerarius the Younger. Classification, nomenclature and description, on the other hand, reached their high-water mark in the "*Prodromos*" (1620) and the "*Pinax*" (1623) of Gaspard Bauhin. As time went on, the *herbal*, with its characteristic mixture of medical and botanical lore, was superseded by the exclusively medical

* "*Herbals, their origin and evolution: a chapter in the history of botany, 1470-1670*" by Agnes Arber, M.A., D.Sc., F.L.S. A new edition, re-written and enlarged. Cambridge, at the University Press, 1938. Pp. xxiv + 326, frontispiece and 26 plates. 131 text-figures. Price 21s. net.

pharmacopoeia, on the one hand, and the exclusively botanical *flora* on the other.

Compared with the first edition, the new one has 73 more pages, 5 more plates, and 18 additional text-figures. There are new sections on the Herbal in Spain and Portugal (pp. 104-110), and the Origin of Herbaria (pp. 138-143). The three appendices are not the least useful part of the book. The first consists of a chronological index of the principal herbals published between 1470 and 1670, the second is an alphabetical list, under authors' names, of works consulted, while the third is a subject index to Appendix II.

Those familiar with the first edition need no reminder of the charming style in which the work is written. Few authors wear their mantle of learning with such grace. It only remains to add that the printing and illustrations maintain the high standard of the Cambridge University Press.

T. A. SPRAGUE.

Pulle's Compendium.*—Professor Pulle's handbook consists of three parts, dealing respectively with the morphological terminology, the nomenclature, and the taxonomy of seed plants. The first part (pp. 1-70) is based on the late Professor J. W. Moll's "Handboek der Plantbeschrijving," of which three editions were published, in 1900, 1911 and 1916 respectively, but has been revised and considerably modified by Dr. H. Uittien. It is arranged under 112 numbered divisions, the first two forming a synopsis of the whole, and the remaining 110 being concerned with the subjects added here in brackets: nos. 3-27 (leaf); 28-38 (stem); 39-41 (root); 42-44 (buds); 45-49 (bulbs and tubers); 50 (tendrils); 51 (spines); 52 (ascidia and utriculi); 53 (lenticels, prickles,ramenta, scales and hairs); 54-56 (inflorescence); 57-103 (flower); 104-105 (fruit); 106-112 (seed).

The treatment of the inflorescence does not follow the stereotyped classification used in most textbooks, the primary division adopted being into inflorescences with sessile, and those with stalked flowers; this results in a mingling of racemose and cymose types, but may perhaps be convenient for the student. It is doubtful whether anything is gained, however, by the segregation of the dichasial panicle (seen in *Ligustrum* and *Buddleja*) from the thyrses; the latter is a general and useful term for any racemose arrangement of cymes.

The figures illustrating the various kinds of aestivation show only three of the four imbricate types occurring in pentamerous whorls, namely, contorted, quincuncial and apotactous (termed "cochlear" in the handbook). The paratactous type (see Journ. Bot. 1923, 210) is unrepresented.

The second part (pp. 71-127) of the handbook, dealing with nomenclature, is a distinct and commendable innovation in a work

of this type. Within the compass of 66 small pages Professor Pulle has given a digest of the more important provisions of the International Rules of Botanical Nomenclature. He points out the difficulties which the subject offers to the average botanist, and has given a clear account of the principal rules and recommendations. Starting with the necessity for a generally accepted international scientific nomenclature of plants, the book deals successively with synonyms, homonyms, categories of taxonomic groups and the terms denoting them, spelling and gender of names, valid publication, legitimate and illegitimate names, citation of authors' names, retention of names on division of groups, the rule of priority, nomina conservanda, starting-points of recognised botanical nomenclature, and the type-method. Then follow sections including examples of application of the Rules, the nomenclature of cultivated plants, and a synopsis of the headings under which the Rules are arranged.

The statement (p. 106) that *Cladium* [P. Br., 1756] is replaced by *Mariscus* [Zinn, 1757] under the Rules is open to question. Reasons for regarding *Cladium* P. Br. (1756) as validly published have been given in Kew Bull. 1934, 218. In any case it has recently been decided by the Special Committee for Phanerogamae and Pteridophyta that *Mariscus* Gaertn. (1788) should be conserved against *Mariscus* Zinn (1757), so that the latter name is unavailable for the genus concerned. The generic name *Neslia* Desv. (1814) cannot (as stated on p. 106) be replaced under the Rules by *Vogelia* Medik. (1792), since the latter is a later homonym of *Vogelia* J. F. Gmel. (1791).

The third part of the book (pp. 129-338) consists of concise descriptions of the Orders and Families of Seed-plants, accompanied by very clear floral diagrams. The classification is mainly in accordance with Engler-Diels' Syllabus, modified by the transposition of various groups to other parts of the system. A new subdivision, *Chlamydospermae*, is proposed for the reception of the Orders *Gnetales* and *Welwitschiales*, formerly included in the *Gymnospermae*. Perhaps the most novel feature, however, is the division of the *Metachlamydeae* (*Sympetalae*, *Gamopetalae*) into five groups, each of the first four being attached to a separate series of *Archichlamydeae*. Thus the Orders *Plumbaginales* and *Primulales* are placed after the *Centrospermae*, *Polygonales* and *Cactales*; the *Ebenales* follow the *Ranales*; the *Diapensiales*, *Ericales* and *Campanulatae* are appended to the *Guttiferales*; and the *Rubiales* succeed the *Celastrales* and *Umbelliflorae*. The position assigned to the *Campanulatae* is very questionable, but there is much to be said for the other changes mentioned, some of which embody suggestions contained in the Übersicht der Reihen der Angiospermen in Wettstein's Handbuch der Systematischen Botanik. The old group of the *Bicarpellatae* remains practically unaltered, except that the *Callitrichales* and *Hippuridales* have been appended to it.

* Compendium van de Terminologie, Nomenclatuur en Systematiek der Zaadplanten door Dr. A. A. Pulle. Utrecht, bij N.V.A. Oosthoek's Uitgevers-Maatschappij, 1938. Small 8vo. Pp. 338, 1 pl. Price Fl. 4.50.

It may be pointed out that the Family *Diclidantheraceae* should be deleted, it having been pointed out in 1932 (Hook. Ic. Pl. t. 3172) that *Diclidanthera* and the closely related genus *Barnhartia* are both referable to the *Polygalaceae*.

Professor Pulle's handbook should do much to stimulate interest in the Netherlands both in botanical nomenclature and in the classification of the Seed-plants. A similar book, written in English, would be welcome.

T. A. SPRAGUE.

A Bibliography of Eastern Asiatic Botany.*—Workers on the flora of China and Japan have been placed in an enviable position by the publication of this impressive Bibliography by Drs. Merrill and Walker. From the point of view of access to the literature of their subject, botanists concerned with this area have now an immense advantage over most of their colleagues.

The bibliography proper (authors and titles) occupies 550 pages, double column. The feature that immediately commends itself is the brief paragraph after each item, indicating or summarising its contents: obviously this greatly enhances the value of the bibliography. Titles of periodicals are abbreviated as shown in the reference list occupying preliminary pages xiii-xlii.

An appendix (pp. 551-592) gives "Older Oriental Works," "Reference Lists of Oriental Serials" and "Reference Lists of Oriental Authors," separate sections being devoted to Chinese and Japanese entries in each case.

The subject index, stated to be mainly the work of the junior author, is arranged under three headings: first, a general index of subjects; second, a geographic index, arranged under 4 main (political) Regions, and other subdivisions, to which a key-map is provided on p. 594 (a useful key-map to the prefectures and provinces of Japan is also given on p. 618); third, a systematic index, the major categories being arranged according to the Engler-Diels "Syllabus" (ed. 11, 1936), while families, genera and species are indexed alphabetically under each major group.

One can have nothing but praise for this work. Typography and lay-out are exceptionally clear, paper and binding are good, and the volume is comfortable to handle and opens flat. Only two misprints have been noted: "catologues," p. ix, l. 17, and "AMENOTAXACEAE," p. 645. Some idea of the labour involved in, and of the care expended on, this work may be gathered from the preface and introduction. There can be no doubt that the authors' hope "that the work will be a real aid to that wide group

* By Elmer D. Merrill and Egbert H. Walker. Sponsored by the Smithsonian Institution, Arnold Arboretum of Harvard University, New York Botanical Garden, Harvard-Yenching Institute. The Arnold Arboretum of Harvard University, Jamaica Plain, Mass., U.S.A., 1938. Pp. xlii+719. Two maps. Price \$50.

of botanists interested in the study of the rich and varied flora of Eastern Asia" (p. viii) will be amply fulfilled.

It would be ungracious to close without noting that publication was finally rendered possible through the generosity of an anonymous supporter, to whom, therefore, botanists in this field owe a special debt of thanks.

H. K. AIRY-SHAW.

Botanical Magazine.—Part I of vol. 161 was published on April 8th, 1938. It contains the following plant portraits:—

Meconopsis superba King ex Prain (t.9513), the handsome white-flowered species found in the Chumbi District, Tibet, and in Western Bhutan; × *Cistus Skanbergii* Lojac. (t.9514), originally described by Lojaccono as a species but now considered to be a natural hybrid between *C. monspeliensis* and *C. parviflorus* occurring in the island of Lampedusa, and in Greece; *Crocus laevigatus* Bory & Chaubard (t.9515), from the Cyclades, Euboea, Attica and N. Peloponnese; *Gaultheria Wardii* Marquand & Airy Shaw (t.9516), a fine purple-fruited species found in S. E. Tibet, N. E. Assam and N. W. Upper Burma; *Lonicera splendida* Boiss. (t.9517), native of S. Spain; *Linaria ventricosa* Coss. & Bal. (t.9518), distributed in S. W. Morocco; *Prunus (Cerasus) dawychensis* Sealy (t.9519), a new species or possibly a hybrid, probably Chinese, but known only in cultivation in Lt. Col. F. R. S. Balfour's garden at Dawyck, Stobo, Scotland; *Cypripedium japonicum* Thunberg (9520), described in 1784, a native of Japan and China; *Rhododendron phoenicodon* Balf. f. & Farrer (t.9521), from N. E. Burma; *Gladiolus Stanfordiae* L. Bolus (t.9522), a beautiful pale-pink-flowered species from the Eastern Province, South Africa, and *Myrtus Lechleriana* (Miquel) Sealy, comb. nov. (t.9523) originally described as *Myrcia Lechleriana* by Miquel, one of several Chilean plants known as "Luma," native of Southern Chile and Western Argentina.

The Alpine House.*—There are a number of books available devoted to the Rock Garden, but none has been published dealing exclusively with the Alpine House. The present volume by Stuart Boothman, therefore, fills an obvious need.

The book is written in such a way that even the most inexperienced alpine grower can follow it, and the advice given, being both practical and sound, will be helpful to all. A little more space might have been given to plunging beds and frames, as these are essential if display is not to be restricted. Some plants have quite a short flowering period, while most of our alpine enjoy the open air if not the full light and do not appreciate being kept in the house most of the year. A rock garden built under glass is not often a success.

* By Stuart Boothman. Rush and Warwick (Bedford) Ltd. 1938. Pp. 131. Illustrated. Price 5s.

Quite a good list of plants is given, but they have perhaps been selected for the specialist rather than for general purposes. All are certainly worthy of a place, but, apart from bulbs and saxifrages, they mainly cover only the months of May, June and July, while quite a number of well-known and easily grown plants have been omitted. These are often hardy on the rock garden, but that does not bar them from the alpine house.

Special attention is given to campanulas. These are undoubtedly a very beautiful group of plants, but other genera, equally attractive, might have been given more space, instead of devoting many pages to one genus.

Greater care might have been given to the orthography of names. The same specific epithet is frequently spelt in two ways on different pages, e.g., *Lupinus Lyalli* on p. 85, and *Lupinus Lyallii* on p. 121, etc. The use of the capital initial letter in specific epithets appears to cause difficulty. According to Recommendation 43 of the International Rules of Nomenclature (as amended at Amsterdam in 1935) "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 taken from generic or vernacular names (substantives or adjectives)." In such names, therefore, as *Veronica bombycina* on p. 104; *Iris histrioides* on p. 108, the specific epithet should be written with the small initial letter, whereas it should be *Rhododhamnus Chamaecistus* on p. 110; *Cypripedium Calceolus* on p. 70 and *Andromeda Polifolia* (not *polyfolia*) on p. 110. Although *Saxifraga Grisebachii* comes from the Balkans, the Wisley variety (p. 98), sometimes known as *Wisleyana*, can hardly claim that part of the world for its habitat. A number of other similar mistakes could be quoted, and it is hoped that they will be corrected in a future edition is called for.

These small technical errors do not detract greatly from the value of the book. Both the beginner and those who already have an alpine house, whether they are amateurs or professionals, will find much useful information in its pages.

G. H. PRESTON.

A Flora of Assam.*—The second volume of this work includes the 21 families from the *Connaraceae* to the *Cornaceae* (both included), following the sequence of the "Genera Plantarum." The two parts of volume I were reviewed in Kew Bull. 1935, 586, and 1937, 528 respectively, and certain shortcomings were stressed. The present volume is a distinct improvement; there are fewer omissions and far more pains have been taken to ensure modern nomenclature. Further, a larger, clearer and more pleasing type has been used.

A retired Forest Officer, Mr. A. Das, has been entrusted with the final duty of revision, but it is to be regretted that, owing to financial considerations, he has not been able to consult the Herbarium

* By U. N. Kanjilal, P. C. Kanjilal and A. Das. Vol. II. The Prabasi Press, Calcutta, 1938. Pp. v + 409. Price 12 Rs.

and Library at Sibpur in person. As he remarks: "It is impossible to do justice to a work of this nature without facilities for ready reference." Mr. Das, however, has been in communication with Kew and Sibpur and acknowledges the help extended to him.

C. E. C. FISCHER.

The Black Poplars.*—The numerous kinds of black poplar in cultivation have been a source of trouble to botanists and silviculturists alike for a long time. The task of identification has been very difficult owing to the great similarity in foliage and branch characters of many hybrids. The need for accurate identification was none the less urgent to the silviculturist, as closely related forms differ considerably in their resistance to disease. The publication of this workable key based on vegetative characters for the identification of the black poplars and their allies is assured of a widespread welcome.

The characters of the leaves and branches of value for identification are discussed and a key to the sections of the genus is given. Then follow excellent descriptions of the species, varieties and hybrids of the black poplar group that are both critical and concise. The key to the species and hybrids cultivated in Britain employs the vegetative characters discussed earlier in the work. It is simple to use except for a few cases in which the distinguishing characters cannot all be determined at one time. Thus $\times$ *Populus serotina* Hartig is separated from $\times$ *P. regenerata* Henry by the relative times of foliation, habit and sex.

It is regrettable that the nomenclature is not always in accordance with the International Rules of Botanical Nomenclature. Different binomial names are given to each of the cultivated segregates of the hybrid *P. nigra* L. $\times$ *P. deltoides* Marshall owing to a misinterpretation of Articles 31 and 34 of the Rules, which the author actually quotes in support of this practice. Article 31 explains the use of binomial names preceded by a symbol for hybrids, while Article 34 deals with different hybrid forms of the same parentage and states that "... the subdivisions are classed under the binary name of the hybrid like the subdivisions of a species under that of a species." In Article 31 it is stated that "The name, (which) is subject to the same rules as the names of species, ..." and Article 28 contains the statement: "The use of a binary nomenclature for subdivisions of a species is not admissible." It is clear therefore that the rules relating to species are intended to be applied to hybrids also when practicable. Morphologically different hybrid segregates derived from one pair of species must, therefore, be classified as varieties or forms of the hybrid under one binomial. Which of the terms variety and form

*By A. S. Cansdale and members of the staff of the Imperial Forestry Institute. The University Press, Oxford, 1938. Pp. 52. Price 3s. 6d.

is used is immaterial to the point at issue; there is no generally accepted definition of either.

The book ends with a good bibliography.

Plants for the Connoisseur.*—Mr. T. Hay has been recognised for many years now as an enthusiastic collector and expert cultivator of new and rare plants. In this work he deals with nearly one hundred subjects, giving full cultural details and adequate descriptions. Aptly described as "Plants for the Connoisseur," some may not prove to be everybody's plants, but the author's introductions are rapidly becoming less uncommon in gardens owing to his generous distribution of seeds and plants to garden lovers throughout the British Isles.

The great value of this book, which is splendidly illustrated, lies in its stimulus to follow the author's lead and grow uncommon and rare plants. Details as to habitat and other historical data serve to increase its interest. The notes on the new additions to the genus *Meconopsis* are especially valuable and are accompanied by a number of excellent photographs of new species which, under Mr. Hay's care, have already flowered in Hyde Park.

The countries yielding the greatest number of Mr. Hay's subjects are those in the neighbourhood of the Himalayas, such as Nepal and Kashmir, but he has flung his net wide and South Africa, California, Chile, Canada, Mexico, and even such isolated places as the Pribylov Islands in the Bering Sea, are all represented.

W. M. CAMPBELL.

Cultivation of Plants without Soil.†—It is a well-known fact in botanical laboratories that many kinds of plants can be successfully cultivated in aqueous solutions of mineral salts, selected so as to provide a balanced supply of those elements which are necessary for plant growth. The method of growing plants in water culture has, in fact, been used for many years to demonstrate to students the effects on the growth of the plants which may be induced by the omission of one or more of the ingredients from the complete culture solution. Those who have attempted to cultivate plants under these conditions are only too familiar with the difficulties which arise unless the cultures are constantly supervised in order to ensure that the solutions are sufficiently aerated and the growth of fungi, algae and bacteria suppressed. In spite of these difficulties, the possibility of growing vegetables and flowers by modifications of these well-known laboratory methods has, in recent years, aroused considerable popular interest, especially in

the United States of America. The system is also being used on a commercial scale in some places and it is understood that before long a hitherto barren island in the Pacific Ocean will become a port of call for aeroplanes in order to obtain supplies of fresh vegetables for the use of passengers. The vegetables are to be raised by soilless cultivation or "hydroponics"—a name which has been coined for this method of raising plants. Several manufacturers are now specialising in the supply of chemicals for "hydroponics" (*Chronica Botanica*, 4, 228: 1938).

The economics of crop production are certainly curious in these days of output restrictions and the deliberate destruction of food supplies which are alleged to be superfluous. One is forced to wonder why, under the existing circumstances, the ingenuity of man has been turned to devise ways and means of cultivating plants by such artificial means as those of hydroponics, when modern transport and cold storage methods enable plant products produced by normal means to reach the four corners of the globe. No doubt the love of novelty, the desire to advertise, and commercial exploitation have provided the principal stimulus. However this may be, those who are attracted by hydroponics either as a hobby or from a desire to know something of its commercial possibilities, would be well advised to read this lucid, semi-popular account of the subject by Ellis and Swaney. The methods described range from the cultivation of single plants in jars in an ordinary sitting-room or small greenhouse, to large-scale methods which are stated to be suitable for commercial purposes. Besides methods in which the roots of the plants are immersed in culture solution, descriptions are given of systems whereby the roots are embedded in sand, cinders, or other suitable materials through which the solutions are allowed to percolate either continuously or intermittently. A student who is first introduced to the physiology of plants by the first chapter of this book would be very unlikely to obtain good marks in an academic examination unless his views were balanced by reading a more orthodox exposition of the subject as well. The authors also tend to be rather sensational in chapter 6 where the influence on plants which may be exerted by hormones, heavy water, photosensitizing dyes, colchicine and other substances which have recently come into prominence is discussed. On p. 140 the authors do not clearly differentiate between algae and fungi. These defects are not very important, however, in a book which is intended primarily for popular rather than academic consumption. Most readers will probably find the book interesting, whilst to others it may be provocative, but it may be perused with advantage by all who are interested in plant cultivation. C. R. METCALFE.

* By T. Hay, C.B.O., V.M.H., Putnam, London, 1938. Pp. 180. Illustrated. Price 10s. 6d.

† "Soilless Growth of Plants," C. Ellis and M. W. Swaney. Reinhold Publishing Corporation, New York, 1938. Pp. 155, with 50 illustrations. Price 2.75 dollars (English price 13s. 6d.)

The Cultivation of Mushrooms.*—This is a revised and enlarged edition, incorporating the results of recent investigations, of a useful little handbook first published in 1934. Detailed descriptions and figures are given of methods of cultivation of mushrooms on a commercial scale including a working description of the shelf method. There is a chapter on diseases and pests, the arrangement of which is rather haphazard. Fungi which attack the mushroom itself are mixed in no obvious order with those which are injurious only as competitors in the beds. Among the invaders of mushroom beds there is no mention of either *Clitocybe dealbata* or *Clitopilus cretatus*, both of which have been described as occasionally causing considerable trouble. This chapter concludes with a general dissertation on control measures for diseases, pests and other contaminations. At the end of the book, some recipes for cooking mushrooms are included, supplied by the Editor of "Good Housekeeping."

E. M. WAKEFIELD.

Laboratory Guide for Elementary Botany Students.†—This book contains practical directions intended for a year's course in elementary botany designed for students at the University of California. The instructions are clearly presented, and the course would be quite suitable for general use in schools and other institutions where instruction in elementary botany is given. The only mistakes noted are on p. 65 where the spelling of *Berberis*, *Althaea*, and *Agaricus* is incorrect.

* By W. F. Bewley and J. Harnett. Anglo-Scottish Press, Ltd., London, 1938. Pp. 95, figs. 30. Price 3s. 6d. net.

† "A Laboratory Guide for a Course in General Botany." By L. Bonar, L. Roush and R. M. Holman. Fourth edition. John Wiley and Sons Inc., New York. Chapman and Hall Ltd., London. 1938. Pp. xii + 110. Price 6s.

Printed under the authority of His MAJESTY'S STATIONERY OFFICE
By the South Essex Record, Ltd., Ilford.

(1359) Wt. 17/32 800 9/38 S.E.R. Ltd. Gp. 381

BULLETIN OF MISCELLANEOUS INFORMATION No. 8 1938 ROYAL BOTANIC GARDENS, KEW

LIII—A REVISION OF THE EUCRYPHIACEAE.

J. BAUSCH (Rotterdam, Holland).

I. INTRODUCTION AND ACKNOWLEDGMENTS.

The genus *Eucryphia*, founded in 1797 by Cavanilles, was for a long time referred by different botanists to various different families, until in 1839 Endlicher in his "Genera Plantarum" raised it to the rank of a distinct family, which I consider still the best course to adopt. The most recent treatment of the *Eucryphiaceae* is that by Ernst Gilg in Engler and Prantl, *Natürl. Pflanzenfam.* 21 (1925). As, however, since then much more material, both dried specimens and wood for anatomical investigation, which may throw new light on its systematic position, has accumulated, the writer has undertaken a new revision, both taxonomic and anatomical, the latter especially in connexion with the relationship of the family with others. A broad discussion on the taxonomic position, based on morphology and anatomy, is given in the Sections V to VII.

The literature and synonyms in this monograph have been checked by myself, and all specimens mentioned, if not stated otherwise, have been identified or verified by me.

I wish to express my great indebtedness to Sir Arthur W. Hill, Director of the Royal Botanic Gardens, Kew, for all the facilities granted to me during my work at Kew. My heartiest thanks are also due to Mr. A. D. Cotton, Keeper of the Kew Herbarium, for his permission to work at the Herbarium and for his kind assistance. To the Herbarium Staff my best thanks for their valuable help, especially to Mr. N. Y. Sandwith and Mr. H. K. Airy-Shaw for many kind suggestions and helpful advice. For permission to work at the Jodrell Laboratory and for assistance in the anatomical part of the work I am very much indebted to Dr. C. R. Metcalfe, Assistant Keeper of that Laboratory.

Further, my sincere thanks are due to the Directors and Keepers of all the Herbaria mentioned below, for kindly granting facilities to work at their Herbaria, sending specimens on loan or giving valuable information and material for anatomical purposes. The abbreviations used for the different institutions in this work are as follows:—

(B.) Botanisches Museum, Berlin-Dahlem. (B.A.) Museo, Universidad Nacional, La Plata, Buenos Aires. (Br.M.) Dept. of Botany, British Museum (Natural History), London. (C.) University

Herbarium, Cambridge. (I.F.I.) Imperial Forestry Institute, Oxford. (K.) Royal Botanic Gardens, Kew. (L.) Rijksherbarium, Leiden. (L.S.) Herbarium, Linnean Society, London. (M.) Botanisches Museum, Staatsherbar, München. (N.Y.) New York Botanical Garden, New York, U.S.A. (O.) Fielding Herbarium, Oxford. (P.) Muséum Nationale d'Histoire Naturelle, Paris. (Sd.) Technological Museum, Sydney, N.S.W., Australia. (St.) National Natural History Museum, Dept. Botany, Stockholm. (U.) Botanisch Museum en Herbarium, Rijksuniversiteit, Utrecht. (W.) Naturhistorisches Museum, Wien. (Wh.) Smithsonian Institution, United States National Herbarium, Washington, U.S.A. (Yale) Yale University, School of Forestry, Newhaven, Connecticut, U.S.A.

II. DESCRIPTION OF THE GENUS.

Eucryphia Cavanilles, Icones, 4, 49 (1797); St.-Hilaire, Expos. 2, 24 (1805); Persoon, Synops. Plant. 2, 92 (1807) (sphalm. *Eucryphia*); Sprengel, Anl. 2, pt. 2, 870 (1818); Choisy, Prodr. Hyper. 62 (1821); Choisy in DC. Prodr. 1, 556 (1824); Sprengel, Syst. 2, 634 (1825); Reichenbach, ap. Moessler, Handb. Gewächsk. 1, p. lxxvii (1827); Reichenbach, Consp. 210 (1828); Dumort. Anal. Fam. 47 (1829); Bartling, Ord. 294 (1830); Cambessèdes in Ann. Sc. Nat. 20, 402 (1830); G. Don, Gen. Syst. 1, 613 (1831); Sprengel, Gen. 2, 803 (1831); Spach, Hist. Nat. Végét. Phanér. 5, 344 (1836); Endlicher, Gen. Plant. 2, 1016 (1836-39); Meisner, Gen. 44 (1837); Endlicher, Ench. Bot. 528 (1841); Reichenbach, Deutsch. Bot. i. Herbarienb. 211 (1841); Schnizlein, Iconogr. 3, 214* (sphalm. 204*) (1843-70); Lindley, Veget. Kingd. ed. 2, 406 (1847); Cl. Gay, Hist. Chil. 1, 350 (1854); Planchon in Ann. Sc. Nat. sér. 4, 2, 261 (1854); Hooker fil. Fl. Tasm. 1, 54 (1855-60); Loudon, Encycl. Pl. 2, 1394 (1855); Bentham et Hooker fil. Gen. Plant. 1, 615 (1862); Bentham, Fl. Austral. 2, 446 (1864); Baillon, Hist. Pl. 1, 401 (1867-69); Focke in Engler u. Prantl, Natürl. Pflanzenfam. 3, pt. 6, 131 (1893); Reiche, Fl. Chil. 1, 268 (1895); Schneider, Handb. Laubh. 2, 328 (1909); Hallier fil. in Beih. Bot. Centralbl. 39, 160 (1921); Gilg in Engler u. Prantl, Natürl. Pflanzenfam., ed. 2, 21, 49 (1925); Rehder, Manual Tr. Shr. N. Amer. 622 (1927); Lemée, Descr. Syn. Pl. Phan. 3, 34 (1931).—*Carpodontos* Labillardière, Relat. Voy. 2, 16 (1798); id., Pl. Nov. Holl. 2, 122 (1806); Choisy, Prodr. Hyper. 61 (1821); De Candolle, Prodr. 1, 556 (1824); Sprengel, Syst. 2, 634 (1825); Reichenbach, ap. Moessler, Handb. Gewächsk. 1, p. lxxvii (1827); id., Consp. 210 (1828); Dumortier, Anal. Fam. 47 (1829); Bartling, Ord. 294 (1830); Loudon, Hort. Britt. 225 (1830); G. Don, Gen. Syst. 1, 613 (1831); Endlicher, Gen. Pl. 2, 1016 (1836-1839); Meisner, Gen. 44 (1837); Endlicher, Ench. Bot. 528 (1841); Reichenbach, Deutsch. Bot. i. Herbarienb. 261 (1841); Lindley, Veg. Kingd. ed. 2, 406 (1847).—*Pellinia* Molina, Sagg. Chil. ed. 2, 160 (1810).

Trees or shrubs, glabrous or tomentose, branchlets opposite, terete. *Leaves* opposite, coriaceous, evergreen in native countries, simple to pinnate, entire or serrate to crenate. *Stipules* always present, connate, interpetiolar, large and caducous. *Flowers* axillary, solitary, stalked, conspicuous, white, peduncle with the exception of one species not visible*. *Sepals* 4, or rarely 5, oblong, concave, thinly coriaceous, rigid, cohering at the apex, and subcalyptrately deciduous, imbricate. *Petals* 4 or rarely 5, large, subhypogynous, broadly ovate-rotundate, straight to oblique, imbricate, membranous. *Stamens* very numerous, inserted many-seriately on a thin pubescent disk, filaments filiform, anthers small, orbicular, versatile. *Ovary* superior, ovoid-conical, 4-14-locular (according to Gilg up to 18), 4-14-sulcate, septicidally 4-14-valved, valves boat-shaped, rostrate with the persistent or partly persistent styles, separating from the placenta-bearing axis, epicarp mostly separating from endocarp, oligospermous. *Seeds* pendulous, oblong, compressed, imbricate, testa margined and produced downwards into a wing. *Embryo* in the axis of sparse fleshy albumen, cotyledons leafy, elliptic, radicle short, superior.

DISTRIBUTION: Chile, Tasmania (Van Diemen's Land), New South Wales and Victoria. 5 species and 1 hybrid; 2 hybrids known only in cultivation.

TYPE SPECIES: *Eucryphia cordifolia* Cav.

III. KEY TO THE SPECIES.

- 1a. Ovary glabrous, bracts at the base of the pedicel, always 6, peduncle not visible, leaves simple, crenate-dentate.....
8. **cordifolia**
- 1b. Ovary pubescent, bracts at the base of the pedicel (peduncle not visible), or halfway or nearly halfway up the stalk (peduncle visible), always less than 6.....2
- 2a. Leaves simple.....3
- 2b. Leaves compound, leaflets usually 5 or more.....4
- 2c. Leaves simple and compound on the same plant, usually 3 leaflets in the compound leaves.....5
- 3a. Bracts 2, peduncle not visible, pedicel twice as long as the fruit, styles 4-5 mm. long, leaves 2.7-5.4 cm. long, but mostly longer than 3.5 cm., entire, oblong to lanceolate, rounded at the base, rounded or slightly emarginate at the apex.....5. **lucida**
- 3b. Bracts 4 or rarely 5, peduncle not visible, pedicel equalling or rarely longer than the fruit, styles never longer than 1.5 mm., leaves 0.7-1.4 cm. long, entire, elliptic-oblong or rarely

* For the terms pedicel and peduncle I have followed the usage of the late Prof. Dr. J. W. Moll in "Phytography as a Fine Art," 176 (1934). The term peduncle designates all caulomes belonging to the bracteal region which are not pedicels. They may be branched, thus representing cormoid systems, or not, as in the case of *Eucryphia Moorei* F. v. Mueller.

subovate, cuneate or subcuneate at the base, strongly emarginate at the apex, leaves very rarely ternate.....

6. *Milliganii*

- 3c. Bracts mostly 3, peduncle not visible, pedicel about as long as the fruit, styles 2-3 mm. long, leaves 0.7-2.6 cm. long, entire, oblong to elliptic-oblong, subcuneate or mostly rotundate at the base, rotundate or shortly emarginate at the apex.....7. $\times$ *hybrida*
- 4a. Bracts 4, above or near the middle of the stalk, peduncle always visible, leaflets always entire, 3-13, narrowly elliptic-oblong, petals up to 1 cm. long.....1. *Moorei*
- 4b. Bracts 4, at the base of the pedicel, peduncle not visible, leaflets always incised-serrate, 3-7, shortly ovate or oblong, petals 2-3 cm. long.....2. *glutinosa*
- 5a. Leaflets and simple leaves conspicuously serrate, pubescent or puberulous on both surfaces, branchlets with long adpressed hairs.....3. $\times$ *nymansensis*
- 5b. Leaflets and simple leaves entire or slightly toothed in upper half, mature leaflets and leaves glabrous on the lower surface, branchlets glabrous or very shortly pubescent.....4. $\times$ *intermedia*

IV. ENUMERATION AND DESCRIPTION OF THE SPECIES.

1. *E. Moorei* F. v. Mueller, *Fragm. Phytogr. Austral.* 4, 2 (1863-64); Bentham, *Fl. Austral.* 2, 447 (1864); Woolls, *Contr. Fl. New South Wales*, 107 (1867); Baillon, *Hist. Pl.* 1, 402 (1867-69); Nilson, *Timb. Tr. N. S. Wales*, 75 (1884); Hook. f. in *Curt. Bot. Mag.* 117, t. 7200 (1889); Maiden, *Nat. Pl. Austral.* 327, 530 (1889); Focke in Engler u. Prantl, *Natürl. Pflanzenfam.* 3, pt. 6, 131 (1893); Moore, *Handb. Fl. N. S. Wales*, 180 (1893); Gilg in Engler u. Prantl, *op. cit. ed. 2*, 21, 49 (1925); Ewart, *Fl. Victoria*, 771 (1930); Bean, *Tr. Shr. Br. Isl.* 3, 152 (1933); Audas, *Nat. Tr. Austral.* 200 (1935); Sandwith in *Curt. Bot. Mag.* 158, t. 9411 (1935).

VERNACULAR NAMES: "dog-rose tree," "wingecarribbee," "white sallow," "acacia," "plumwood," "plum tree" (New South Wales); "stinkwood" (Victoria).

TYPE: New South Wales, in montibus silvaticis originem versus fluviorum Clyde et Shoalhaven River, C. Moore (in Melbourne Herb., duplicate seen!)

Evergreen tree, up to 26.5 m. high, branches opposite, terete, pruinose. Branchlets densely pubescent, apical buds shining glutinous. Stipules interpetiolar, ovate, glutinous, brown, very caducous. Leaves opposite, imparipinnate with 1-7 pairs (mostly 2-5 pairs) of opposite leaflets, petiolules very short, petioles up to 1.7 cm. long; petiole, rhachis and petiolules densely villose-pubescent, internodes of rhachis 0.5-2 cm. long; leaflets narrowly oblong, terminal leaflet narrowly elliptic-oblong, rounded or obtuse and then sharply mucronate-apiculate at the apex (mucro up to

4 mm. long), obliquely obtuse or rounded and unequal-sided at the base, lateral leaflets cuneate and equal-sided at the base. Lowest pair of leaflets mostly very small, the other pairs gradually increasing in length, the terminal leaflet always longest and broadest, 0.8-7.1 cm. long and 0.4-1.5 cm. broad, entire, margins somewhat revolute, chartaceous or thinly coriaceous, green; shining on the upper surface, on the lower surface pale green or greyish-glaucous, slightly pubescent on both surfaces, especially on the midrib and at the margins, the venation intricately reticulate on upper-, more reticulate on under-surface. Stipellae seen on cultivated specimens, up to 1 mm. long, in the axils of the leaflets and sometimes displaced on the petiolule of the leaflet or on the rhachis of the leaf, often foliaceous, up to 5 mm. long, elliptic-oblong, rounded at the apex and mucronate, slightly cuneate at the base, nervature, colour and pubescence the same as in the leaflets. Flowers solitary, axillary, stalks up to 3.1 cm. long, spreading pubescent, jointed and bracteate above or near the middle when grown out, when not full-grown the bracts nearly cover the buds, peduncle 0.35-1.6 cm. long. Bracts 4, verticillate, ovate, outer pair shorter, rigid, brown, persistent, sometimes glutinous, glabrous or slightly pubescent, 3.5-5 mm. long and 3-4 mm. broad. Sepals 4, rigid, brown, greyish-downy at the apex, otherwise glabrous and somewhat shining. Petals 4, white, broadly obovate, irregularly crenulate at the apex, 1-1.3 cm. long and broad, scarious. Stamens numerous, many-seriate on the raised, dome-shaped receptacle, up to 7 mm. long, glabrous; at the base of the stamens short scales, which are outgrowths of the receptacle, and are clothed with long soft hairs near their apex; anthers short, versatile. Ovary ovoid or ovoid-ellipsoid, densely adpressed pilose-tomentose, 7-9-locular (mostly 7-locular), 3.5-4 mm. long and 2 mm. in diam.; styles 7-9, glabrous, up to 3.5 mm. long. Capsule coriaceous to ligneous, oblong and somewhat compressed, 1-1.55 cm. long, 7-9-locular (mostly 7-locular), 7-9-sulcate, septically 7-9-valved; each valve glabrous and flat at the sides, slightly tomentellous at the back. Fertile seeds in each valve mostly 2, sometimes 3 or 4, winged, dark brown, shining, glabrous, slightly compressed, rhombic-ovate, 3.5-5 mm. long.

FLOWERS: February-April.

Distribution: NEW SOUTH WALES and VICTORIA.

NEW SOUTH WALES. RICHMOND COUNTY: Richmond River, no date (Wh.). CAMDEN COUNTY: Macquarie Pass, August 1917, Cleland s.n. (N.Y.); Hasting River, no date, Betche 63 (M.); Burrawang, Nov. 1888, Maiden s.n. (K.); Bundanoon, Nov. 1923, C. F. Laseron s.n. (K.); Meryla, 15 miles south of Moss Vale, July 1892, Wing s.n. (K.); Cambewarra Range, between Nowra and Kangaroo Valley, in brush forest, 330 m., March 1930, Rodway s.n. (K.). ST. VINCENT COUNTY: Clyde River, no date, C. Moore (K., dupl. type!); Sugarloaf Mtn., Braidwood, May 1890, Bauerlen s.n. (K.); ibid., Feb. 1893, Bauerlen s.n. (K.);

Monga or Sugarloaf Mtn., near Braidwood, Feb. 1909, *Boorman* s.n. (L., St., Wh., M.); Braidwood, Feb. 1909, *Boorman* s.n. (Br.M.); Clyde, Mt. Clyde Rd., *Boorman* s.n. (Wh.); Bateman's Bay, Clyde Mt., 550-600 m., April 1932, *Rodway* 768 (K.). DAMPIER COUNTY: Tilba-Tilba (Cape Dromedary), Nov. 1911, *Boorman* s.n. (Br.M.).

VICTORIA. Cape Howe Range, April 1871, *C. Walter* s.n. (Br.M.).

From Victoria I have seen only one specimen; Prof. Ewart in his "Flora of Victoria" writes that the species is confined there to Eastern Victoria, where it is uncommon near Mallacootta; it is one of the coastal extensions of the N.S. Wales flora into Victoria. After his first collection (about 1860) in N.S. Wales, Charles Moore made another collection, according to a note in Mueller's handwriting in an interleaved copy of vol. 2 of Bentham's *Flora Australiensis* (1864) at Kew, which gives the following additional information: "Recently found (again) by Moore at Wingecaribbee, where it forms a tree, 80 ft. high, with stems 2 ft. in diam.; also by Mr. Woolls at 'Sassafras place,' 15 miles from Berrima, consociated to *Fieldia*, *Doryphora*, *Dicksonia*, *Schizomeria*, *Quintinia* and *Lomatia Patersonii*." This was confirmed by Mr. Woolls himself in "Remarks on the Botany of Berrima and the Mittagong Range," reprinted in his "Contributions to the Flora of Australia," 107-8 (1867). The specimen from Richmond River (Wh.) has never been cited: it considerably extends the known range of this species, given by Sandwith in *Bot. Mag.* l.c.

Boorman's specimen from Braidwood (Br.M.) occasionally seems to show 2 instead of 1 flower per axil: this may be due to bad or non-development of an internode. The mature leaflets on this specimen are unusually small (8 mm. long and 6 mm. broad).

2. *E. glutinosa* (Poepp. et Endl.) Baillon, *Hist. Pl.* 1, 402 (1867-69); Sandwith in *Curt. Bot. Mag.* 158, t. 9411 (1935).—*Fagus glutinosa* Poepp. et Endl., *Nov. Sp. et Gen.* 2, 68, t. 194 (1838-45); *Bot. Zeit.* 6, 130 (1848); *Beih. Bot. Zeit.* 6 (1848).—" *Fagus glandulosa* Poepp. et Endl.," Reiche, *Flor. Chil.* 1, 28 (1895).—*E. pinnatifolia* Gay, *Hist. Chil.* 1, 352 (1854); Walpers, *Ann. Bot. Syst.* 1, 113 (1848-49); Baillon in *Adansonia*, 5, 303 (1864-65); *Gard. Chron.* ser. 3, 1, 337 (1880); Hooker in *Curt. Bot. Mag.* 115, t. 7067 (1889); *Gard. Chron.* ser. 3, 22, 246 (1897); *Mitt. Deutsch. Dendr. Ges.* 9, 96 (1900); *Gard. Chron.* ser. 3, 54, 284 (1913); Bean, *Tr. Shr. Br. Isl.* 1, 536 (1914); *Mitt. Deutsch. Dendr. Ges.* 26, 230 (1917); *id.* 28, 124 (1919); *Gard. Chron.* ser. 3, 80, 166 (1926); *id.* 81, 123 (1927); *id.* 82, 130 (1927).—" *E. pinnatifida* Gay," Schnizlein, *Iconogr.* 3, t. 214* (sphalm. 204*) (1854).—" *E. glandulosa* (Poepp. et Endl.) Focke," Reiche, *Fl. Chil.* 1, 268 (1895); Hauman in *Rec. Inst. Bot. Errera*, 9, 360 (1913).—*E. glutinosa* (Poepp. et Endl.) Focke in *Engl. u. Prantl, Natürl. Pflanzenfam.* 3, pt. 6, 131 (1893); Schneider, *Handb. Laubh.* 2, 329 (1909); Gilg in *Engler u. Prantl,*

Natürl. Pflanzenfam. ed. 2, 21, 49 (1925); Rehder, *Manual Tr. Shr. N. Amer.* 623 (1927); *Mitt. Deutsch. Dendr. Ges.* 40, 284 (1928).

VERNACULAR NAME: "nirthe" (Pehuen Indians, Chile).

TYPE: Chile, Andes antucenses, in rupium fissuris Pico de Pilque, Jan. 1829, *Poeppig* 868B (in *Herb. Mus. Vindob.*).

Small tree or shrub, 8-10 m. in height, evergreen in native country, in culture often deciduous, branches many, decussate or subverticillate, seldom alternate, monochasial sympodium or dichasium, terete, under pressure subterete or angulate, pruinose, ramentaceous or glutinous, purplish-brown and glabrous. *Branchlets* lighter brown and adpressed pubescent, short annual cicatrices, tuberculate. *Stipules* ovate-oblong to ovate-lanceolate or lanceolate, very acute, pubescent especially at the apex, deciduous, brown, about 1.5 cm. long and 0.5 cm. broad, interpetiolar. *Petioles* 0.4-1.3 cm. long, adpressedly pubescent. *Leaves* crowded towards the end of the branchlets, opposite, imparipinnate with 2 (sometimes only 1) pairs of opposite leaflets, lateral leaflets subsessile or mostly sessile, internodes of the rachis up to 1.4 cm. long, rachis densely adpressedly pubescent. *Lateral leaflets* elliptic to elliptic-oblong, apex acute or sometimes slightly obtuse (type!), base unequally rotundate, 1.2-5.4 (mostly 3.5-4) cm. long and 0.8-2.1 cm. broad. *Terminal leaflet* rather longer elliptic, apex acute, seldom obtuse (type!), base very cuneate (sometimes nearly rounded or even revolute cordate: *Cabrera* 3678) into a pubescent petiolule (which is about 0.3-1.2 cm. long), 1.7-5.6 cm. long and 1.4-2.8 cm. broad. All leaflets crenately toothed or serrate, sometimes nearly mucronate-serrate, dark shiny green, on the upper surface (especially on the main and lateral nerves) adpressedly pubescent, on the lower surface same pubescence, same colour or paler, venation conspicuous. *Flowers* solitary, axillary; pedicels up to 1.2 cm. long, but mostly shorter, pubescent. *Bracts* 4, at the base of the pedicel (peduncle never visible), verticillate, caducous, rigid, brown, ovate, acute at the apex and revolute at the margins, densely adpressedly pubescent, up to 8 mm. long and 7 mm. broad. *Sepals* 4, broadly oblong, obtuse, up to 1.4 cm. long and 6 mm. broad, tomentose at the apex and margins, coriaceous, imbricate, greenish-brown, deciduous. *Petals* 4, white, orbicular-ovate, concave, up to 3.2 cm. long and 3.3 cm. broad, entire at the apex, very much imbricate and scarious. *Stamens* very numerous, capillary, glabrous, up to 2.5 cm. long, many-seriate on the raised dome-shaped receptacle, each filament surrounded by a short, tubular effiguration of the thalamus; anthers short, orbicular, versatile, bright yellow, after flowering red. *Ovary* ovoid-oblong, densely adpressedly pilose-tomentose, 8-14-locular (according to Gilg up to 18), finely furrowed, up to 5 mm. long and 2-2.5 mm. in diam. *Styles* 8-14, filiform, pubescent in lower part, sparsely pubescent in upper part, up to 1.7 cm. long, stigmas minute. *Capsule* brown or purplish-brown, coriaceous to ligneous, oblong-obovoid to obovoid, somewhat compressed at the

base, 1.4–1.8 cm. long and up to 0.9 cm. in diam. *Pedice*l of mature fruits 1.2–1.8 cm. long, adpressedly pubescent, terete. *Capsule* septically 8–14-valved, conspicuously 8–14-sulcate, valves adpressedly pubescent at the back, glabrous at the sides; epicarp splitting off from the endocarp, the latter remaining attached to the central axis by means of two filaments in only a few specimens; mostly epicarp and endocarp remain united; endocarp from each valve, besides splitting septically, also splitting loculicidally (along the midrib) about 1 or 2 mm. from the apex. *Seeds* rhombic-ovate, dark brown, winged, very compressed, shining, glabrous, up to 5 mm. long, 2–5 fertile seeds in each valve.

According to Gilg the ovary is up to 18-locular. I have, however, never seen this unusually high number on any of the herbarium specimens or on the living material and I do not think it advisable to mention this number as common.

FLOWERS: January, February.

Distribution: CHILE, from 27°–38° S. lat.

PROV. ATACAMA: Santa (Aguada) Gertrudis, no date, no collector. (K.) Doubtful locality! PROV. NUBLE: San Ignacio, Renaico Valley, no date, *Elwes* s.n. (K.); Palo Santo, near San Ignacio, Renaico Valley, on river bank, 200 m., Jan. 1902, *Elwes* s.n. (K.); Recinto, Junte al rio Renegado, Feb. 1936, *Cabrera* 3678 (St.); Chillan, no date, *Philippi* s.n. (B.). PROV. MALLECO: Andes, near Copahue, 1895, *F. W. Neger*, s.n. (M.); near Araucamien, 1896, *F. W. Neger*, s.n. (M.). PROV. BIO BIO: Pico de Pilque (Cerro del Pilque), in cold regions, Jan. 1829, *Poeppig* 868 B (W., type); Cuesta Alul, 1885, *Philippi et Borchers* (C., Br. M.). WITHOUT LOCALITY: 1824–34, *Cl. Gay* 1251 (N.Y.); 1904, *Philippi* s.n. (Br. M.); no date, *Cl. Gay* s.n. (K., B.).

The type, *Poeppig* 868 B, is a very much stunted and reduced specimen; the terminal leaflets never exceed 2.7 cm. in length and are often much smaller, also simple leaves occur occasionally. However I do not hesitate in accepting this specimen as the type, as it was collected in very cold regions, at least 1000 ft. above sea-level, even though the original description has to be modified considerably to cover all the other specimens, which have larger, more elliptic leaflets. The specimen from Santa Gertrudis, Prov. Atacama, shows an exact match of the type at the end of a sympodial branch. The locality of this specimen is doubtful, though not impossible.

This species has been in cultivation in England since 1851, introduced by Pearce. Cultivated specimens often differ from the original Chilean material in having the leaflets narrower and longer. On cultivated material foliaceous stipellae occur, up to 3 mm. in length. In culture is also known the double-flowered form: *Eucryphia glutinosa* (Poepp. et Endl.) Baill. var. *plena* Hort.

3. × *E. nymansensis* Bausch (*E. glutinosa* (Poepp. et Endl.) Baill. × *cordifolia* Cav.), hybr. nov.; inter parentes ob folia

heteromorpha optime intermedia, ad illam ob folia composita sed plerumque 3-foliolata, dentaturas argutas, ovarium albido-villosum, ad hanc ob folia nonnulla simplicia, foliola subtus glaucescentia approximans.—*E. "Nymansay"* Comber in Gard. Chron. ser. 3, 76, 161 (1924), et l.c. 154 (1924); id. 80, 177 (1926).—"*E. nymansay*" Messel ex Bean, Tr. Shr. Br. Isl. 3, 153 (1933).

Arbor parva, sempervirens, statura incerta, ramulorum cortice hic illic pruinoso. *Stipulae* lineari-lanceolatae, pubescentes, ad 1.5 cm. longae, circuitu 2 mm. latae. *Folia* simplicia vel composita vel in eodem pari alterum simplex cum altero composito. *Folia simplicia* elliptico-oblonga vel elliptico-lanceolata, apice acuta, basi plerumque rotundata, saepe cuneata, rarius aliquantum cordata, ad 6.3 cm. longa, subcoriacea, argute serrata, subtus glaucescentia, venulis supra intricatis sed quam in *E. cordifolia* minus crasse reticulatis. *Folia composita* plerumque 3-foliolata, rarius 2–7-foliolata, foliola lateralia nunc petiolulata nunc subsessilia vel sessilia, forma atque magnitudine valde variabilia, oblonga, elliptico-oblonga, ovato-oblonga vel fere suborbicularia, apice mucronata; foliolium terminale lateralibus 1.5–3-plo longius, elliptico-oblongum usque ovato-lanceolatum, apice acutum vel rotundatum, mucronatum, basi cuneatum usque rotundato-truncatum, usque 7.8 cm. longum et 3.6 cm. latum; foliola omnia dentaturis textura venatione colore foliis simplicibus similia. *Bractae* 4–5, basi pedicellorum positae. *Pedunculus* haud visibilis. *Pedicelli* 0.9–1.9 cm. longi. *Sepala* usque ad 1.4 cm. longa, apicem versus adpresse pubescentia. *Petala* alba, 2–3.5 cm. longa, 1.5–3.3 cm. lata. *Stamina* usque 1.6 cm. longa; antherae aureae. *Ovarium* ovoideum, albido-villosum, 9–12-loculare; styli 9–12, glabri, usque 8 mm. longi, stigmatibus minutis. *Fructus* nondum visus.

Cult. in hort. Nymans, Handcross, Sussex, comm. Lt. Col. L. C. R. Messel, August 30th, 1930 (typus in Herb. Kew.); ex eodem origine, August 27th, 1924 (K.). Hybrid known only in cultivation.

FLOWERS in July and August.

Mr. J. Comber, in a letter to the writer, explained how the fancy name "*Nymansay*" originated. It was Lt. Col. Messel's idea to call the seedlings of this hybrid respectively Nymans A, Nymans B, Nymans C, and so on. In order to make it look more like a name, "*Nymans A*" was altered to "*Nymansay*." It is therefore clear that "*Nymansay*" is not a scientific name. The epithet *nymansensis* has accordingly been chosen and has been validated by a latin description.

4. × *E. intermedia* Bausch in Kew Bull. 1937, 193.—*E. "Rostrevor"* Hort., Gard. Chron. 100, 187 (1936); Journ. Roy. Hort. Soc. 61, 439 (1936). Type: Cult. in Hort. Bot. Reg. Kew., January 1937, J. Bausch (K.).

E. glutinosa (Poepp. et Endl.) Baill. × *lucida* (Labill.) Baill., a good intermediate, approaching the former in the possession of pinnate leaves, 2-5-foliolate, mostly 3-foliolate, the leaflets being often toothed especially in upper half; the latter in the leaves being glaucescent on the lower surface, some of them small and simple, oblong, shortly petiolate and usually quite entire.

Small tree, semi-evergreen to evergreen, height not known; branchlets in living state subterete and somewhat compressed, after pressure ribbed and angular, brown, slightly pruinose, glabrous below, pubescent above with subadpressed hairs. *Stipules* ovate, acute, glabrous, brown, 5-7 mm. long and 3.5-4.5 mm. broad. *Leaves* glaucescent on under surface, margins weakly pilose, otherwise glabrous or pubescent above when young; venation evident as in *E. glutinosa*; uppermost and younger pairs of leaves often as in *E. lucida* small, simple, oblong, rounded and usually very shortly emarginate with 2 small teeth at the apex, more rarely entire, obtuse or acute, cuneate at the base and narrowed into a pubescent petiole (which is about 3-5 mm. long), sometimes rounded, 1.4-5.85 cm. long and 0.5-2.4 cm. broad, usually entire, more rarely toothed in the upper half or towards the apex; sometimes the same pair is composed of a pinnately-foliolate and a simple leaf, the latter being similar to the other simple leaves or more rarely cordate at the base. Pinnate leaves with a pubescent petiole, 0.4-1.1 cm. long; lateral leaflets subsessile, elliptic-oblong, usually obtuse, rarely acute and always shortly apiculate at the apex, rounded or subtruncate and somewhat oblique at the base, 1.2-3.8 cm. long and 0.5-1.7 cm. broad, the smaller ones entire, the larger ones subentire or sharply serrate in the upper half; the terminal leaflet with a pubescent petiolule, which is 2-5 mm. long or in the 2-4-foliolate leaves subsessile and very oblique at the base, elliptic, elliptic-oblong or oblong-lanceolate, usually obtuse and shortly apiculate or emarginate at the apex, acute and cuneate to rounded at the base, 2.2-6.3 cm. long, always 1.5-2 times longer than the lateral leaflets, 0.6-3 cm. broad, entire or toothed as in *E. glutinosa* in the upper half of the leaflet or often only towards the apex. *Inflorescence* not seen, petals white, a little larger than those of *E. lucida*.

Distribution: Known only in cultivation. Cult. in Hort. Bot. Reg. Kew., Jan. 1937, *Bausch* s.n. (K., type); cult. in Hort. Nymans, Handcross, Sussex, April 1937, *Bausch* s.n. (K., duplicates not yet distributed).

5. *E. lucida* (Labill.) Baillon, Hist. Pl. 1, 402 (1867-69); Maximowicz in Act. Hort. Petrop. 6, 257 (1876); Gilg in Engl. u. Prantl, Natürl. Pflanzenfam. ed. 2, 21, 49 (1925); Sandwith in Curt. Bot. Mag. 158, t. 9411 (1935).—*Carpodontos lucida* Labillardière, Relat. Voy. 2, 16 (1798); idem, Pl. Nov. Holl. 2, 122 (1806); Choisy, Prodr. Hyper. 62 (1821); De Candolle, Prodr. 1, 556

(1824); G. Don, Gen. Syst. 1, 613 (1831).—*E. Billardieri* Spach, Hist. Nat. Végét. Phanér. 5, 345 (1836); Hooker fil., Fl. Tasm. 1, 54 (1855); Benthams, Fl. Austral. 2, 446 (1864); Hooker f. in Curt. Bot. Mag. 67, t. 7200 (1891); Meredith, Bush Fr. Tasm., last ser., 36 (1891); Focke in Engler u. Prantl, Natürl. Pflanzenfam. 3, pt. 6, 131 (1893); Pritzel in Engler, Bot. Jahrb. 24, 356 (1897); Gard. Chron. ser. 3, 22, 246 (1897); Rodway, Tasm. Fl. t. 15 (1903); Bean, Tr. Shr. Br. Isl. 1, 535 (1914); Record and Mell, Timb. Trop. Am., 432 (1924); Bean, Tr. Shr. Br. Isl. 3, 152 (1933); Audas, Nat. Tr. Austral. 200 (1935).—*E. lucida* (Labill.) Druce in Rep. Bot. Exch. Cl. Brit. Isl. 1916, 4, Suppl. 2, 622 (1917).

VERNACULAR NAMES: "pinkwood," "leatherwood" (Tasmania).

TYPE: Nouvelle Hollande, Côte S.O., Labillardière (in Herb. Mus. Paris).

Evergreen tree, up to 34 m. high, usually 10-15 m., trunk straight, up to 2 m. in circumference. *Branches* glabrous, brown, terete or subterete, slightly pruinose; young foliage-bearing branchlets very numerous, light brown, adpressedly pubescent, buds very resinous. *Stipules* interpetiolar, ovate, acute, brown, slightly adpressedly pubescent, 2.5-4 mm. long and about 2 mm. broad. *Petioles* round, glabrous or puberulous, 2-6 mm. long. *Leaves* simple, opposite, narrowly oblong (nearly linear-oblong) to elliptic-oblong, broadest in lower half, always at least 3 times longer than broad, coriaceous, entire, ciliate on the margins; adpressedly pubescent, dark green and shining on the upper surface, on the lower surface very glaucous, glabrous, the venation not conspicuous; obtuse or subacute and sometimes minutely bidentate at the apex, truncate or rounded and very rarely almost cuneate at the base; 2.7-5.4 cm. long and 0.8-1.7 cm. broad. *Flowers* solitary, axillary, stalks up to 1.4 cm. long, but mostly shorter, pubescent; bracts 2, at the base of the pedicel (peduncle not visible), verticillate, ovate, slightly rounded and ciliate at the apex, otherwise glabrous, persistent, brown, rigid, up to 5 mm. long and broad. *Sepals* 4, broadly oblong, rigid, up to 5 mm. long and broad. *Petals* 4, tomentellous especially at the apex, about 8 mm. long. *Petals* 4, broadly ovate to rotundate, broadly rounded and somewhat crenulate at the apex, scarious, white, up to 2.1 cm. long and broad (very rarely 5-petalled flowers occur, e.g., on *Gunn* 272 from Lake St.-Clair, 1845; this is, however, too rare to be a constant character). *Stamens* very numerous (30-50), up to 8 mm. long, filaments glabrous, surrounded at the base by short, tubular effigurations of the thalamus, anthers short, versatile. *Ovary* ovoid-oblong, adpressedly villose-tomentose, up to 4.5 mm. long and 1.5 mm. in diameter, 5-7- (mostly 5-) locular. *Styles* 5-7, filiform, glabrous, up to 5 mm. long, stigmas minute. *Pedicel* of the fruit at least 1.5-2.5 times longer than the fruit, adpressedly pubescent, in dried state very angulate. *Capsule* ligneous, oblong or linear-clavate and somewhat compressed at the base, up to 1.4 cm. long and 6 mm. in

diameter, septically 5-7-valved, 5-7-sulcate, light brown or almost yellowish; valves slightly hairy at the back, glabrous at the sides, fissile and minutely bidentate at the apex; epicarp very occasionally splitting off from the endocarp in mature stage; endocarp, besides splitting septically, splitting also loculicidally at the apex, but never for more than 1 mm. Fertile seeds mostly 1 or 2 in each valve, ovate-oblong, winged, very compressed, dark brown, shining, glabrous, up to 4.5 mm. long.

In Hooker's "Flora of Tasmania," 1, 54 (1855), the name *Eucryphia lucida* occurs twice, as "*E. lucida*," in a short note under the species *E. Milliganii*. Evidently, however, Hooker did not have the intention of making this combination, as he gave the description of the species in question under the thick printed name *Eucryphia Billardieri* Spach; i.e., under the circumstances he was following the Kew Rule, placing *Carpodontos lucida* Labill. in the synonymy. The name "*E. lucida*" probably was an accidental mistake for *E. Billardieri*, and therefore, although Hooker used the new combination about 12 years earlier than Baillon, the authorship for it, according to the International Rules of Botanical Nomenclature, cannot be attributed to Hooker.

FLOWERS: February-March.

Distribution: TASMANIA, mountainous districts, especially in the interior and towards the west, south and east coasts.

WELLINGTON: Hampshire Hills, near Emu River, Feb. 1837, Gunn 272 (K.); ibid., Feb. 1842, Milligan 134 (K., N.Y.). RUSSELL: Mt. Bischoff, near Waratah, re-growth of scrub, 530 m., March 1929, Comber 1943 (K.). MONTAGU: Zeehan, W. Coast, open hillside, wet country, 170 m., Feb. 1930, Comber 2055 (K.); Macquarie Harbour, at entrance and on margins of rivers, Feb. 1847, Milligan 134 (Br. M., K., N.Y.); Macquarie Harbour, W. coast, in damp shaded woods, Jan. 1819, Cunningham s.n. (Br. M., K.). LINCOLN: Lake St.-Clair, 1833, Gunn 272 (K.); ibid., central plateau, western shore, in forest, 830 m., Jan. 1915, Gibbs 6603 (K., Br. M.); ibid., southwest, Feb. 1845, Gunn 272 (K., O.); ibid., April 1842, Gunn 272 (Br. M., C., N.Y.). MONTGOMERY: Birch Inlet, Macquarie Harbour, Dec. 1846, Milligan 134 (C., K.). BUCKINGHAM: National Park, path to plateau, in forest, 660 m., March 1928, Giblin s.n. (K.); ibid., on low moist sheltered place, Dec. 1929, Comber 1943 (K.); Huon River, Feb. and Dec. 1876, J. E. J. Woods s.n. (O.). KENT: Porte de l'Esperance, on banks of larger rivers, 1804, Brown 5217 (B., Br. M., K., N.Y.); ibid., near Storm Bay Passage, no date, Brown, s.n. (K.); South Port, no date, Stuart s.n. (N.Y.). DORSET: Launceston, 1843, Archer s.n. (L.). CORNWALL: Ben Lomond, 1840, Archer s.n. (L.).

WITHOUT EXACT LOCALITY OR DATE: S.W. coast, Nova Hollandia, Labillardiere s.n. (B.K., P. (type), St., Br. M., M.); 1832, Lambert s.n. (K.); no date, R. C. Gunn s.n. (B., C., N.Y., O., St., M.);

id., A. Cunningham s.n. (K.); id., Forster s.n. (St.); id., Dr. Hooker s.n. (N.Y.); id., Archer s.n. (O., Wh.); id., Sutton 296 (K.).

CULTIVATED: Hort. Bot. Reg. Kew., June 11th, 1891, type for Curt. Bot. Mag. t. 7200 (*E. Billardieri* var. *Milligani* (Hook. f.) Benth.) (K.).

6. *E. Milliganii* Hook. f., Fl. Tasm. 1, 54 (1855); Schnizlein, Iconogr. 3, t. 214* (sphalm. 204*) (1854); Maximowicz in Act. Hort. Petrop. 6, 254 (1876); Sandwith in Curt. Bot. Mag. 158, t. 9411 (1935).—*E. Billardieri* Spach var. *Milligani* (Hook. f.) Benth., Fl. Austral. 2, 446 (1864); Hooker f. in Curt. Bot. Mag. 117, t. 7200 (1891); Gard. Mag. Dec. 31, 1892.—*E. lucida* Druce var. *Milliganii* Summerhayes in Handlist Tr. Shr. Roy. Bot. Gard. Kew (1934); My Garden 34, 262 (1936).

TYPE: Gunn 1034, in forest east of Franklin River, W. Macquarie Harbour, April 14th, 1842 (in Herb. Kew.).

Evergreen tree or shrub, up to 14 m. in height, densely branched, branches terete, glabrous, blackish-brown. Branchlets terete, subterete or slightly angular, glabrous or thinly adpressedly pubescent, light brown and covered with a resinous substance from the buds. Stipules interpetiolar, ovate, acute, pubescent especially at the apex, blackish-brown, never longer than 1 mm. Petioles never longer than 2 mm., glabrous or shortly adpressedly pubescent. Leaves simple, opposite, very crowded especially towards the ends of the branchlets, elliptic-oblong or rarely subovate, coriaceous, length very seldom exceeding twice the breadth, broadest in the middle, rounded and strongly emarginate at the apex, cuneate or subcuneate at the base; on the upper surface dark green, shining, puberulous or glabrous, on the under surface very glaucous, glabrous and reticulate, venation both on upper and under surfaces more conspicuous than in *E. lucida*; 0.4-1.4 cm. long and 0.2-0.6 cm. broad. Flowers solitary, axillary; pedicel bracteate at the base, up to 0.7 cm. long, finely pubescent, peduncle not visible. Bracts 4 (accidentally 5), very much imbricate, brown, rigid, persistent, the 2 external ones ovate, acute, viscid and hardly pubescent, 1-1.5 mm. long and 1 mm. broad; the 2 internal ones linear-ovate, acute, ciliate-pubescent, up to 2 mm. long and 1 mm. broad. Sepals 4, broadly ovate to oblong, obtuse, and densely villose at the apex, rigid, brown, margins on the upper and under surface slightly hairy, up to 4 mm. long and 1.5-2 mm. broad. Petals 4, scarious, white, broadly ovate, broadly rounded and quite entire at the apex, about 8 mm. long and broad. Stamens numerous, seldom more than 20, filaments up to 4 mm. long, glabrous, surrounded by shortly tubular, ciliate effigurations of the thalamus, anthers short, versatile, reddish-brown, always as large as in *E. lucida*. Pollen-grains very minute, hyaline and elliptic. Ovary ovoid-oblong to oblong, densely adpressedly villose, up to 2 mm. long and 1.5 mm. in diam., 4-5- (mostly 4-) locular. Styles 4-5, filiform, glabrous, up to 1.5 mm.

long, stigmas minute. *Capsule* coriaceous to ligneous, ovoid-oblong and somewhat compressed at the base, up to 1 cm. long and 3.5 mm. in diam. *Pedicel* never longer than the fruit, slightly pubescent and terete. *Fruit* septicidally 4-5-valved, 4-5-sulcate, dark brown, valves pubescent on the back, glabrous at the sides; epicarp in mature fruits always splitting off from the endocarp, endocarp besides splitting septicidally also splitting loculicidally about $\frac{1}{4}$ - $\frac{1}{3}$ of its length. *Fertile seeds* 0-2 in each valve, up to 3 mm. long, very shortly winged, dark brown, glabrous, rhombic-ovate, compressed towards the wing.

FLOWERS: February-May.

Distribution: TASMANIA, interior and towards the South and West Coast.

RUSSELL: Heazlewood River, near Waratah, at edge of river, with *Comber* 2186, 200 m., March 1930, *Comber* 2187 (K.). MONTAGUE: Lake Margaret Pipe Line, N. of Queenstown, W. Coast, 500 m., Feb. 1930, *Comber* 2148 (K.); *ibid.*, 660 m., Feb. 1930, *Comber* 2151 (K.). FRANKLIN: Mount Sorell, near Gordon River and Macquarie Harbour, Jan. 1847, *Milligan* 725 (Br., M. K., L., N.Y., U.); Franklin River, east, near Macquarie Harbour, *Gunn* 1034 (K. (type!), C., O., St., M.). BUCKINGHAM: National Park, open place, Dec. 1929, *Comber* 1944 (K.); *ibid.*, in open forest, 930 m., Dec. 1929, *Comber* 1945 (K.); *ibid.*, leaves smallest seen, Dec. 1929, *Comber* 1946 (K.); *ibid.*, in moist forest, still in flower, 1000 m., May 1930, *Comber* 2373 (K.). KENT: Hartz Mountains, 700 m., March 1930, *Comber* 2252 (K.); Adamson's Peak, exposed tableland, 700 m., March 1872, *J. R. Scott* s.n. (O.); Mount Lapeyrouse, Van Diemen's Land, no date, *Stuart* s.n. (K., O.); Acheron River, Feb. 1845, *Gunn* 1034 (O.); *ibid.*, no date, *Milligan* 359 F (O.).

I certainly consider *E. Milliganii* Hook. f. as a separate species from *E. lucida* (Labill.) Baill., and I cannot agree with the opinion of certain botanists during recent years, that this plant merely represents a stunted, alpine variety of *E. lucida*. In several respects they are totally different; differences in elevation, alpine conditions, etc., could hardly transform a species into a plant like this. The two species are nevertheless very closely related. *E. Milliganii* is frequently associated in the forest flora with *E. lucida*; the former reaches an altitude of 3500 ft., whilst the latter occurs up to 2000 ft. in elevation; these two species may thus easily give rise to the hybrid, described below as $\times$ *E. hybrida* Bausch. The main points on which I differentiate them are: the number of bracts, in *E. lucida* 2, in *E. Milliganii* 4; differences in shape and size of the leaves, the apex and the base; size of flowers, length of the pedicel of the fruit in proportion to the fruit itself; further the leaves are much more crowded in *E. Milliganii* than in *E. lucida* and the method of splitting of the epicarp and the endocarp in the valves of the capsules is different. In *Comber* 1946, on some branches towards the apex, ternate-pinnate or bifoliolate leaves occur.

The specimen in question was a young shoot from a cut stump, and abnormalities like this may be found on any plant which has been badly damaged. The shape of the leaflets in these pinnate leaves is rather more ovate than in the simple leaves. *Comber* 1946 bears the smallest leaves ever seen by Mr. Comber or myself; they are here on the average only 5-6 mm. long and 2-3 mm. broad.

7. $\times$ *E. hybrida* Bausch (*E. lucida* (Labill.) Baill. $\times$ *Milliganii* Hook. f.), hybr. nov.; inter parentes magnitudine formaque foliorum necnon corollae magnitudine intermedia.—*E. Milliganii* Hook. f. Fl. Tasm. 1, 54 partim, t. viii, quoad f. A (1855).

Frutex vel *arbor parva*, sempervirens, usque 13 m. alta, ramulis foliiferis valde numerosis, internodiis brevibus, foliis fere ut in *E. Milliganii* congestis. *Folia* oblonga vel elliptico-oblonga, apice rotundata et breviter emarginata, basi cuneata vel rotundata, 0.7-2.6 cm. longa, 0.3-1.1 cm. lata; petiolus 1.5-5 mm. longus. *Bractae* plerumque 3, basi pedicellorum positae. *Pedicelli* 5-8 mm. longi. *Petala* 0.8-1.35 cm. longa, usque 1.4 cm. lata. *Capsula* 1-1.5 cm. longa, pedicello 1-1.1 cm. longo. *Ovarium* 5-6-loculare; styli 5-6, usque 2 mm. longi.

FLOWERS: February-May.

Distribution: TASMANIA.

Heazlewood River, near Waratah, at edge of river, 200 m., March 3rd, 1930, *Comber* 2186 (type, K.); Gordon River, Macquarie Harbour, Jan. 3rd, Feb. 7th, and March 1st, 1847, *Milligan* 724 (Br. M., K., L., N.Y.); National Park, 1925, *Mrs. Lindon* H. 273 (K.); *ibid.*, in open woodland on steep mountainside, 830 m., Dec. 11th, 1929, *Comber* 1857 (K.); *ibid.*, in moist forest, 1000 m., May 6th, 1930, *Comber* 2372 (K.); Hartz Mountains, by stream on summit plateau and slopes, 660-1160 m., Feb. 1915, *Gibbs* 6792 (Br. M., K.); *ibid.*, near top of mountain, the last tree met with, 830 m., March 28th, 1930, *Comber* 2236 (K.).

WITHOUT PRECISE LOCALITY OR DATE: *C. Stuart* s.n. (K.).

TYPE: Heazlewood River, near Waratah, 200 m., March 3rd, 1930, *Comber* 2186 (in Herb. Kew.).

8. *E. cordifolia* Cav. Icones, 4, 49, t. 372 (1797); St.-Hilaire, Expos. 2, 24 (1805); Persoon, Synops. Plant. 2, 92 (sphalm. *Eucraphia*) (1807); Poiret, Encycl. Method. Suppl. 2, 594 (1811); Choisy, Prodr. Hyper. 62 (1821); Choisy in DC. Prodr. 1, 556 (1824); Sprengel, Syst. 2, 634 (1825); G. Don, Gen. Syst. 1, 613 (1831); Spach, Hist. Nat. Végét. Phanér. 5, 346 (1836); Gay, Hist. Chil. 1, 351, t. 8 (1854); Schnizlein, Iconogr. 3, t. 214* (sphalm. 204*) (1854); Baillon in Adansonia, 5, 303 (1864-5); Philippi in R. Bot. Zeitung, 22, 12 and 22 (1864); Bentham et Hooker fil. Gen. Plant. 1, 615 (1865); Baillon, Hist. Pl. 1, 402 (1867-69); Maximowicz in Act. Hort. Petrop. 6, 257 (1876); Reed, Hist. Nat. Chil. 101 (1892); Focke in Engler u. Prantl, Nat. Pflanzenfam. 3, pt. 6, 131 (1893); Reiche, Fl. Chil. 1, 268 (1895); Gard. Chron. ser. 3, 22,

24 (1897); Pritzel in Engl. Bot. Jahrb. 24, 355 (1897); Gard. Chron. ser. 3, 42, 259 (1907); Castillo et Dey, Jeogr. Vej. Rio Valdivia, ed. 2, 6, 80 (1908); Gard. Chron. ser. 3, 44, 129 (1908); Stapf in Curt. Bot. Mag. 134, t. 8209 (1908); Schneider, Ill. Handb. Laubh. 2, 326-8 (1909); Hauman in Rec. Inst. Bot. Errera, 9, 363 (1913); Bean, Tr. Shr. Br. Isl. 1, 535 (1914); Gotschlich in Bol. Mus. Nac. Chil. Santiago, 6, 232 (1914); Mitt. Deutsch. Dendr. Ges. 25, 184 (1916); Hauman in Trab. Inst. Bot. Sc. Buenos Aires, 34, 25 (1916); Gard. Chron. ser. 3, 62, 126 (1917); Mitt. Deutsch. Dendr. Ges. 28, 124 (1919); Record, Timb. Trop. Amer. 432 (1924); Gilg in Engler u. Prantl, Natürl. Pflanzenfam. ed. 2, 21, 49 (1925); Gard. Chron. ser. 3, 82, 130 (1927); Winkler in Beitr. Biol. Pfl. 24, 196-8 (1936).—*Pellinia cordifolia* Molina, Sagg. Chil. ed. 2, 290 (1810) (*nom. abortiv.*); Philippi in Bot. Zeit. 22, Beih. 21 (1864).—*Pellinia chilensis* Molina, Sagg. Chil. ed. 2, 160 (1810) (*nom. abortiv.*); Philippi in Bot. Zeitung, 22, Beih., 12 (1864).—" *Eucryphia cordata* Cav.", Loudon, Encycl. Pl. 2, 1394 (1855).

Molina (l.c.), without any reason, rejects the name *Eucryphia cordifolia* Cav., and creates the generic name *Pellinia* for *Eucryphia*. In his Italian description he then uses the specific epithet *chilensis* (p. 160), whilst in his system in the Polyandria Polygynia (p. 290) he makes the combination *Pellinia cordifolia*. The generic name *Pellinia* is of course superfluous (*nomen abortivum*).

VERNACULAR NAMES: "roble de Chile," "roble de Chiloë," "ulmo" (Chile); "muermo" (Chilotes); "ngulngo," "ngulngo," "gnulgnu" (Mapuche Indians).—"Ulmo" and "muermo" are both said to be corruptions from the Spanish for the Indian name "ngulngo."

TYPE: San Carlos de Chiloë, Cavanilles (not seen!, probably in Herb. Matrit.).

Evergreen tree, up to 40 m. high, trunk upright and 30-60 cm. in diameter, branches copious in upper part. Older branches with a brownish bark, young branches tomentose when young, at length glabrescent. *Stipules* interpetiolar, linear, acute, very pubescent, brown, 3-9 mm. long. *Leaves* simple, opposite, broadly oblong, elliptic- or ovate-oblong; obtuse or sometimes acute and slightly mucronate at the apex, cordate, truncate or rotundate at the base, repand-crenulate to serrate-dentate at the margins (the latter often in young seedlings, especially the top leaves), 3-7.1 cm. long (in cultivated specimens up to 13.2 cm.), 1.9-4.4 cm. broad, coriaceous, on the upper surface in the juvenile stage very pubescent, shining and dark green, mature leaves quite glabrous, network of veins close and conspicuous, on the under surface greyish or glaucescent, and softly pubescent especially on the midrib and on the lateral nerves, 7-11 pairs of lateral nerves; petioles reddish-brown tomentose, 3.5-8 mm. long. *Flowers* solitary, axillary, from perulate, ovate-rotundate, tomentose buds; peduncle not visible, pedicel tomentose, 0.9-2.1 cm. long. *Bracts* 6, at the base of the pedicel,

verticillate, ovate, rounded at the apex, pubescent, rigid, brown, persistent, the outer pair the shortest, 3.5-4 mm. long and 3-3.5 mm. broad. *Sepals* 4, rarely 5, broadly oblong, brown and tomentellous especially at the apex. *Petals* 4, rarely 5, obovate-rotundate to rotundate, slightly crenulate at the apex, scarious, white, up to 2.5 cm. long and broad. *Stamens* very numerous, many-seriate, filaments filiform, glabrous, up to 1.1 cm. long, surrounded at the base by shortly tubular, ciliate effigurations of the thalamus, anthers short and versatile. *Ovary* ovoid, glabrous, 9-13-locular, 9-13-sulcate or not furrowed, up to 5 mm. long and 2-3 mm. in diameter. *Styles* 9-13, glabrous, about 3.5 mm. long, stigmas minute. *Capsule* ligneous, oblong-clavate, up to 1.8 cm. long and 9 mm. in diameter, 9-13-sulcate or not furrowed (the latter in *Hollermayer* 1853), septicidally 9-13-valved, valves brownish-purple and glabrous on the back, brown and glabrous at the sides, on the apex of each valve a small persistent portion of the style; epicarp of the valve in mature fruits splitting off from the endocarp, sometimes with the exception of the very apex. *Fertile seeds* 2-3 in each valve; seeds ovate, winged, shining, glabrous and dark brown, up to 8 mm. long.

Cavanilles, l.c., gives 5 as the number of the petals and the sepals, and indeed very occasionally such a supernumerary petal or sepal occurs; as I have not seen the type, it is not possible to confirm or to contradict the original description on this point, but in my opinion the exceptional occurrence of such supernumerary petals and sepals (which I have seen only on cultivated material) should not be included in the normal complement. Wrongly the genera *Eucryphia* and *Carpodontos* have been kept separate only for the reason that the former genus sometimes exhibited the abnormality more than the latter (see *E. lucida* (Labill.) Baill., *Gunn* 272!).

FLOWERS: January, February.

Distribution: Middle and Southern CHILE (37°-44° S. lat.).

PROV. ARAUCO (CONCEPCION): Coronel, 1860, *C. Ockenius* s.n. (B.); Arauco Bay, south, no date, *Miss A. Calvert* s.n. (Br.M.); Colico, near Arauco Bay, no date, *Miss A. Calvert* s.n. (Br.M.); Carmino de los Rios, near Arauco, on the way to Hualqui, no date, *Philippi* s.n. (K.); Concepcion, 1825, *D'Urville* s.n. (B.). PROV. BIO Bio: Angol, Nov. 1896, *Dusen* 327 (M., St.). PROV. CAUTIN: Lollui de Chile, in open part of forest near stream, 300 m., Feb. 1926, *Comber* 558 (K.); Temuco, in forest, Jan. 1906, *Sargent* s.n. (K.); *ibid.*, wooded hills near Nícol, Feb. 1906, *Morton-Middleton* s.n. (Br. M., St.); *ibid.*, Jan. 1920, *Cl. Joseph* 1058 (Wh.); Puerto Saavedra, hills with remains of former forest, 50 m., Feb. 1918 (fruits) and Nov. 1919 (flowers), *Hollermayer* 56 (B., M.); Budi, Jan. 1923, *Cl. Joseph* 1851 (Wh.). PROV. VALDIVIA: Panguipulli, 200 m., Feb. 1925, *Hollermayer* 362 (B., Br.M., M., N.Y., St., Wh.); *ibid.*, 200 m., Nov. 1927, *Hollermayer* 1853 (B., St., Wh.); *ibid.*, Jan. 1920,

Cl. Joseph 2620 (Wh.); Corral, Feb. 1872, *Philippi* s.n. (B., Br.M., C.); *ibid.*, Feb. 1930, *Gunckel* 52 (Br. M.); Arique River, Dec. 1850, *Lechler* 465 (Br.M., C., St., U.); *ibid.*, in forests, no date, *Lechler* s.n. (B., M.). Without exact locality: in woods, 1833, *Bridges* 787 (B., Br.M., C., K., O.); no date, *Bridges* s.n. (K.); 1824-34, *Cl. Gay* 1250 (N.Y., Wh.); no date, *Philippi* s.n. (K.); 1861, *Philippi* s.n. (K.); Feb. 1885, *Philippi et Borchers* s.n. (Br.M.); in forests, 1896, *Buchtien* s.n. (Wh.); in forests, Feb. 1899, *Buchtien* s.n. (C., L., O.); Feb. 1925, *Cl. Joseph* 3274 (Wh.). PROV. LLANQUIHUE: Lake Todos Santos, forest, Feb. 1902, *Elwes* s.n. (K.); Lake Llanquihue, Feb. 1902, *Elwes* s.n. (K.); Ensenada, near Lake Llanquihue, April 1897, *Dusen* s.n. (B.); Puerto Varas, Feb. 1927, *Gunther* s.n. (St.); Peulla, forest, 170-200 m., Feb. 1925, *Pennell* 12671 (N.Y., Wh.). PROV. CHILOE: Ancud, April 1868, *Cunningham* s.n. (K., N.Y.); *ibid.*, in forest, 200 m., Feb. 1925, *Pennell* 12555 (N.Y.); *ibid.*, Jan. 1932, *Macmillan et Erlanson* 1 (St., Wh.); San Carlos de Chiloé, no date, *Matthews* s.n. (L.); *ibid.*, no date, no collector (B.).

WITHOUT EXACT LOCALITY: 1826-30, *Capt. King* s.n. (Br.M., C., K., O.); 1833, *Bridges* 787 (B., Br.M., C., K., O.); 1845, *Dr. Jos. Hooker* s.n. (K.); Feb. 1885, *Philippi et Borchers* s.n. (Br.M.); no date, *W. Lobb* s.n. (K.).

WITHOUT ANY LOCALITY: March 1852, *Philippi* 148 (B., Br.M., St.); 1803, *Cavanilles* s.n. (L.S.); 1860, *H. Krause* s.n. (B.); 1904, *Philippi* s.n. (Br.M.); no date, *Philippi* s.n. (B., K., Wh.); no date, *Cl. Gay* s.n. (B., K., N.Y., O., P.).

CULTIVATED: Hort. Bot. Reg. Kew., from Ward's Case, Aug. 1877 (K.).

Lucien Hauman in "La forêt valdivienne et ses limites" (Rec. Inst. Bot. Bruxelles 9) studied the zone between 40° and 41° S. lat. (between Valdivia and Puerto Montt). He gives the following information: "The characteristic element of the Valdivian forest is *Eucryphia cordifolia*. Everywhere, where the forest occurs in all its complexity, one can find it always. But, on the contrary, it is the first to disappear, whenever the climatic conditions modify in a sensible way; the forest becomes poorer, and with the exception of the frontier zones where it does not occur, the geographical area of *E. cordifolia* coincides exactly with the formation of the Valdivian forest. Only in the northern part of the Valdivian forest *E. glandulosa* is to be found. At the boundary of the formation, some miles east of Lake Todos los Santos, in the higher region, i.e., higher than 500 m., the *E. cordifolia* and *Nothofagus Dombeyi* formation disappears first, later the *Bambusa*, *Flotowia* and *Weinmannia*, and is replaced by *Nothofagus pumilio*. The extreme altitude of that boundary is about 1000 m., and on the other side of the mountain *Eucryphia* does not appear again. The absence of *Eucryphia* there is an important fact, which is completely explained by the difference in altitude; one can see it disappear at 500 m. altitude round

Lake Todos los Santos, and so it is impossible to find it again at 740 m. (Nahuel Huapi) at the other side of the Andes."

Carl Skottsberg, in his "Vegetationsverhältnisse längs der Cordillera de los Andes" (K. Svensk. Vet. Akad. Handlingar, n.s. 56, no. 5, 1916), gives some more localities and typical associations in which this species occurs. "A characteristic element of the Valdivian rain-forest; in Chile from the province Arauco to N. West Patagonia, 43° 40' S. In Chiloé abundant in the coast-districts, near Ancud together with *Aextoxicum punctatum*, *Drimys Winteri*, *Guevina avellana*, *Laurelia serrata*, etc. In the interior of Chiloe in the forests round the Rio Pudeto (Fundo San Antonio) the species is dominant and forms the *Eucryphia-Myrceugenia*-association. *Eucryphia cordifolia* and *Nothofagus Dombeyi* reach a height of 50 m. in this region; towards the mouth of the Rio Pudeto, in forests and on sandbanks, the *Aextoxicum*-association becomes dominant and *Eucryphia cordifolia* grows as solitary trees." Further, Skottsberg found the species in the province of Llanquihue near Peulla, Lago Todos los Santos, and in Cerro Tronador (3400 m.) also as a part of the glacier vegetation. In this last vegetation the plants were of dwarf-shrubby character.

With the cultivated specimen indicated on the sheet by: "From a wardian-case from Chile," the description of *Eucryphia patagonica* Speg. (Spegazzini in An. Mus. Nac. Buenos Aires, 7, 281, no. 920, 1902) agrees very well, with the exception of the stipules. *Eucryphia cordifolia* Cav. has very linear, acute, pubescent stipules up to 9 mm. long; according to Spegazzini's description *E. patagonica* has very short, obtuse, pubescent ones. The cultivated specimen in question has been attributed by Dr. J. Hutchinson of Kew to *E. patagonica* Speg. with the following note on the sheet: "but evidently only a seedling of *E. cordifolia* Cav." It has indeed the same linear, acute stipules as the latter, up to 4 mm. long, although they are hardly pubescent. Notwithstanding the glabrous stipules, the very serrate-dentate, acute and subsessile or very shortly petioled leaves, it was right to attribute the specimen to *E. cordifolia* Cav.; in juvenile stages plants often show great differences from the mature ones. It is not advisable however to refer this specimen to *E. patagonica* Speg., as the type specimen of the latter, according to a letter from Prof. Dr. L. Parodi from Buenos Aires (November 1936), has disappeared in some way and a topotype could not be found by him at the type locality in the woods round Puerto Nuevo, Lake Nahuel-Huapi. Mr. H. F. Comber, who visited these regions twice, informed me that he believed in the possibility of another species being found, as the 4000 ft. level of the Andes in that region is most inaccessible; this area may contain many little known plants. Until more evidence is available, *E. patagonica* Speg. should be regarded as a doubtful species, the description of which follows here.

DOUBTFUL SPECIES.

E. patagonica Speg. in Anal. Mus. Nac. de Buenos Aires, 7, 281, nr. 920 (1902).

TYPE: Round Puerto Nuevo, Lago Nahuelhuapi, Dec. 1897, C. Spegazzini (in herb. Mus. Buenos Aires?, not seen).

Arborea, ramis fastigiatis, ramulis dense hispidovillosis, foliis simplicibus decussatis brevissime petiolatis elongato-lanceolatis basi obtuse rotundatis non v. vix cordatis apice sensim attenuatis acutis margine irregulariter serratis, dentibus acutis cuspidato-mucronatis, pergameneo-subcoriaceis superne glabris subnitidis, inferne cinerascensibus ad nervos praecipue villosis, floribus solitariis longe pedunculatis, sepalis pubescentibus, staminibus numerosis glabris.

The following description has been translated from the Latin one of Spegazzini:

Species very closely related to *E. cordifolia* Cav., but differing in the longer, more shortly petioled, acute leaves with acute-mucronate marginal teeth. Tree more than 10 m. in height, trunk robust, cortex ochraceous, almost smooth; branches not very divaricate, branchlets rather dense. Branchlets subvirgate, obsolete and alternately subcompressed, densely and patently ferrugineo-villose, internodes varying greatly in length, 1-3.5 cm. long and 2.5-3 mm. in diam. Stipules short, obtuse, ferrugineo-villose, interpetiolar and very deciduous. Petioles very short (2-3 mm. long), densely long ferrugineo-villose. Leaves decussate, very spreading, lamina pergameneous, lanceolate, 5-15 cm. long and 1.5-4 cm. broad; obtusely rotundate, not or scarcely subcordate at the base, gradually cuneate-attenuate, acute and often mucronate at the apex; margins dentate-serrate with 15-35 teeth on either side, teeth slightly irregular acute-mucronate, on the upper surface dark somewhat glossy green, densely and minutely reticulate, in juvenile stage puberulous hispidulous, in mature stage entirely glabrate, or the midrib villosulous; on the under surface cinereous or glaucous, densely and prominently nerved, about 15-35 pairs of secondary nerves from the midrib, densely or loosely and patulously ferrugineo-villose. Flowers solitary, axillary, collected towards the end of the branches; peduncles scarcely half as long as the leaves, 1-3 cm. long and 0.1 cm. in diam., base perulate, ferrugineo-villose; sepals puberulous, stamens numerous, filaments glabrous.

GENUS TO BE EXCLUDED.

Paracryphia Baker fil. in Journ. Linn. Soc. 46, 306 (1921); Gilg in Engler u. Prantl, Natürl. Pflanzenfam. ed. 2, 21, 50 (1925).

Perianth segments 2, imbricate, hirsute on the outside, subcalyptrate, very caducous. Stamens 8-10, subperigynous, anthers basifixed, dehiscent longitudinally, yellowish, filaments enlarged after flowering time. Ovary free, hirsute, 12-15-locular, multiovulate;

in each locus few ovules, attached uniseriately to the central axis. Capsule septicidally dehiscent into 12-15 valves, which separate from the placenta-bearing axis with the exception of the very apex; each valve few-seeded. Shrub or small tree, up to 20 ft. in height. Leaves simple, nearly glabrous, verticillate or subverticillate, coriaceous, serrate at the margins, base attenuate into the petiole, apex subacuminate. Flowers small, in panicles, upper ones hermaphrodite, lower ones male.

Species 1, *P. suaveolens* Bak. f. loc. cit.

Shrub or small tree, 6-7 m. in height, branchlets with a cinereous cortex. Leaves oblanceolate to oblong-lanceolate, 5-11 cm. long and 1.2-3 cm. broad, margins serrate, coriaceous, subacuminate at the apex, glabrous on the upper surface, on the under surface midrib conspicuous, lateral nerves slender; petiole thick, 1-2 cm. long. Perianth segments concave, very caducous, ferrugineo-hirsute on the outside. Stamens 8-10, anthers 3-4 mm. long and longitudinally dehiscent, filaments enlarged after flowering time; ovary 12-15-locular. Capsule septicidally dehiscent into few-seeded valves, which are 7-8 mm. long and 1-1.5 mm. broad.

Distribution: NEW CALEDONIA: Ignambi, forest, 1000-1650 m., Compton 1515 (type !, Br. M.); Mt. Panié, forest, 500 m., Compton 1772 (Br. M.).

This genus differs from *Eucryphia* in the subcalyptrate, caducous perianth segments, character of inflorescence, sessile stigmas, small number of stamens, absence of the shortly tubular effigurations of the thalamus, verticillate leaves, uniseriate ovules, etc.; only the dehiscence of the fruit would suggest relationship to *Eucryphia*, if the attachment of the persistent valves to the central axis were not so different. The valves of the mature fruit in this genus are attached at their very apex to the central axis by means of one very short filament, which is placed on the top of the central axis; in the genus *Eucryphia* the two filaments, bearing the valves, are attached at or nearly at the base of the valves, running up towards the apex. Here the filaments split off from the central axis for their total length, remaining attached by their base to the base of the central axis. This peculiar opening of the capsule can also be found in other families. For the reasons mentioned above, it does not seem desirable to place *Paracryphia* in the family *Eucryphiaceae*. Possible allies could be the *Winteraceae* (*Drimys*, *Illicium*) and *Trochodendraceae*. In the *Winteraceae* the peculiar enlargement of the filaments of the stamens is found also. In *Paracryphia* this enlargement is probably not, as Mr. E. G. Baker writes, due to a gall; it only occurs in the male flowers: in the hermaphrodite flowers the filaments retain their original size after flowering time.

V. HISTORY OF THE GENUS AND THE FAMILY.

In 1797 the genus *Eucryphia* was created by Cavanilles with *E. cordifolia* as type-species, a plant he had found on one of his

many travels to the southwestern part of Chile; he was not sure, however, in which family this remarkable genus should be placed. Persoon (1807) was also unable to decide; Molina (1810) in his system in "Saggio de Chile" (ed. 2) placed it in the class *Polyandria Polygynia* under the generic name *Pellinia*.* After that period nearly every botanist, who mentioned the genus, had a different opinion on its systematic position: Sprengel (1818) was the first to point out its relationship to the *Rosaceae*; Choisy (1821) believed it to be an anomalous genus in the *Hypericaceae*; Cambessèdes (1830) proposed to form a section '*Eucryphiae*' in the *Hypericineae*, consisting of the three genera *Eucryphia*, *Carpodontos* and *Eliea*. This section was meant to form a connexion between the *Hypericineae* and the *Ternstroemiaceae*, whilst the genus *Haronga* of the *Hypericineae* formed a connexion to the *Guttiferae*; this opinion is generally accepted nowadays by including the *Hypericaceae* in the *Guttiferae*. The genus *Eliea*, which seemed to be related to *Eucryphia*, and dried specimens of which have been attributed to the latter, has been placed by Engler in the tribe *Hypericoideae-Cratoxyleae*. Spach (1836) pointed out the relationship of *Eucryphia* to the *Ternstroemiaceae*, particularly to *Laplacea*; at the same time he included the genus *Carpodontos*, with the only species known at that time, *C. lucida* Labill., in the genus *Eucryphia*. *Carpodontos* had been created in 1798 by Labillardière. It is evident now that *Carpodontos* is merely the same genus as *Eucryphia*, but botanists such as G. Don, Sprengel, Reichenbach, Choisy, Endlicher and others, kept these two genera separate. Endlicher (1839 and 1841) placed the section *Eucryphiae* (genera *Eucryphia* and *Carpodontos*) in the *Chlaenaceae*, mainly because it had albuminous seeds as in the *Chlaenaceae* and *Ternstroemiaceae*; although, in his opinion, the opposite leaves pointed strongly to the *Hypericineae*. Schnizlein (1843-70) suggests a relationship near the *Rutaceae*, though he gives no reasons. Agardh, in the "Theoria," does not cite the genus at all. Lindley (1847) also favours the *Hypericineae*, especially because of the oblique and unequal-sided petals. The first to constitute a new order '*Eucryphiaeae*' (or family *Eucryphiaceae*) was Claude Gay (1854): following Endlicher, he placed this new order near the *Chlaenaceae* and the *Hypericineae*, with a strong emphasis towards the latter. Planchon (1854) places the genus in the *Cunoniaceae*, a 'subseries' of the *Saxifragaceae*,

* Dr. R. A. Philippi in "Commentar zu den von Molina beschriebenen Chilenischen Pflanzen" (Bot. Zeitung, Beih. 1864) attributed Molina's mistake to the following confusion: Molina confused the 'Coyam' of the Indians ('Roble' of the Spaniards, *Fagus obliqua* Mirb.), with the 'Muermo' or 'Ulmo' (*Eucryphia cordifolia* Cav.). Although Molina knew the araucanian language very well, he was unaware that the word 'Pellin' did not mean a particular tree, but only heartwood in general. In a special note he adds that on the branches of the tree is to be found a soft excrescence of a white colour, called 'Dihuen,' with red perforations containing a very sweet liquid and very much appreciated by the people. It is a fungus: *Cyttaria Berterii* Berk.

notwithstanding the hypogynous stamens and the very much imbricated sepals and petals; resemblances in the vegetative characters in his opinion pointed to *Weinmannia*, the stamens to *Belangera*, and the capsules and their dehiscence were similar to those of the *Cunoniaceae*. Bentham and Hooker (1862) and Hooker (1889) followed Sprengel in placing *Eucryphia* in the *Rosaceae*, in the tribe *Quillajaeae*. Bentham (1864) cited *Eucryphia* as the 16th genus of the *Saxifragaceae-Cunoniaceae*, thus following Planchon. In Bentham's opinion differences in foliage, the presence of the connate stipules and the albuminous seeds removed *Eucryphia* too much from the *Hypericaceae*; the fruits and the seeds were nearly those of *Geissois* (15th genus in his *Saxifragaceae-Cunoniaceae*), except that the carpels were more numerous. Baillon (1867-69) followed Bentham and Hooker in including *Eucryphia* as an anomalous type in the tribe *Quillajaeae* of the *Rosaceae*. Maximowicz (1879) in his "Adnotationes de Spiraeaceis" allies the genus to the *Tiliaceae*, pointing especially to the *Sloaneaeae* and *Elaeocarpeaeae*. Focke (1893) in Engler and Prantl's "Die Natürlichen Pflanzenfamilien" restored Gay's view in regarding the *Eucryphiaceae* as a distinct family, allied, however, to the *Ternstroemiaceae* and the other members of Engler's subseries *Theineae*; he accordingly placed the family between the *Dilleniaceae* and the *Ochnaceae*.

In 1901 in his "Abhandlung über Tubifloren und Ebenalen" and in 1903 in Engler's "Rosalen" Hans Hallier brought *Eucryphia* in relation to the *Cunoniaceae* again; in the latter work also to the *Quiinaceae*, *Rosaceae* and, by mistake, also to the genus *Brunellia* of the *Terebinthaceae*. *Eucryphia*, the *Cunoniaceae*, *Quiinaceae* and *Brunellia* form together a tribe in his *Rosaceae*. Rodway (1903) placed *Eucryphia* in the *Saxifragaceae* near the genus *Tetracarpaea*; he stated that *Eucryphia* was, like *Tetracarpaea*, not typically saxifragaceous, but more allied to that order than to any other. Hallier (1908) in "Über Juliania und die wahren Stammeltern der Kätzchenblüher" recognized his mistake in having formed the *Rosaceae*-tribe mentioned above. He now regarded the *Quiinaceae*, notwithstanding the relationship to the *Saxifragaceae*, as more nearly related to the *Ochnaceae* and the *Guttiferae* than to the *Cunoniaceae* incl. *Eucryphia*. In the first part of that work Hallier made it clear why the *Cunoniaceae* should be treated as a separate family next to the *Saxifragaceae*, a treatment which, in the author's opinion, is undoubtedly right. It seems advisable to mention the most important reason which Hallier has given, in connexion with the systematic position which the writer thinks should be assigned to the *Eucryphiaceae*. The *Cunoniaceae* are distinguished from all the *Saxifragaceae* except the *Brexiaceae* by a superficial cork-development. Although the *Cunoniaceae* have opposite leaves, they evidently must not be placed near the *Philadelphaeae*, but, in view of the superficial development of the cork and the coriaceous-pergamentaceous leaves, to

the *Brexieae*. Stipules similar to those of the *Cunoniaceae* also occur in the *Brexieae*-genera *Strasburgera* and *Itea*. In many respects, in his opinion, the *Cunoniaceae* might be placed near the following families, which are nearly related to the *Brexieae*, viz., *Ternstroemiaceae*, *Quiinaceae* and *Guttiferae*, especially if *Eucryphia* is included in the *Cunoniaceae* as an older type, in which the gynaeceum is still polymerous, and possesses an elongated floral axis. Some of the points, on the basis of which he included *Eucryphia* in the *Cunoniaceae*, are the following: (1) The gelatinization of the inner walls of the epidermal cells of the leaves, characteristic of the *Cunoniaceae* (also *Bergia*), is also to be found in *Eucryphia* (according to Radlkofer, Küster and Kruch in Solereder's "Systematische Anatomie der Dikotyledonen," Germ. ed.). (2) The vessels are small in diameter, and the elements of which they are composed scalariform with many bars, or simple. (3) The phloem strands are separated from one another by sclerenchyma, and the epidermal hairs are unicellular as in the *Cunoniaceae*. (4) Spicular cells, similar to those in *Pancheria*, are present in the parenchyma. (5) The stipules and bracts possess digitiform resin-secreting glands which may correspond to the glandular hairs of *Escallonia*, *Cunonia* and *Ceratopetalum*. (6) The distribution of *Eucryphia* (Chile, Tasmania, New South Wales and Victoria) is similar to that of the *Cunoniaceae*. (7) The very prominent reticulation of the upper surface of the leaves of *E. cordifolia* Cav. is very similar to that of *Callicoma serratifolia* Andr., *Ceratopetalum gummi-ferum* Sm., and *Platylophos trifolius* D. Don, and hairs are more abundant on the lower than on the upper surface. (8) The sepals of the same species of *Eucryphia* bear many parallel veins on the inner side as in *Ceratopetalum*, and are caducous as in *Gillbeea* and *Belangera*. (9) By the extraordinary "red"* petals *Eucryphia* approaches *Bauera*, by the form and number of the stamens to *Bauera* and *Belangera*, by the septicidal capsule to *Cunonia*, *Weinmannia*, *Belangera*, *Philadelphus*, *Itea* and *Escallonia*. Further he stated that *Medusagyne oppositifolia* Bak. of the Seychelles should be regarded as very closely allied to *Eucryphia*.

Engler and Gilg (1912) placed the *Eucryphiaceae* again between the *Dilleniaceae* and the *Ochnaceae*, in the immediate neighbourhood of the *Theaceae* and the *Guttiferae*. In 1921 Hallier in the "Beiträge zur Kenntnis der Linaceae" (Bot. Centralbl. Beih. 39, pt. 2, 160) proposed quite another theory. He formed a polymorphic centre of development, the *Linaceae*, from which the higher Dicotyledons had developed along several different lines. The *Quiinaceae* (with "Linaceae-venation" in the leaves and the "Bonnetieae-anthers"), *Eucryphia* (with the gelatinized inner walls of the epidermal leaf-

*Hallier made a curious mistake by stating "red" petals, as all the *Eucryphas*, known up till now, have white petals. Probably Hallier saw only dried material; in the dried state the white colour of the petals turns into an orange-red colour, and so may cause confusion.

cells and reticulation of the leaves, "Bonnetieae-anthers," the boat-shaped valves of the capsules as in the *Bonnetieae* and the *Ixonanthaeae*, and the epitropous, winged seeds as in *Emmenanthis*) and *Medusagyne* should belong to the *Linaceae*. They could be derived from this centre, more or less in the same way as they were derived by Hallier himself in 1908, from the *Saxifragaceae-Brexieae*. Wettstein (1923) placed the *Eucryphiaceae* in the order *Guttiferales* after the *Dilleniaceae* and the *Ochnaceae*. From these latter families the *Eucryphiaceae* were very different in the tetramerous petals and sepals and in the separating valves of the capsule. Gilg and Melchior (1925) placed the family together with the *Medusagynaceae* between the *Actinidiaceae* and the *Ochnaceae* in the *Parietales*. Sandwith (1935) added an interesting note to his description of *E. Moorei* F.v.M. in Curtis' Botanical Magazine: "The high position of the bracts [in this species], normally above the middle, on the mature flower stalk, is a peculiar character which appears to separate it from all its congeners, in which the bracts arise from near the base. Perhaps this character, suggesting a more elaborate inflorescence with a longer common peduncle, combines with that of the numerous leaflets of the compound leaves to indicate that *E. Moorei* is the youngest of the species of *Eucryphia* in existence to-day; but any such theory would stand or fall by the taxonomic position which is finally given to this much discussed family."—The possibility of the direction of the lines of evolution being just the other way round (compound leaves → simple leaves, elaborate inflorescence → simple inflorescence) is not mentioned, but, however that may be, an attempt will be made to show, that, whether more primitive or not, the *Eucryphiaceae* are undoubtedly closely related to the *Saxifragaceae-Cunoniaceae*. The *Eucryphiaceae* certainly offer many characters in common with many of the families and genera mentioned above besides the *Cunoniaceae*, but the balance of characters is evidently in favour of this last family. Whether the *Medusagynaceae* should be placed next to the *Eucryphiaceae*, is a very difficult question to answer, as the dried material is not abundant and wood for anatomical investigation could not be obtained. Some of the characters are in favour of the *Eucryphiaceae*, e.g., the calyptrately caducous sepals, the numerous stamens which remain much longer than the petals and sepals, the polymerous ovary and the winged seeds. Other characters however offer great differences, e.g., the red petals, the angular ovary, the unguiculate short pedicel of the fruit, the valves of the mature fruit separating from the central axis in the same way as in *Paracryphia suaveolens* Bak.f., the funicles being on the top of the central axis and the styles being placed at an appreciable distance from each other on the ovary; further, the geographical distribution and anatomical characters of this genus are of a different type from that of the *Eucryphiaceae*.

VI. ANATOMICAL STRUCTURE OF THE WOOD.

The wood structure of the various species of *Eucryphia* available for study is very uniform, and the following description might equally well be applied to any of them.

MACROSCOPIC CHARACTERS. *Colour* similar to the "fawn" on plate 40 of Ridgway's "Colour Standards and Nomenclature." Sap- and heartwood not sharply differentiated; odour and taste absent or not distinctive. *Specific gravity* (air dry) 0.63–0.65. *Grain* straight or nearly so; texture fine and uniform (suggesting according to Professor Record the "red gum" *Liquidambar*). *Growth rings* not obvious under the hand lens, but conspicuous under the microscope (see below). *Pores* not visible to the naked eye, but just visible with the hand lens; solitary or in multiples, vessel-lines fairly obvious with a hand lens. *Parenchyma* not visible without the microscope. *Rays* crowded, clearly visible with a hand lens on transverse and radial surfaces, appearing more reddish in colour than the surrounding tissues.

MICROSCOPIC CHARACTERS. *Vessels*: Internal diameter of the solitary vessels 31–77 (mostly about 60) μ , about 72–113 vessels or vessel-multiples per sq. mm.; solitary or in multiples, the latter in radial pairs or short chains; tangential oblique pairs also present. *Growth rings* conspicuous, marked by narrow concentric bands of small vessels alternating with larger ones. Concentric zones of terminal parenchyma sometimes present. All elements in this position tending to be radially flattened. A fair proportion of the vessels contiguous to the rays. Average length of vessel-elements (after maceration with potassium chlorate and 10 per cent. nitric acid) 341–1085 (mostly 700–775) μ . Vessel elements with or without tails, the latter sometimes of considerable length. Intervascular pits small, bordered, with horizontal apertures, or with scalariform and intermediate types of pitting. Perforations both simple and scalariform, the latter with 5–39 bars. Vessel-ray pits not easily seen in most instances owing to deposits in the ray cells; approximately circular to horizontally elongated, the borders of the larger pits being inconspicuous, those of the smaller ones more obvious. Thin-walled tyloses rarely present. *Fibres*. Groundwork of wood composed of thick-walled fibre-tracheids with small, slit-shaped, usually vertically orientated pits with inconspicuous borders, or small circular pits with conspicuous borders; apertures sometimes extending beyond the borders; not arranged in radial rows, 310–1360 μ long and 14–20 μ in diameter; angular in transverse section, usually hexagonal, lumen circular or oval. *Parenchyma*. Chiefly diffuse, more abundant in the neighbourhood of the smaller than of the larger vessels; consisting of isolated cells or cells in short, usually tangential groups, rarely in small blocks. Terminal parenchyma sometimes present as well, and also a small amount of paratracheal parenchyma. *Rays*. 10–12 per m.m. in transverse sections, predominantly biseriate, but sometimes with uniseriate

margins, occasionally confluent. Short uniseriate rays also present. Rays 1–22 (mostly 9–13) cells high, heterogeneous, central cells procumbent, marginal cells upright. Height of rays about 200–375 (maximum 558) μ ; most of the cells filled with dense granular contents. *Gum Ducts and Ripple Marks*: absent. *Pith*: small, some of the cells filled with densely staining contents. *Leaves*: bifacial with beams of sclerenchyma. Hairs on leaves short, thick-walled and always unicellular.

There were found to be slight differences in the length, diameter and distribution of the vessels, and in the length of the fibre-tracheids of the four species of *Eucryphia* examined. These are not recorded, however, as they were not sufficiently great to enable the species to be identified with certainty. The colour of the wood of the four species also varied somewhat, but it is not known whether these differences are sufficiently constant to be of diagnostic value.

MATERIAL EXAMINED:—*Eucryphia cordifolia* Cav.: Yale 3749 and 4932. *E. lucida* (Labill) Baill.: Yale 19658 and 19951. *E. Moorei* F.v.M.: Yale 19336. Kew 24–1890. *E. glutinosa* (Poepp. et Endl.) Baill.: Ex Hort. Bot. Reg. Kew.

The anatomical structure of the wood has been carefully compared with that of a few members of the different families in which the genus has been placed or to which it has been said to be related, but especially with the *Cunoniaceae*. Wood specimens from the museums or from plants cultivated in the gardens at Kew were used for this purpose. The following is a list of species with which comparison were made:—

CUNONIACEAE:—*Weinmannia trichosperma* Cav., *W. sylvicola* Br., *W. racemosa* L.f., *Geissois Benthani* F.v.M., *Cunonia capensis* L., *Platylophos trifolius* D. Don, *Acrophyllum verticillatum* (D. Don) Hook. fil., *Ceratopetalum apetalum* D. Don.

COMBRETACEAE:—*Terminalia Catappa* L., *Combretum holosericeum* Sond.

ELAEOCARPACEAE:—*Elaeocarpus Hullettii* King, *E. grandis* F.v.M., *E. dentatus* Vahl, *Sloanea javanica* Ridley, *S. Sigun* K. Schum.

DILLENACEAE:—*Dillenia pulcherrima* Kurz, *D. parviflora* Griff.

THEACEAE:—*Camellia japonica* L., *C. Sasanqua* Thunb., *C. drupifera* Lour.

HYPERICACEAE:—*Hypericum lanceolatum* Lamk., *H. Leschenaultii* Choisy.

ROSACEAE:—*Prunus avium* L., *P. serotina* Ehrh., *Quillaja saponaria* Mol., *Lyonothamnus floribundus* A. Gray, *Rhodotypos kerrioides* Sieb. et Zucc.

TILIACEAE:—*Tilia americana* L.

OCHNACEAE:—*Ochna arborea* Burch.

GUTTIFERAE:—*Symphonia globulifera* L.f., *Clusia alba* Jacq., *Cratoxylon polyanthum* Korth.

DIPTEROCARPACEAE:—*Dipterocarpus alatus* Roxb.

	A.	B.	C.	D.	E.	F.	G.	H.	K.	L.	M.	N.	O.
Elaeocarpaceae ...	p.	—	—	p.	—	—	p.	—	—	—	p.	—	—
Dilleniaceae ...	—	p.	—	—	p.	p.	—	p.	—	—	—	—	p.
Hypericaceae ...	—	—	—	—	p.	—	p.	—	—	—	—	—	—
Theaceae ...	p.	—	—	—	—	p.	—	p.	—	—	p.	—	p.
Cunoniaceae ...	(p)	—	—	—	—	—	—	p.	—	p.	—	—	p.
Rosaceae ...	p.	p.	—	—	—	—	p.	—	—	—	p.	p.	p.
Tiliaceae ...	p.	—	p.	—	—	—	p.	—	—	—	p.	—	—
Guttiferae ...	—	p.	—	p.	—	—	p.	—	—	—	—	—	—
Chlaenaceae ...	—	—	—	—	—	—	p.	—	—	—	—	—	—
Linaceae ...	—	—	—	—	—	—	p.	—	—	—	p.	—	—
Ochnaceae ...	—	—	—	—	—	—	p.	—	p.	—	—	—	p.
Brunelliaceae ...	—	—	—	—	—	—	p.	—	—	p.	—	—	—
Eucryphiaceae ...	—	—	—	—	—	—	—	p.	—	p.	—	—	p.
Dipterocarpaceae	—	—	p.	p.	—	—	p.	—	p.	—	—	—	—

TABLE I.

As the result of this comparative anatomical study of the timbers it was possible to construct Table I.

EXPLANATION OF TABLE I.

A = Ringporous wood. B = Conspicuous large rays. C = Ripple marks or storied structure. D = Intercellular canals (vertical-normal, vertical-gummosis or radial-small type). E = Included phloem. F = Raphides. G = Simple perforations in the vessels (with or without the tendency to multiple perforations). H = Scalariform perforation plates in the vessels (with or without the tendency to simple perforations). K = Vestured pits. L = Scalariform pitting. M = Spiral thickenings in the vessels. N = Spiral thickenings in the fibre-tracheids. O = Wood fibres with conspicuous bordered pits. p. = Present or usually so; — means absent.

The sign (p) in column A was inserted against the *Cunoniaceae* because only the single species *Platylophos trifolius* D. Don was found to have ring-porous wood. The writer, however, thinks it is doubtful whether the genus *Platylophos* is really a member of the *Cunoniaceae*. This suggestion is supported by the chemical evidence (see below).

The similarity of the wood structure of *Eucryphia* to that of the *Cunoniaceae* is very striking (see Table I). The most important

characters of the *Eucryphiaceae* are also to be found in the *Cunoniaceae* in the great majority of the cases investigated. *Platylophos* in the *Cunoniaceae*, as mentioned already, seems to be more typical of the *Saxifragaceae*. The vessel perforations throughout both the *Cunoniaceae* and *Eucryphiaceae* are predominantly scalariform, but in both families simple perforations also occur although less frequently.

The *Cunoniaceae* also have scalariform pitting like the *Eucryphiaceae* and these two families seem to be the only ones amongst those investigated, which show these characters together. The fibre-tracheids in both families have conspicuous bordered pits, the crossed apertures extending beyond the borders. In the *Rosaceae*, *Dilleniaceae* and the *Theaceae* these apertures extend in a more V-like shape beyond the borders. The internal diameter of the vessel-elements of most of the *Cunoniaceae* is about the same size as that of the *Eucryphiaceae*: in the genus *Weinmannia* 27 to 77 μ , in *Geissois* 46 to 94 μ , and in *Cunonia* 30–62 μ ; in the *Combretaceae*, *Terminalia Catappa* L. and *Combretum holosericeum* Sond., which also show some similarity in the wood structure, possess vessels with an internal transverse diameter of 66–201 μ . *Sloanea* (*Elaeocarpaceae*) is distinguished from the *Eucryphiaceae* in wood structure by the vertical canals and exclusively simple perforations in the vessels; *Elaeocarpus* has, besides the last character of the former family, also ring-porous wood and spiral thickenings in the vessels, whilst the canals are of the vertical-gummosis type. Although some characters of the *Dilleniaceae* are exhibited by the *Eucryphiaceae* and *Cunoniaceae* as well, the first of these families usually differs in having much broader rays, and included phloem has been recorded for one genus. The *Hypericaceae* differ in possessing included phloem (island-type) in some of the species and by having only simple perforations in the vessels. The *Theaceae* differ in having ring-porous wood, raphides and also spiral thickenings in the vessels. The *Rosaceae* often possess comparatively large rays, ring-porous woods in some species, simple vessel perforations with a tendency towards the multiple type, and spiral thickenings in vessels and fibre-tracheids; the *Tiliaceae* show, besides some of the last-mentioned differences, also ripple marks. Some of the *Guttiferae* have small radial intercellular canals, large conspicuous rays and simple perforations to the vessels, whilst the *Chlaenaceae* possess very few of the characters mentioned above, being distinguished by having only simple perforations and no tendency to multiples. Also the *Linaceae* and the *Ochnaceae* both possess only simple vessel perforations, the latter also vestured pits. The *Brunelliaceae*, from which the genus *Brunellia* showed some similarities to *Eucryphia* according to Hallier, indeed show this in their wood structure by having both simple and scalariform vessel perforations. The *Dipterocarpaceae* are quite different in wood structure from the *Eucryphiaceae* as they have vertical intercellular

canals, vested pits, only simple perforations to the vessels and sometimes ripple marks. From this it is clear that the greatest similarity in wood structure is shown between the *Cunoniaceae* and the *Eucryphiaceae*, and this, combined with the morphological, geographical and biochemical characters, which these two families have in common, undoubtedly indicates that the *Cunoniaceae* possess a greater balance of characters than all the other families to which *Eucryphia* has been attributed. The *Medusagynaceae* differ also in their wood structure from the *Eucryphiaceae*; this information has been obtained from Engler and Prantl, Nat. Pfl. Fam. 21, p. 51/52. In the juvenile stage the medullary rays are 5-8 cells high, later never more than 2-3 cells; the average number of these in the *Eucryphiaceae* is between 10 and 15. The fibre-tracheids are extraordinarily narrow, and with very small lumina; the vessels are always with simple perforations. The quantity of wood parenchyma is much larger than in the *Eucryphiaceae* and between the ordinary parenchyma cells of the pith, many sclerenchyma cells are present. Vascular bundles are also present in the cortex; these are absent throughout the *Eucryphiaceae*. They differ from the *Marcgraviaceae* and *Guttiferae* by the absence of resin elements, from the *Theaceae* by the absence of the characteristic sclereids; with the *Ochnaceae* they agree partly in having cortical vascular bundles and also in the wood structure.

VII. SOME CHEMICAL PROPERTIES OF THE WOOD OF THREE EUCRYPHIA SPECIES COMPARED WITH THOSE OF CUNONIA CAPENSIS L. AND PLATYLOPHOS TRIFOLIATUS D. DON.

For help with this section, which is based on work carried out during the summer of 1937 in the Jodrell Laboratory of the Royal Botanic Gardens, Kew, the writer is very much indebted to Mr. J. Pryde, a visitor working there. Extracts of sawdust taken from the heartwoods of the undermentioned timbers were made, and the colours of the solutions were noted as following:—

Extracts made with :	<i>Cunonia</i> sp. :	<i>Platylophos</i> sp. :	<i>Eucryphia</i> spp. :
Boiling water ...	Red.	Yellow.	Reddish brown.
Absolute alcohol ...	Red.	Brown.	Red.
Dilute ammonia ...	Vinous red.	Yellow passing to pink.	Red passing to brown.

TABLE II.

It may be noted that all the aqueous extracts were acid to litmus. When the aqueous and alcoholic extracts were tested with an FeCl_3 solution, abundant dark blue precipitates were obtained with the *Cunonia* and *Eucryphia* spp., but not with *Platylophos*. Tannic acid is therefore present in the first two,

which was confirmed by other well known tests for tannin. The presence of phlobatannins in the same two woods was inferred from the reddish brown precipitates obtained on boiling aqueous extracts with a few drops of tincture of iodine. But there was a difference in the colours of the filtrates, that from *Cunonia* wood being yellowish brown, while the other was blue. The blue colour suggests starch, or a saponin in colloidal condition. As no starch was found in wood sections of *Eucryphia* examined under the microscope, it was inferred that the blue colour was probably due to a saponin.

Further evidence of the presence of a saponin was the distinct frothing observed on shaking an aqueous extract of *Eucryphia* sawdust. In this respect the *Eucryphia* resembles *Quillaja saponaria* Mol.

In the stem and in the leaves of the *Eucryphas*, as reactions with tincture of alkannin showed, there was no trace of resin. The tops of the connate stipules and the basal and pedunculate bracts however carry many digitiform glands, which excrete a yellow, waxy, aromatic resin in great quantities. This resin runs down the stem and branches and coagulates as a thick mass on the leaves. It looks almost as though the resin has been formed on the leaves themselves; for this reason Bentham and Hooker called them "arbores resinosaes." The resin of *E. lucida* (Labill.) Baill. has highly antiseptic or styptic properties and therefore is greatly valued for cuts and bruises. The results of these investigations may be summarized as follows:—The chemical properties of the three species of *Eucryphia* investigated are fairly similar; the quantities of tannic extracts in the various species vary between 15 and 22 per cent.* *Cunonia capensis* L. showed great chemical similarity to *Eucryphia* in possessing about the same quantities of tannin, a little less phenolic substances, and phlobatannins. *Platylophos trifolius* D. Don in these respects, however, appeared to be quite different from the two former genera. Tannic acid could not be detected and very little phenolic substance was present. The quantities of anthocyanidin were fairly equal in each of the species. (The wood structure of *Platylophos* is not similar to that of the *Cunoniaceae*, and it is, as already stated, doubtful whether this genus should really be included in the *Cunoniaceae*; it seems more advisable to refer it to the *Saxifragaceae*.) The similarities, shown between the *Eucryphiaceae* and the *Cunoniaceae* here, may be regarded as another confirmation of the relationship which exists between these families.

VIII. COMMERCIAL VALUE OF THE WOOD, BARK, ETC.

In general the *Eucryphas* have a heavy, strong and durable wood, and although it is not very common on the markets, in Chile, Tasmania and New South Wales the timbers are offered for sale under different local names. Also the bark of the *Eucryphas*,

*The quantities of tannic extracts are quoted from Record and Mell, Audas, and Maiden l.c.

which contains tannin substances, has a moderate commercial value.

E. cordifolia Cav., Chile. The wood is hard and strong, very closely grained, and weighs 39 lbs. per cub. ft. As the wood is easy to work, it is used in furniture, vehicle parts, yokes, oars and piling. It makes an excellent flooring and is principally in use in Southern Chile. As it is abundant south of the present main lumbering region, it is not common on the markets, but according to Prof. S. Record, it is in demand because it is not given to checking and so is preferred to *Fagus obliqua* Mirb. for railway sleepers and telegraph poles. The Indians use large trees for dugout canoes. The bark contains 15 per cent. of tannic extracts and is used for the manufacture of extract for commercial tanning. The flowers are rich in nectar and are an excellent source of honey. Prof. Record in "Timbers of Tropical America" mentions that *E. patagonica* Speg. is called 'huinque' or 'huinke' at Neuquen, Argentina; it is a tree of 50 feet in height and 16 inches in diameter; the wood moderately hard, finely textured and of an excellent quality for carpenter's use. It seems very doubtful to me whether the tree, described here, is really *E. patagonica*, and has not been confused with another tree, which is in use out there. Also a confusion with *E. cordifolia* Cav. seems not impossible.

E. lucida (Labill.) Baill., Tasmania. The wood of this species is moderately hard, strong and tough, free from knots and weighs 49 lbs. per cub. ft. It is leathery to work (hence the name 'Leatherwood'), finely textured and suitable for cabinet work and heavy constructions. The flowers produce honey with a distinctive flavour. The resin, exuded by the digitate glands on the bracts and the stipules, has antiseptic and styptic properties and therefore is greatly valued for cuts and bruises.

E. Moorei F.v.M., New South Wales and Victoria. This wood also is moderately hard, tough and beautifully clear, but is little used. It is free from knots and easy to work. The bark has been tried for tan by settlers with excellent results; it yielded 21.4 per cent. of tannic extract with 7.74 per cent. of tannic acid.

IX. MISCELLANEOUS NOTES.

The seed anatomy of *E. cordifolia* Cav. is not very interesting from the taxonomic standpoint. The endosperm surrounds the moderately large embryo in about 5 or 6 cell layers, nearly everywhere of the same thickness. The endosperm is white and fleshy, and consists of small irregular cells with unthickened walls. The cell-contents consists of a number of large, round aleurone grains (protein grains), which are surrounded by a fatty oil substance. Starch is absent. The embryo, which is about equal in volume to the endosperm, possesses thick, fleshy cotyledons, in which many small aleurone grains and a quantity of oil serve as food reserves. Seeds of *E. lucida* (Labill.) Baill. were similar in composition. Pritzel (System. Wert der

Samenanatomie usw.; in Engler's Bot. Jahrb. 24, 1898) found that on this seed anatomy the *Eucryphiaceae* might fit very well in the first natural group of the class *Parietales* in Engler's system, which included the families: *Dilleniaceae*, *Ochnaceae*, *Caryocaraceae*, *Marcgraviaceae*, *Quinaceae*, *Theaceae*, *Guttiferae* and *Dipterocarpaceae*. In his opinion the differentiation of the embryo in the *Eucryphiaceae* is similar to that in the most highly developed *Dilleniaceae*. He excluded *Eucryphia* from the *Rosaceae* because of the presence of an endosperm. Although Pritzel's opinion possibly is correct, it seems better to maintain the *Eucryphiaceae* in the proposed systematic place near the *Cunoniaceae*.

Regarding the geographical distribution, it is remarkable to note that the genus *Eucryphia* is confined to middle and south western Chile and the extreme south-eastern part of Australia, including Tasmania. This might be regarded as evidence of a vegetation, which was present when there was either a direct or an interrupted land communication between Australia and South America in the temperate regions. From this point of view, therefore, it is a pity that neither from New Zealand nor from one of the Polynesian Isles in the Pacific Ocean are any more species in this genus or of a related genus known.

X. SUMMARY.

The taxonomy of the *Eucryphiaceae* is fully discussed from as many aspects as possible. The following are the most important points that emerge:—

- (1) The floral characters of the different species are very uniform. The most important diagnostic feature of the flowers are the hairiness of the ovary, the length of the peduncle and the number of bracts.
- (2) Both simple and compound leaves occur.
- (3) Hybrids are recorded, either in nature or in cultivation, for all species except *E. Moorei*.
- (4) The distribution of the species is interesting. Two species occur in Chile, confined to the subtropical and temperate rain forest. *E. glutinosa* (compound leaves) is a lowland tree or shrub, while *E. cordifolia* (simple leaves) extends up the mountains to the level of the glaciers.

The other species are Australian, the compound-leaved species occurring in the subtropical rain forests of the continent, and the two simple-leaved species and their hybrid in Tasmania.

- (5) The family is considered to be taxonomically most nearly related to the *Cunoniaceae*. This conclusion is based on morphological characters and on similarity of anatomical structure, especially on the occurrence of both simple and scalariform perforations in the vessels in the two families. Similarity in chemical properties also points to the same relationship.

LIV—MISCELLANEOUS NOTES.

Retirement of Economic Botanist.—Mr. H. C. SAMPSON, C.I.E., B.Sc., retired under the age limit from the post of Economic Botanist on September 30th, 1938. Mr. Sampson came to Kew in 1927 as the first occupant of the post, which was created in connexion with the grant from the Empire Marketing Board for the promotion of the economic development of the Empire, and his wide experience of tropical agriculture gained in India and Africa has enabled him to carry out very valuable work on crop improvement and on the introduction of new plants of economic importance into various Empire countries. Especial mention should be made of Mr. Sampson's visits to British Honduras, British Guiana, the West Indies, Florida, and to East and West Africa to study their economic resources, and of his recent "List of the Cultivated Crop Plants of the British Empire," which was published as Additional Series XII of the Kew Bulletin (1936).

Mr. Sampson was selected to accompany, as Adviser in Agriculture and allied matters, the Leverhulme Trust Fund West Africa Commission, which left England in October, 1938, to study West African conditions and problems.

The Minister of Agriculture and Fisheries has appointed Sir GEOFFREY EVANS, C.I.E., who is retiring from the post of Principal of the Imperial College of Tropical Agriculture, Trinidad, to succeed Mr. Sampson as Economic Botanist.

JOHN FREDERICK BAILEY.—It is with deep regret that we record the death of Mr. J. F. Bailey, at Brisbane, Queensland. He belonged to a family well-known in Australia for its services to botanical science, agriculture and horticulture. For many years he was assistant to his father, the late F. Manson Bailey, C.M.G., Colonial Botanist at Brisbane. During this period he visited various parts of Queensland and made collections of plants, some of which formed the basis of special reports. In 1905, he was appointed Director of the Botanic Gardens, Brisbane, a position he occupied until 1917. For a short time after his father's death in 1915, he was also Government Botanist and during this period published several papers on the Queensland Flora in collaboration with his nephew, Mr. C. T. White. From 1917 until his retirement in 1932, Mr. Bailey was Director of the Botanic Garden, Adelaide, South Australia. He was a fellow of the Royal Societies of Queensland and South Australia. For many years he was closely connected with the former society, being honorary secretary from 1894–1905, a vice-president in 1908 and president in 1909. He was the author of numerous articles on exotic and native plants and his advice on horticultural problems was constantly sought by public bodies and private individuals.

A Horticultural Autobiography.*—This account of the gardening experiences of a well-known amateur should have a wide popular appeal. The author writes in his usual humorous style. The book is profusely illustrated with black-and-white drawings, which vary considerably in merit: the frontispiece is distinctly gloomy. The text, divided into four sections of three chapters each, tells first of the author's early days of gardening ("Apprenticeship"), after which the scene moves to Loughton, where the reader is taken on a personally conducted tour of the garden at "The Summit," and is introduced to the innumerable treasures which it contains. Dr. Stoker takes an evident delight in finding out the individual preferences of each pet, and also in exploding the reputations of many for being "difficult." The book is a mine of information for any gardener who has to contend with conditions at all comparable to those in Loughton.

A Textbook of General Botany.†—The third edition of this general textbook was published in 1934. That a new edition has appeared after four years suggests that it has found considerable favour with students and teachers. Opinions must differ widely as to the contents and form of the ideal textbook, but the present work covers the ground of plant physiology, anatomy, and gross morphology fairly fully. There are also useful chapters serving as introduction to the study of ecology and genetics. Unfortunately there is little stress laid on the need for the students to see, handle, examine, draw, describe, and work out material and problems for themselves. To the teacher forced to cram students for examinations such a textbook may well be a godsend, but it gives little guide to any teacher or student who wishes to carry out "practical" studies in the field, experimental ground, or laboratory.

In this new edition, prepared by Prof. Robbins after the death of Dr. Holman, many changes have been made and certain sections have been re-written. This is particularly evident in the chapters dealing with plant physiology, which is probably the most difficult part of botany to teach adequately to students early in their course. So many of the basic principles, or what till recently were regarded as such, are now being called in question that the teacher has either to risk confusing the student by reference to opposing hypotheses, and sometimes apparently contradictory experimental results, or he has dogmatically to teach one viewpoint, which may or may not be correct, to the exclusion of others which, on our present knowledge, are equally possible. In this textbook the happy combination of

* "A Gardener's Progress," by Fred Stoker, M.B., F.R.C.S. (Edin.), F.L.S., V.M.H. Illustrated with Drawings of Plants in the Author's Garden by H. A. Thomerson. Putnam & Co., Ltd., 42, Great Russell Street, London, 1938. Pp. xii+457; xxv plates; 43 text-figures; sketch-plan. Price 15s.

† By R. M. Holman and W. W. Robbins, New York: John Wiley & Sons, Inc. London: Chapman & Hall, Ltd. 4th edition, 1938. Pp. xvii+664. Price 20s. net.

gross morphology, anatomy, and physiology has much to recommend it, since it avoids the extremely artificial division of subject matter under such headings as morphology, anatomy, etc., found in many other textbooks. A brief discussion of hormones in their relation to growth phenomena is included. The importance of the study of pollen is also indicated.

The treatment of the cryptogams, in part 2, seems reasonably complete for a book of this scope, but it is out of proportion to the space devoted to the classification of the spermatophytes, and especially to the angiosperms. While the importance, from many standpoints, of the numerous and very diverse groups of "lower plants" should not be underrated, there remains the fact that the seed-bearing plants dominate the flora and vegetation of the world at the present day. They are also of supreme economic importance to man. It is therefore to be regretted that in a general textbook adequate space has not been devoted to an outline of their systematics. Even the attempt to summarize the "principal tendencies in the evolution of the flower" must appear to the critical student as either dogmatic statement or argument in a circle.

The illustrations are, on the whole, excellent and relevant to the text. The line drawings are usually very clear, the microphotographs exceptionally good, and the photographs well chosen. A glossary, an index of thirty pages, and a list of books for reference and collateral reading are included.

It may be suggested that a more detailed account of cymose and mixed inflorescences (p. 257) is desirable. The diagram to illustrate "inheritance in a monohybrid cross" might be improved by differentiating homozygotes from heterozygotes. What may prove a seriously misleading mistake is the printing on the back of the binding of the words "Third edition" when the title-page and the prefaces show that this is the fourth edition. W. B. TURRILL.

BULLETIN OF MISCELLANEOUS INFORMATION

No. 9 1938

ROYAL BOTANIC GARDENS, KEW

LV—CONTRIBUTIONS TO THE FLORA OF TROPICAL AMERICA : XXXVII.*

NOTES ON THE FLORA OF TOBAGO. N. Y. SANDWITH.

At the time of the publication by Urban in 1902 of a list of botanical collectors in Tobago (see *Symb. Ant.* 3, 157), the name of the Baron von Eggers stood out in lonely prominence as that of the first serious investigator of the flora of this island. His collections of about 510 numbers were widely distributed and there is an almost complete representation in the Kew Herbarium. Since 1902 the island has been much better explored and the flora of all regions except that of the Forest Reserve of the Main Ridge may now be regarded as comparatively well-known. This is due to the efforts of that energetic collector the late Mr. W. E. Broadway, who was for some time resident in the island as Curator of the Botanic Station, and paid subsequent visits to it almost up to the date of his death in January 1935. From the evidence of his registers of field-notes, now preserved at Kew, it appears that Broadway's collections in Tobago, extending over a period between August 1908 and December 1933, reached a total of some 1122 numbers. Of these very many, it is to be regretted, are not represented either at Kew or at the British Museum; the great majority was sent to Berlin where it was thoroughly studied by Professor Urban and was found to contain a fair number of good new species which are apparently endemic. Very useful collecting in Tobago has also been done by Professor E. E. Cheesman, and Messrs. R. O. Williams and W. G. Freeman, whenever they have had occasion to visit the island, with the particular object of obtaining additional records and materials for the Flora of Trinidad and Tobago.

During October 1937 the writer, accompanied by Dr. John Smart of the Department of Entomology, British Museum, stayed for three weeks on Tobago and collected about 325 numbers, with duplicates, for the Kew Herbarium. They were joined for about four days by Prof. E. E. Cheesman who was collecting fresh material of *Cucurbitaceae* and *Compositae* for descriptions for the Flora of Trinidad and Tobago. The season, a "wet" one without rain, was unusually hot and oppressive, and the month was unfavourable for the flowering of trees in the high virgin forests. Nevertheless,

* Continued from K.B. 1938, 294.

excursions were made from Bacolet to most parts of the island, the Main Ridge was crossed or entered on several occasions, and four days were spent in the Parlatuvier neighbourhood on the remote and roadless north side. Now that the collection has been worked out the impression gained is that there is a great deal more work to be done in what is, obviously, the most interesting and important region in the island, the Forest Reserve of the Main Ridge. This is particularly true of the northern slopes above Parlatuvier and towards Pigeon Hill, which have a heavy rainfall. It is quite evident that repeated exploration of these forests will add many new trees, herbs and ferns to the known flora of the island, and among them there will be some good new species. The present difficulty is that very few public "roads" cross the Main Ridge, there is only a limited number of paths entering the virgin forests from the higher cacao areas of the estates, and there are no Government resthouses on the Ridge itself. Again, material of many of the larger trees will never be collected until they are felled.

In spite of the low altitude of the Main Ridge—the highest point is 1890 ft.—the flora of these forests is obviously of great interest from the standpoint of distribution. It resembles that of the Northern Range of Trinidad, but some species evidently belong to a Lesser Antilles flora, while others (e.g., *Tresanthera*) represent a Venezuelan element which apparently does not reach Trinidad. There are also several supposed endemics, some of them, for instance *Tobagoa* and *Besleria Seitzii*, remarkably distinct and quite frequent. The dry thickets on the coast slopes of the southern side of the island have another very characteristic type of vegetation, some of the species (e.g., *Daphnopsis caribaea*), being widely distributed in the Antilles and on the islands or the coast of Venezuela, but rare or unknown on the mainland of Trinidad where such ground is less often met with. Apart from these two types the island is mainly cultivated, but interesting species are still to be found on coast rocks, along shady gullies, by rivers, and on the steep slopes of valleys in the low-lying populated districts.

The object of the following enumeration—which omits many very common species—is to indicate first records for the island and also records which were omitted from those parts of the Flora of Trinidad and Tobago which have been published; while a number of observations on the taxonomy or nomenclature of species is included. Two new species are described. The writer's thanks are due to the following botanists who have assisted him with the identification of certain families: Dr. S. F. Blake (*Compositae*), Dr. E. P. Killip (*Urticaceae*), Mr. V. S. Summerhayes (*Orchidaceae*), Mr. C. E. Hubbard and Mrs. Agnes Chase (*Gramineae*), and Mr. A. H. G. Alston (*Pteridophyta*).

The following abbreviation and symbols are used:

Fl. The Flora of Trinidad and Tobago, now in course of publication.

Indicates first published record for Tobago.

Indicates that the record existed but was omitted from the Flora of Trinidad and Tobago.

RANUNCULACEAE.

***Clematis caracasana* DC.**

By Easterfield Road, two miles from Mason Hall, very local, Oct. 19th, S. 1867. Climbing over trees. Hairs of fruit greyish-white. Also seen in one spot by the Parlatuvier-Roxborough road.

ANNONACEAE.

***Duguetia tobagensis* (Urb.) R.E. Fr. *Alcmene tobagensis* Urb.; Fl., 1, part 1, p. 18.**

Great Dog River, in virgin forest on river-bank, Oct. 12th, S. 1739; a small tree with cream-coloured flowers. An additional locality is Menna Road, Lot 42, *Broadway* 8926.

For the reduction of *Alcmene* to *Duguetia* see R. E. Fries in *Acta Horti Bergiani*, Band 12, 1, pp. 92-94 (1934).

CAPPARIDACEAE.

***Capparis flexuosa* L.**

Store Bay, on coral cliffs, Oct. 17th, S. 1950.

****Cleome aculeata* L.**

Bacolet, grassy side of Friendsfield Road, Oct. 17th, S. 1815. Erect herb with unarmed petioles and white petals.

FLACOURTIACEAE.

***Casearia spinescens* (Sw.) Griseb.**

Bacolet, frequent on dry wooded hillside, Oct. 6th, S. 1634. Shrub or small tree with spinous twigs. Flowers white. Fruit green, warty.

***C. sylvestris* Sw.**

Lambeau Hill, c. 700 ft., Oct. 7th, S. 1644. A small tree with cream-coloured flowers.

CARYOPHYLLACEAE.

****Drymaria cordata* (L.) Willd.**

Mount St. George-Castara road, grassy side of track in virgin forest, Oct. 18th, S. 1835.

GUTTIFERAE.

***Clusia minor* L.**

Sandy River Valley, bushy bank, Oct. 9th, S. 1681. Small tree, 20-30 ft. high. Corolla pure white.

****Marila grandiflora* Griseb.**

Roxborough-Parlatuvier road, in forest reserve of Main Ridge, plentiful from 6½-8½ mileposts, usually by streams and on the edges of ravines, c. 1200-1500 ft., fl. Oct. 25th, S. 1928. A small tree up to about 30 ft. high; branchlets brown, flattened; petals snow-white, reflexed.

Hitherto regarded as an endemic of the Northern Range in Trinidad.

MARCGRAVIACEAE.

Marcgravia tobagensis Urb.

Mount St. George-Castara road, creeping and climbing up trees in forest reserve of Main Ridge, c. 1200 ft., Oct. 18th, S. 1855. Flowers and pitchers green. Ripe fruit red.

THEACEAE.

Ternstroemia oligostemon Krug et Urb.

Slopes of Main Ridge above Parlatuvier, in a patch of relict forest on borders of cultivations, fl. and fr. Oct. 24th, S. 1916. A middle-sized tree with white flowers.

MALVACEAE.

Malvastrum coromandellianum (L.) Garcke.

Store Bay, on roadside, Oct. 17th, S. 1817; erect herb with yellow flowers.

Sida acuta Burm., auct. amer.

Store Bay, bare waste ground near cliffs, Oct. 17th, S. 1822. A low shrub with woody stem. Petals yellow.

Agrees with authentic specimens of *S. antillensis* Urb., which is treated as a form of the variable *S. acuta* by Britton and Wilson. The habit, the shape and indumentum of the leaves, and the very short (about 0.75 mm.) awns of the carpels give these specimens a distinct facies.

†**S. glomerata** Cav.

Store Bay, bare waste ground near cliffs, Oct. 17th, S. 1823; leaves yellowish-green; petals very pale creamy-white. Milford Main Road, Oct. 1925, *Freeman and Williams* in *Herb. Trin.* 11454. Near Crown Point, 1912, *Broadway* 4240, det. Urban (fide *Broadway's* Register). Recorded from Tobago by Urban, *Symb. Ant.* 8, 415.

S. linifolia Juss.

Bacolet, dry grassy hillside, Oct. 21st, S. 1875.

†**Pavonia fruticosa** (Mill.) Fawc. et Rendle.

Parlatuvier, locally plentiful on rocky shady bank, Oct. 22nd, S. 1885. Petals very pale pinkish-white.

Recorded from Tobago by Urban (as *P. Typhalaea* (L.) Cav., in *Symb. Ant.* 8, 422), no doubt on the strength of *Broadway* 4458, from Lot 42, April 1913.

STERCULIACEAE.

†**Waltheria americana** L.

Bacolet, bare ground on edge of dry scrub, Oct. 20th, S. 1872.

Recorded by Urban, *Symb. Ant.* 8, 431, presumably on the strength of *Broadway* 4770, from Scarborough, see *Broadway's* Register.

TILIACEAE.

Corchorus aestuans L.

Near Bacolet, grassy side of Friendsfield Road, Oct. 17th, S. 1814. Store Bay, bare ground on coral cliffs, Oct. 17th, S. 1828. Prostrate herb with small bright yellow flowers.

No local specimen had been seen when the account of the *Tiliaceae* appeared in the *Flora*. Confirms the Tobago record in *Urb. Symb. Ant.* 8, 406.

Apeiba Schomburgkii Szyszyl. *A. Tibourbou* Aubl. var. *membranacea* Lockh.

Bacolet, in thickets on dry hills, Oct. 21st, S. 1874. Tree, about 30–40 ft. high. Sepals very pale brown. Petals white.

Restored to specific rank by Uittien in *Rec. Trav. Bot. Néerl.* 32, 249 (1935).

Muntingia Calabura L.

Castara, roadside on slopes above village towards Moriah, c. 700 ft., Oct. 18th, S. 1830.

ERYTHROXYLACEAE.

***Erythroxylum cumanense** H.B.K. *E. ovatum* Cav. var. *splendens* O. E. Schulz?

Buccoo Bay, on sandy promontory with species of the Mangrove association, Oct. 8th, S. 1667. A small tree with spreading twiggy branches, about 6–8 ft. high, and as much or more in breadth. Corolla cream.

The writer cannot distinguish this material specifically from specimens from Margarita and Guiana which Schulz compared with the authentic sheets of *E. cumanense*, and it agrees well with the original description of that species. The habit (horizontal branches and branchlets) and the very short pedicels distinguish the plant from the West Indian *E. ovatum*, and the habitat and considerations of distribution are favourable to the identification with *E. cumanense*. A specimen from Cedros, Trinidad, coll. *Crueger*, is possibly the same plant. It is possible that this material may be identified with *E. ovatum* var. *splendens* O. E. Schulz, which was unfortunately omitted from the *Flora* (vol. 1, part 2), although it was based partly on a specimen from Tobago (*Eggers* 5675).

MALPIGHIACEAE.

†**Heteropteris macrostachya** Juss. *Banisteria apiculata* (Miq.) C. B. Robinson.

Mason Hall, on cliffs of waterfall in Courland River, Oct. 19th, S. 1860; flowers pale yellow. Frenchfield, in woods, *Eggers* 5536. The Widow, *Broadway* 5895.

Recorded from Tobago by Niedenzu, in *Engl. Pflanzenreich*, 4, 141, p. 343 (1928).

Tetrapteris discolor (G. F. W. Mey.) DC.

Mount St. George-Castara road, in forest, Oct. 18th, S. 1841.

SIMAROUBACEAE.

Picramnia pentandra Sw.

Ascent of Pigeon Hill, c. 800 ft., fr. Oct. 16th, S. 1811. A small tree with reddish-brown fruit.

BURSERACEAE.

†**Bursera Simaruba (L.) Sarg.**

Bacolet Point, fr. Oct. 10th, S. 1704. A small tree in dense thickets on dry coast slopes. Fruit reddish-brown.

Recorded from Tobago by Urban in Symb. Ant. 8, 329, no doubt on the strength of *Broadway* 3497, from Chelsea, near Scarborough, April 1910.

HIPPOCRATEACEAE.

Hippocratea volubilis L.

Green Hill, on rocks in the river-bed, Oct. 11th, S. 1708. Bloody Bay, trailing on sandy shore in coconut thicket, Oct. 23rd, S. 1890.

***Salacia sphaerocarpa Rusby**, Descr. 300 new species S. Amer. pl., p. 52 (1920).

Parlatuvier, in virgin forest on slopes of Main Ridge, fl. Oct. 24th, S. 1910. A small tree, growing in deep shade. Flowers yellow, turning brown.

An addition to the Flora. The material agrees excellently in characters both of foliage and inflorescence with that of the type collections from the Orinoco Delta, Venezuela. Rusby did not describe the flowers of his species, but they are present on the Kew specimen of his no. 416, and dissection shows agreement with those of the Tobago plant. The inflorescence is up to 3 cm. in length; the sepals semiorbicular, lacerate-fringed, about 0.8 mm. long and 1.3 mm. broad; the petals obovate-oblong, nearly 2 mm. long, about 1.3 mm. broad. The species has the characteristic disk, ovary and stigma of Miers' genus *Kippistia* and falls into the first section of Peyritsch's account of the genus in Mart. Fl. Bras. 11, pars i (1878). *S. granulata*, a Tobago endemic described by Urban, has completely different foliage and was referred by its author to another section of the genus on account of characters of the flower. The affinity of *S. sphaerocarpa* is with the Brazilian *S. cognata* (Miers) Peyr.

RHAMNACEAE.

Gouania polygama (Jacq.) Urb.

Ascent of Pigeon Hill, c. 800 ft., Oct. 16th, S. 1810. Climber over low trees; flowers creamy-yellow.

SAPINDACEAE.

Paullinia excisa Radlk.

Castara-Parlatuvier road, 1½ miles from Castara, Oct. 22nd, fl. and fr., S. 1879. Climber over thicket on bank by path. Corolla cream. Fruit reddish-brown.

A Tobago endemic, hitherto known only from the fruiting type collection (*Eggers* 5723), which was gathered by Bacolet River. The above collection bears flowers which may now be described as follows: flowers about 8 mm. in diameter when expanded; 2 outer sepals very much smaller, ovate-orbicular, 2.25 mm. long, 2 mm. broad; 3 inner sepals broadly obovate, 4.5 mm. long, 3 mm. broad; petals rather narrowly obovate-spathulate, up to 4.5 mm. long, 2 mm. broad; scales slightly exceeding half the length of the petals, those of the upper petals with a short obcordate crest which is somewhat shorter than the barbate inflexed appendage; filaments flattened, about 2.5 mm. long, pilose near the base only; torus and ovoid-oblong glands pilose.

LEGUMINOSAE.

Teramnus labialis Spreng.

Store Bay, creeping over bushes on edge of cliffs, Oct. 17th, S. 1825. Flowers white.

Clitoria rubiginosa Juss.

Bacolet, creeper in coconut plantation, Oct. 13th, S. 1754. Leaflets thick, more or less glaucous beneath. Corolla white; standard with purplish stripes leaving the median vein within.

A glabrescent form, to be compared with *H. H. and G. W. Smith* 402 from St. Vincent, and sheets from Tropical Africa.

Dioclea megacarpa Rolfe.

Bacolet, dry wooded hillsides, Oct. 6th, S. 1631. Corolla violet.

Sophora occidentalis L. *S. tomentosa* L. according to Fl. vol. 1, part 4, p. 204.

Buccoo Bay, sandy promontory with Mangrove-swamp species, Oct. 8th, S. 1673. Small tree in thickets. Leaflets thick, dark green above, greyish below. Corolla rather pale yellow, recalling *Laburnum*.

The Trinidad and Tobago material is to be referred to this species, which is distinguished from *S. tomentosa* by the minute pubescence of the lower surface of the leaflets and calyx, the clothing on the leaflets being also much sparser.

Cassia bacillaris L.f.

Easterfield Road, 2 miles from Mason Hall, small tree in bushy ground, Oct. 19th, S. 1869. Leaflets greyish-glaucous below. Petals yellowish-biscuit.

A small-flowered form, the petals reaching only 13 mm. in length, but otherwise indistinguishable from this species.

C. patellaria DC.

French Hill, dry sides of track on slopes, Oct. 9th, S. 1697. Erect herb; petals small, yellow.

Brownea latifolia Jacq., auct.

Parlatuvier, dry bushy bank by track to Castara, Oct. 22nd, S. 1886. A small shrub with bright vermilion petals.

Entada polystachya (L.) DC.

Bacolet, dry wooded hillsides, Oct. 6th, S. 1622. Liane ; petals reddish-brown ; filaments cream.

Desmanthus depressus H. et B.

Bacolet, bare open ground, Oct. 15th, S. 1795. A small depressed shrublet ; filaments white.

Mimosa pudica L.

Bacolet, in dry coconut plantation, Oct. 5th, S. 1613.

Leucaena glauca (L.) Bth.

Buccoo Bay, in open ground on sandy promontory, Oct. 8th, S. 1669. A low shrub with cream-coloured petals and filaments, and pinkish-cream anthers.

Inga punctata Willd.

Mount St. George-Castara road, in forest reserve of Main Ridge, c. 1200 ft., Oct. 18th, S. 1848. A tree about 40 ft. high.

ROSACEAE.

***Hirtella triandra** Sw.

Great Dog River, Oct. 12th, S. 1737. A small tree on river-bank ; petals white ; filaments purplish.

H. silicea Griseb.

Caledonia, deep ravine by Easterfield Road, Oct. 11th, S. 1721. A small tree ; inflorescence with brownish hairs.

The fruit of this collection is softly scattered-pilose.

MYRTACEAE.

***Krugia ferruginea** (Poir.) Urb.

Roxborough-Parlatuvier road, 6th-7th mileposts, in Govt. Reserve Forest, 1400-1600 ft., Oct. 25th, S. 1929 ; a small tree, up to about 50 ft. high ; inflorescence pale brown. Menna Road, lot 42, April 1913, *Broadway* 4451 (det. Urban, fide *Broadway's* Register) and March 1914, *Broadway* 8932.

Calyptranthes sericea Griseb.

Bacolet, dry wooded hillside, Oct. 6th, S. 1624 ; a small tree. Other collections, not cited in the Flora, are *Broadway* 4056, Belmont, and *Broadway* 4864, The Widow.

Calyptranthes sp. nov.?

Roxborough-Parlatuvier road, in virgin forest of Main Ridge near 5th milepost, c. 1300 ft., Oct. 14th, S. 1769. A small tree, c. 30-40 ft. high. Buds and young fruit pale green.

The material does not agree with any species of the family recorded from Trinidad and Tobago, nor has it been matched at all. The inflorescences consist of buds and a single fruit. The splitting of two or three calyces suggests the genus *Calyptranthes*, but the general facies of the plant is perhaps more suggestive of *Marlicrea*.

The large elliptic leaves, up to 20 cm. long and 11 cm. wide, the short clustered sericeous-pubescent axillary inflorescence-branches, and the small buds which are pubescent at the apex, mark an interesting plant which can scarcely be described on present evidence.

Eugenia Cruegeri Krug et Urb.

Roxborough-Parlatuvier road, on slopes descending to Bloody Bay, Oct. 25th, S. 1920. A small shrub. Inflorescence and calyx very pale mauve with greenish tinge.

E. monticola (Sw.) DC. var. **latifolia** Krug et Urb.

Bacolet, dry wooded hillsides, fr. Oct. 6th, S. 1630. Small tree or shrub. Berries yellow, then red, finally black.

MELASTOMACEAE.

***Platycentrum clidemioides** Naud.

Roxborough-Parlatuvier road, c. 6th-7th mileposts, in reserve forest of Main Ridge, c. 1400 ft., Oct. 25th, S. 1930. Shrub or small tree. Inflorescence branches violet. Anthers yellow. Fruit pale greyish-purple.

***Conostegia icosandra** (Sw.) Urb.

Roxborough-Parlatuvier road, in forest Reserve of Main Ridge, 8th-9th mileposts, c. 1200 ft., Oct. 25th, S. 1924. Large shrub or small tree ; petals and filaments white.

***Miconia hypoleuca** (Bth.) Triana.

Roxborough-Parlatuvier road, near 5th milepost, in forest reserve of Main Ridge, c. 1300 ft., Oct. 14th, S. 1771 ; shrub with brownish-orange fruits. Mount St. George-Castara road, Sept. 1927, *Williams* in *Herb. Trin.* 11808.

M. laevigata (L.) DC.

French Hill, dry slopes, Oct. 9th., S. 1693. Shrub about 6 ft. high ; petals and stamens snow-white.

Clidemia hirta (L.) D. Don.

Above Bloody Bay, shady bank in cacao plantations by path to Charlotteville, Oct. 23rd, S. 1893. Low shrub with white petals.

var. **elegans** (Aubl.) Griseb.

Above Bloody Bay, with the typical plant, S. 1894.

The variety seemed so distinct in the field that it is desirable to call attention to it as an extreme form with broadly ovate, conspicuously cordate leaves which are deeply and irregularly crenate.

C. pustulata DC.

Above Parlatuvier, dry slopes on edges of cultivation, Oct. 24th, S. 1917 ; a shrub with dirty white flowers.

***C. trinitensis** (Crueg.) Griseb.

Roxborough-Parlatuvier road, in forest reserve of Main Ridge near 5th milepost, about 1300 ft., Oct. 14th, S. 1774. Shrub ;

hypanthium reddish-brown; petals 4, reflexed, dirty white. Forest reserve, 1911, *Broadway* 4000, det. Urban (fide *Broadway's Register*).

Hitherto known only as a rarely collected endemic of Trinidad.

***Henriettea multiflora** Naud.

Roxborough-Parlatuvier road, in forest reserve of Main Ridge, near 5th milepost, 1300 ft., Oct. 14th, S. 1775. A small tree; inflorescence galled.

LYTHRACEAE.

Cuphea denticulata H.B.K.

Lambeau Hill, roadside on edge of virgin forest, about 700 ft., Oct. 7th, S. 1665. Erect low shrub with pink petals.

C. setosa Koehne var. **glabrescens** Koehne.

Caledonia, on rocks in stream in ravine, Oct. 11th, S. 1730. Petals pinkish-purple.

BEGONIACEAE.

Begonia humilis Ait.

Caledonia, damp bank by stream in deep shady ravine, Oct. 11th, S. 1728. Flowers white. ♂ petals 2.

PASSIFLORACEAE.

Passiflora cyanea Mast.

French Hill, 750 ft., Oct. 9th, S. 1689. Roxborough-Parlatuvier road, by wooded slopes, 1st-2nd mileposts, Oct. 14th, S. 1760. Stems and petioles pruinose, purplish-glaucous. Leaves glaucous beneath. Petals white. Filaments amethyst.

Apparently not infrequent at low levels throughout the island.

P. laurifolia L.

Back Hill, above Charlotteville, Oct. 16th, S. 1798.

Not recorded from Tobago in Killip's monograph of the genus, but recorded by Urban, *Symb. Ant.* 8, 456.

P. tuberosa Jacq.

Slopes of Great Dog River valley, in cleared bushy ground on border of cacao plantations, Oct. 12th, S. 1744. Leaves with pores on lower surface. Corolla pale greenish-white. Stamens and staminodes with purplish blotches.

CUCURBITACEAE.

Melothria guadalupensis (Spr.) Cogn.

Back Hill, above Charlotteville, Oct. 7th, S. 1666.

Anguria umbrosa H.B.K.

Great Dog River valley, climbing over bushes by river, Oct. 12th, S. 1748. Corolla rich orange-brown.

Cayaponia racemosa (Sw.) Cogn.

French Hill, among bushes on dry open slopes, Oct. 9th, S. 1695 (♂ fls). Moriah, climbing over trees on roadside, Oct. 18th, S. 1829

(♂ and ♀). ♂ Corolla dark green, the lobes yellowish-white above and on the margins.

UMBELLIFERAE.

Eryngium foetidum L.

Great Dog River, in shade in cultivated land at lower end of valley, Oct. 12th, S. 1734.

RUBIACEAE.

†**Tresanthera pauciflora** K. Schum. ex Solereder in Bull. Herb. Boiss. 1, 280 (1893); Standley in Field Mus. Publ. Bot. 8, 158 (1930). *Rustia pauciflora* Solereder in Ber. Deutsch. Bot. Ges., ann. 1890, Generalvers. Heft, p. 99 in obs. (1890), nomen. *Tresanthera pauciflora* K. Schum. in Engl. et Prantl, Pflanzenfam. 4, 4, p. 19 (1891), nomen.

Roxborough-Parlatuvier road, in forest reserve of Main Ridge, 800-1300 ft., Oct. 14th, S. 1757. Similarly on slopes above Parlatuvier, Oct. 24th, S. 1899. A shrub, 15-20 ft. high. Corolla greenish-white with purplish tinge. Morne d'Or, Cremorne River, 1200 ft., fl. Nov., Eggers 5812 (Munich, type. Kew. Field Museum, Chicago). Easterfield, fl. Dec. 1912, *Broadway* 3076 (Field Museum, Chicago, fide Standley).

This remarkable plant, frequent in the virgin forests of the Main Ridge, was omitted from the Flora, nor has the name hitherto appeared in the Index Kewensis, while Standley in 1930 was unable to trace the description. The genus *Tresanthera* Karst. had been monotypic, being based on *T. condamineoides* Karst., which was collected in rain forests at 500 ft. and upwards near the coast at Puerto Cabello in Venezuela. Solereder, who attributed the type locality of the genus to Mexico instead of Venezuela, distinguished Eggers' material from Tobago by the simpler, few-flowered inflorescence and the colour of the corolla. The first of these characters has proved to be useless, since recent collections from Tobago show the inflorescence to be quite as elaborately many-flowered as in Karsten's plate of *T. condamineoides*. On the other hand, all collections from Tobago note the colour of the flowers of *T. pauciflora* as yellowish-white, pale white, or greenish-white with a purplish tinge; whereas Karsten described the corolla of *T. condamineoides* as reddish-orange, the lobes orange-yellow within. Even more significant perhaps is the fact that the Tobago species is apparently always a shrub, scarcely even a small tree, barely reaching 20 ft. in height and with a stem that cannot be described as a trunk; whereas *T. condamineoides* was said to be a real tree, 50-60 ft. in height, and with a trunk a foot in diameter. Comparison with Karsten's description and plate does not help further towards the differentiation of the Tobago material, nor has any Venezuelan specimen of *T. condamineoides* been seen except Fendler 2366 (Tovar), which is in full fruit and agrees closely with *T. pauciflora*. On the whole it is wisest, in the absence of further evidence about the characters of the Venezuelan tree, to treat the Tobago *T. pauciflora* as an independent species.

Gonzalagunia spicata (Lam.) Maza. *Duggena hirsuta* (Jacq.) Britton; Fl. 2, part i. 14.

Bacolet, dry bushy hillside, Oct. 6th, S. 1623. Low shrub. Leaves greyish below.

Alibertia tobagensis Sprague et Williams.

Bacolet, dry thickets on hills, fr. Oct. 21st, S. 1873. A shrub or small tree.

Basanacantha phyllosepala Sprague et Williams.

Lambeau Hill, in high virgin forest, about 700 ft., Oct. 7th, S. 1645. A small tree.

Guettarda parviflora Vahl.

Bacolet, dry slopes, Oct. 6th, S. 1636. Small tree with twiggy branchlets and reddish-brown corollas.

†**G. scabra** (L.) Lam.

Mount St. George-Castara road, frequent in dry forest on Mount St. George slope of the Main Ridge, Oct. 18th, S. 1843. A small tree. The Widow, near Easterfield, 1910, *Broadway* 3844.

Recorded from Tobago by Urban, Symb. Ant. 8, 671.

Malanea macrophylla Bartr.

Mount St. George-Castara road, in dry virgin forest on the Mount St. George slope of the Main Ridge, Oct. 18th, S. 1844. Scrambling shrub with yellow flowers.

†**Erithalis odorifera** Jacq.; *E. fruticosa* L. of the Flora, vol. 2, part i, p. 28.

Buccoo Bay, sandy promontory with species of the Mangrove association, Oct. 8th, S. 1668. A small tree up to 30 ft. high. Corolla lobes white, recurved. Fruit turning lead-coloured.

E. fruticosa L. (including *E. odorifera*), was recorded from Tobago by Urban in Symb. Ant. 8, 674 (1921), and was admitted to the Flora by Williams and Cheesman on the strength of an unlocalised scrap in the Kew Herbarium which was mounted on a sheet of the Jamaican *E. quadrangularis*. This scrap is also apparently to be referred to *E. odorifera* which is again segregated from *E. fruticosa* by S. Moore and Rendle in Fl. Jam. 7, 67 (1936). The characters given for distinguishing *E. odorifera*, namely the cup-shaped calyx-limb and the much larger corolla, are convincing and its distribution is also somewhat different since it appears to replace *E. fruticosa* in most of the Lesser Antilles. Urban's Tobago record is probably based on *Broadway* 3787, from Cullodon, May 1910: see his Register of collecting numbers which is preserved at Kew. According to *Broadway* the tree is known in Tobago as "Parrot Apple."

Chiococca parvifolia Wulfschl. ex Griseb.

Mount St. George-Castara road, frequent in dry forest on slopes of the Mount St. George side of the ridge, Oct. 18th, S. 1842. A

small shrub, some 12 ft. high, with pale brownish-white corollas and white berries.

***Psychotria pendula** (Jacq.) Urb.

Roxborough-Parlatuvier road, 5th milepost, in forest reserve of Main Ridge, 1300 ft., Oct. 14th, S. 1767. Creeper. Inflorescence vermilion. Corolla white.

The inflorescences of this gathering are wholly axillary.

P. tobagensis Urb.

Great Dog River, in virgin forest on river-bank, Oct. 12th, S. 1738. A small tree. Stipules dark purple, large, about 1.5 cm. long. Inflorescence a very pale, delicate, pinkish-brown. Corolla whitish, with a tinge of the same colour.

P. uliginosa Sw.

Caledonia, damp shady ravine in forest, Oct. 11th, S. 1722. Low shrub, 1 ft. high, with whitish-pink flowers and scarlet fruit.

Cephaelis muscosa Sw.

Mount St. George-Castara road, in forest reserve of Main Ridge, 800-1400 ft., Oct. 18th, S. 1852. Small shrub, 2 ft. high, with white corollas and violet drupes.

Rudgea Freemani Sprague et Williams.

Bacolet, open dry bushy ground on hills, fr. Oct. 6th, S. 1637. A small tree or shrub with scarlet fruits.

***Borreria eryngioides** Cham. et Schl.

French Hill, border of dry track, Oct. 9th, S. 1701. Very erect and stiff. Corolla white. Botanic Station, wild among grasses, 1932, *Broadway* 9067 (fide *Broadway's* Register only, not seen).

B. ocymoides (Burm.) DC.

Mount St. George-Castara road, moist bank, about 1200 ft., Oct. 18th, S. 1853. Flowers very small, white.

Tobagoa maleolens Urb.

Lambeau Hill, in shade in virgin forest, 700 ft., Oct. 7th, S. 1662. Stem and roots evil-smelling especially when pressed. Branchlets spreading. Flowers white.

COMPOSITAE.

Vernonia scorpioides (Lam.) Pers.

French Hill, open bushy ground on slopes facing north, Oct. 9th, S. 1687. Flowers mauve.

Rolandra fruticosa (L.) Kze.

Bacolet, a weed in coconut plantations, Oct. 13th, S. 1752.

Eupatorium inulifolium H.B.K., f. **suaveolens** (H.B.K.) Hieron.

French Hill, open bushy ground on slopes facing north, Oct. 9th, S. 1686. Tall herb with white flowers.

E. macrophyllum L.

Great Dog River, dry slopes, Oct. 12th, S. 1749. Flowers white.

Mikania micrantha H.B.K.

Ascent of Pigeon Hill, climbing over bushes by trace, 1200 ft., Oct. 16th, S. 1807. Flowers dirty white.

M. scabra DC.

Roxborough-Parlatuvier road, in forest reserve of Main Ridge, 1300 ft., Oct. 14th, S. 1770. Climber with white flowers.

Erigeron bonariensis L.

Bacolet, roadside bank, Oct. 15th, S. 1794. Heads creamy-white.

E. spathulatus Vahl.

Mount St. George-Castara road, on bank by track in forest, Oct. 18th, S. 1839. Heads creamy-yellow.

Clibadium surinamense L.

French Hill, dry open slopes, Oct. 9th, S. 1694. Roxborough-Parlatuvier road, in forest reserve of Main Ridge, Oct. 14th, S. 1766, det. S. F. Blake.

Acanthospermum hispidum DC.

Plymouth, on village green by the sea, towards Courland Point, Oct. 6th, S. 1638. Flowers pale yellow.

Eleutheranthera ruderalis (Sw.) Sch. Bip.

French Hill, dry side of track, Oct. 9th, S. 1696. Flowers orange-yellow.

Aspilia verbesinoides (DC.) Blake, det. S. F. Blake.

Roxborough-Parlatuvier road, wooded banks in forest reserve of Main Ridge, 800-1300 ft., Oct. 14th, S. 1763. Leaves black-dotted beneath. Flowers yellow.

Melanthera nivea (L.) O. E. Schulz.

Pigeon Point, abundant on sea sands, Oct. 10th, S. 1707. Flowers very pale whitish-mauve.

Spilanthes uliginosa Sw.

Roxborough-Parlatuvier road, roadside weed in forests of Main Ridge, Oct. 14th, S. 1772. Flowers deep yellow.

Synedrella nodiflora (L.) Gaertn.

Great Dog River valley, weed by track in cultivated region, Oct. 12th, S. 1735. Flowers rather pale yellow.

Porophyllum ellipticum (L.) Cass.

Roxborough-Parlatuvier road, dry bank by trace not far from Roxborough, 500 ft., Oct. 14th, S. 1758.

Pectis humifusa Sw.

Bacolet, on low bare crumbling cliffs at the west end of Minister Bay towards Bacolet Point, Oct. 27th, S. 1933. Plants prostrate.

Leaves somewhat fleshy, glaucescent and gland-dotted beneath. Ray florets brownish-chocolate. Disk florets greenish-yellow.

Emilia sonchifolia (L.) DC.

Easterfield road, between Green Hill and Caledonia, weed on roadside, Oct. 11th, S. 1716. Heads narrow, rose-pink.

Chaptalia nutans (L.) Polak.

Mount St. George-Castara road, shady banks by track, Oct. 18th, S. 1836. Heads crimson outside, dirty yellow within.

ERICACEAE.

***Spherospermum buxifolium Poepp. et Endl. S. majus Griseb.**

Mount St. George-Castara road, near 8th milepost, in reserve forest of Main Ridge, 1400 ft., Oct. 18th, S. 1854. Pendent from trunks. Corolla pale pinkish-white.

MYRSINACEAE.

Stylogyne lateriflora (Sw.) Mez.

In forests of the Main Ridge above Parlatuvier, Oct. 24th, S. 1904. Shrub with pinkish inflorescence and white acuminate buds.

THEOPHRASTACEAE.

Jacquinia barbasco (Loefl.) Mez.

Store Bay, on dry coral cliffs, Oct. 17th, S. 1819.

***J. revoluta Jacq.**

Bacolet, wooded slope above sea, Oct. 13th, S. 1756. Shrub. Corolla and staminodes pure white, scented like *Philadelphus*.

SAPOTACEAE.

Chrysophyllum argenteum Jacq.

Castara-Parlatuvier road, near Little Englishman's Bay, on forested slope, Oct. 22nd, S. 1881. A large tree. Flowers greenish-white. Belmont, 1910, *Broadway* 3991.

EBENACEAE.

Maba inconstans (Jacq.) Griseb.

Bacolet, common on dry wooded hillsides and in hedges, Oct. 6th, S. 1632. A small tree with green flowers and fruit. "Tobago, haud infrequens," *Eggers* 5550.

OLEACEAE.

Linociera caribaea (Jacq.) Knobl.

Bacolet, dry wooded hillsides, Oct. 6th, S. 1628. Mason Hall, bank of Courland River, Oct. 19th, S. 1861. A small tree with snow-white petals.

APOCYNACEAE.

Rauwolfia Lamarckii DC.

Store Bay, on dry coral cliffs, Oct. 17th, S. 1820. Shrub or small tree. Fruit red. "Tobago, in fruticetis maritimis," ann. 1889, *Eggers* 5928.

Prestonia exserta (DC.) Standl. *P. tobagensis* Urb.

Bacolet, creeping in coconut plantation, Oct. 13th, S. 1753. Back Hill above Charlotteville, 800 ft., Oct. 16th, S. 1799. Corolla yellow with greenish tinge; faucal annulus and anthers pure white.

Tabernaemontana citrifolia Jacq.

Ascent of Pigeon Hill, Oct. 16th, S. 1802. Shrub with white flowers.

Mandevilla hirsuta (Rich.) K. Schum.

Sandy River valley, dry bushy slopes under French Hill, Oct. 9th, S. 1678. Corolla yellow; tube and base of limb deep reddish-brown.

Frequent in the island.

M. subsagittata (R. et P.) Woodson.

Ascent of Pigeon Hill, Oct. 16th, S. 1812. Climber over small trees. Corolla dark yellow, limb reddish-brown at the throat and centre.

ASCLEPIADACEAE

Metastelma decipiens Schltr.

Bacolet, dry scrubby thickets over the sea, Oct. 20th, S. 1871. Corolla white. The Whim, Dec. 1909, *Broadway* 3178.

This species has not yet been recorded from Trinidad.

Gonolobus ciliatus Schltr.

Great Dog River valley, cleared bushy slopes on edge of cacao plantations, Oct. 12th, S. 1745. Corolla green.

Very doubtfully distinguishable from *G. viridiflorus* R. et S.

G. tobagensis Urb. ex descr.

Mount St. George-Castara road, in forest reserve of Main Ridge, Oct. 18th, S. 1840. Climbing over trees. Corolla green; gynostegium pale reddish-brown.

Marsdenia macrophylla (H.B.K.) Fourn. *M. maculata* Hook.

Store Bay, climbing over bushes in a hedge, fr. Oct. 17th, S. 1816. Sterile material from Tobago in the Berlin Herbarium was said probably to be referable to this species by Rothe in Engl. Bot. Jahrb. 52, 416 (1915).

GENTIANACEAE

Coutoubea spicata Aubl.

Bacolet, open grassy dry hills, Oct. 6th, S. 1625.

BORAGINACEAE

Tournefortia bicolor Sw.

Lambeau Hill, in thicket, Oct. 7th, S. 1643.

T. hirsutissima L.

Sandy River valley, Oct. 9th, S. 1685.

CONVOLVULACEAE

***Ipomoea triloba** L.

Store Bay, creeping on low coral cliffs, Oct. 17th, S. 1818. Corolla pinkish-mauve.

Operculina alata (Ham.) Urb.

Bacolet, dry open hillsides, trailing over bushes, Oct. 6th, S. 1621. Stems winged. Corolla bright yellow.

Merremia dissecta (Jacq.) Hall. f.

Bacolet, scrambling over bushes by roadside, Oct. 26th, S. 1932. Corolla white; tube dull crimson within and with conspicuous longitudinal lines of this colour.

M. umbellata (L.) Hall. f.

Bacolet, dry grassy roadside, Oct. 5th, S. 1615. Prostrate, creeping. Corolla bright yellow.

Jacquemontia elongata Britton.

French Hill, climbing over bushes on dry slopes, Oct. 9th, S. 1700. Corolla very pale whitish-mauve.

The relationships of this species with forms of *J. pentantha* (Jacq.) G. Don require critical study.

Evolvulus sericeus Sw.

Bacolet, dry hillside, open bare spots on burnt ground among bushes of *Guettarda*, Oct. 21st, S. 1878.

SOLANACEAE

Solanum dolichostylum O. E. Schulz.

Caledonia, on damp rocks in ravine in deep shade, Oct. 11th, S. 1731. Corolla white. Not infrequent in the island, and always found in river-beds.

S. lanceifolium Jacq.

Ascent of Pigeon Hill, creeping over bushes by trace, Oct. 16th, S. 1803. Corolla white.

S. nigrum L. var. **americanum** (Mill.) O. E. Schulz.

Bacolet Point, a weed by lighthouse ruins, Oct. 10th, S. 1703. Herb, suffrutescent below. Corollas white. Berries turning black.

S. scabrum Vahl.

Lambeau Hill, above Speyside, climbing over low trees, 700 ft., Oct. 7th, S. 1641. Corolla pale violet.

S. Seaforthianum Andr.

Roadside hedge, Friendsfield Road, Oct. 9th, S. 1674. Corolla very pale whitish-mauve.

Lycianthes pauciflora (Vahl) Bitter subsp. **tobagoensis** Bitt.

Roxborough-Parlatuvier road, bushy side of track, Oct. 14th, S. 1764. Berries scarlet.

****Acnistus arborescens* (L.) Schlecht.**

Mount St. George-Castara road, in forest reserve of Main Ridge, about 1000 ft., Oct. 18th, S. 1838. A small tree, 20–30 ft. high. Corolla tube white; lobes green with white margins, the upper half recurved. Also from Menna Road, Mason Hall, June 1925, *Williams* in *Herb. Trin.* 11124; and from Easterfield, 1910, *Broadway* 3510, det. Urban (fide *Broadway's Register*).

****Cyphomandra tobagensis* Sandwith, sp. nov.; *C. obliquae* (R. et P.) Sendtn.** quam ceteris speciebus adhuc descriptis ut videtur magis affinis, foliis basi haud vel vix cordatis, corolla albo-viridi distinguitur; *C. Holtoni* Hochr. foliis basi profunde cordatis minus obliquis longe recedit.

Arbor parva, ramulis teretibus, annotinis glabrescentibus hornotinis dense brevissime glanduloso-pilosulis. *Folia* integra, simplicia, solitaria vel per paria subheteromorpha, omnia apice conspicue acuminata, majora ovato-oblonga vel ovata, basi vulgo obliqua rotundata neque cordata, 9.5–21 cm. longa, 5–11 cm. lata, minora ovata vel fere orbicularia, basi vix obliqua distincte sed haud profunde cordata, 4.5–15 cm. longa, 4.2–8.7 cm. lata, chartacea, supra nitida, utrinque minute praecipue secus nervos glandulosa, ceterum glabra, fragrantia, utrinque conspicue reticulata, nervis primariis utroque costae latere 5–6 sursum arcuatis; petiolus 1.8–4 cm. longus, junior dense glanduloso-pilosulus. *Inflorescentia* passim glanduloso-pilosula, apicem versus nutans, 2.5–5 cm. longa, pedunculo sub cicatricibus ad 2 cm. longo; pedicelli inferiores ad 2.2 cm. longi. *Calyx* aperte cupulatus, totus ad 2.5 mm. longus ac ad 4.5 mm. latus, glandulosus; lobi late ovato-triangulares, obscure obtuse cuspidatuli, flore aperto 0.5–1 mm. longi. *Corolla* sordide albo-viridis, tubo brevissimo circiter 1 mm. longo; lobi anguste lanceolati, extra plus minusve glandulosi, dense ciliati, circiter 1–1.1 cm. longi, 2.5 mm. lati. *Stamina* filamentis glabris parte libera 1.75 mm. longa; antherae amethystinae, rectae, circiter 6.5 mm. longae, dense minute papillosae, connectivo dorsaliter gibboso basi loculos superante atque fere acquilato. *Ovarium* ovoideum, glabrum, circiter 2 mm. longum, 1.5 mm. diametro; stylus glaber, 6–7 mm. longus, stigmatibus clavatis haud dilatatis. *Fructus* ovoideus, acuminatus, 2.6 cm. longus, 1.3 cm. diametro.

TOBAGO. Near Parlatuvier, in forests of Englishman's Bay, April 15th, 1912, *Broadway* 3879 (typus). Roxborough-Parlatuvier road, in forest reserve of Main Ridge near 5th milepost, c. 1300 ft., Oct. 14th, 1937, *Sandwith* 1773: a small tree with dirty whitish-green corollas and amethyst anthers. The flowers, according to *Broadway*, have a disagreeable penetrating odour, and the fruit resembles that of a *Passiflora*.

***Cestrum alternifolium* (Jacq.) O. E. Schulz var. *pendulinum* (Jacq.) O. E. Schulz.**

Bacolet, dry wooded hillside, Oct. 6th, S. 1631. Shrub with greenish-mauve corollas.

GESNERACEAE.

****Tussacia pulchella* (Donn) Rechb.**

Between Parlatuvier and Bloody Bay, shady bank by path, Oct. 23rd, S. 1895. Calyx orange-vermilion. Corolla (in bud) yellow.

***Episcia mimuloides* Benth.**

Forests of Main Ridge above Parlatuvier, on damp rocks by stream in deep shady ravine, Oct. 24th, S. 1902. Corolla creamy-yellow (in bud only).

Previously recorded from this neighbourhood by Urban (*Fedde Rep.* 17, 166) on the strength of *Broadway* 4282. The pedicels are strongly pubescent whereas those of Guiana specimens are practically glabrous, and it is possible that the Tobago plant may deserve at least varietal rank.

***Drymonia serrulata* (Jacq.) Mart.**

Mason Hall, on bushy rocky bank above road, Oct. 19th, S. 1866. Scrambling shrub. Corolla dirty creamy-yellow, limb with reddish-brown blotches and dots forming longitudinal lines along the lobes.

This species has been discovered in Trinidad by several collectors.

***Columnnea scandens* L., det. T. A. Sprague.**

Mount St. George-Castara road, in Govt. Reserve Forest of Main Ridge, c. 1000 ft., Oct. 18th, S. 1837. Epiphytic on trees. Corolla vermilion.

***Codonanthe Eggersii* Urb.**

Roxborough-Parlatuvier road, near 3rd milepost, Oct. 14th, S. 1761. Creeping up base of a trunk, the roots not colonised by ants. Leaves thick, fleshy. Corolla white.

In this material the long jointed hairs on the margins of the calyx lobes are far more plentiful and conspicuous than on those of the type collection (*Eggers* 5848) from the Great Dog River.

***Besleria Seitzii* Krug et Urb.**

Ascent of Pigeon Hill, damp shady bank by path, 1000 ft., Oct. 16th, S. 1805. Corolla limb pure white, the tube sigmoid-curved.

Not infrequent in the wilder forested regions of the island.

***Napeanthus subacaulis* (Griseb.) Benth. et Hk. f. ex Kze. *Marssonina subacaulis* (Griseb.) Urb. Symb. Ant. 7, 378 (1912).**

Forests of Main Ridge above Parlatuvier, about 1000 ft., Oct. 24th & 25th, S. 1915, 1922. Growing in deep shade on damp rocky banks by streams in ravines or by cascades. Corolla very pale lilac.

BIGNONIACEAE.

**Anemopaegma carrerense* Armitage.

Ascent of Pigeon Hill, climbing over bushes by path, about 800 ft., Oct. 16th, S. 1800. Corolla tube pale brownish-yellow; limb white. Fruit flat, green.

[*Anemopaegma tobagense* Urb. in Fedde Rep. 14, 311 (1916) is *Ceratophytum tobagense* (Urb.) Sprague et Sandwith in Kew Bull. 1933, p. 322, and occurs in Trinidad, Venezuela and Guiana, as well as in Tobago.]

**Martinella obovata* (H.B.K.) Bur. et K. Schum.

Great Dog River, climbing on trees by the river, Oct. 12th, S. 1746. Corolla pale greenish-mauve in bud; tube of open flower greenish-white, limb very pale chocolate-mauve.

**Amphilophium paniculatum* (L.) H.B.K.

Mount St. George-Castara road, climbing over trees in Forest Reserve of Main Ridge, Oct. 18th, S. 1834. Calyces green. Corolla sticky, pale brownish-red.

Not recorded from Trinidad by Urban in his list of Trinidad *Bignoniaceae* published in Fedde Rep. 14 (1916), but collected by *Broadway* (no. 9086) in fruit in Dec. 1932 on the sea-shore at Moruga, and noticed by the writer in October 1937 on the ascent of Tucuche.

Tabebuia rufescens J. R. Johnst.; Sprague et Sandwith in Kew Bull. 1932, p. 22. *T. glomerata* Urb.

Bacolet Point, in dry thickets by the sea, fr. Oct. 10th, S. 1705.

This is a small tree, frequent in woods on dry slopes of the island.

**T. serratifolia* (Vahl.) Nichols.; Sprague et Sandwith, l.c. p. 22.

Parlatuvier, dry slopes and edges of sea-cliffs, Oct. 23rd, S. 1897. Sterile material taken from small trees 6-10 ft. high. The species also grows to middle size (about 50 ft.). Leaflets wavy-edged and crenate.

ACANTHACEAE.

Ruellia fulgida Andr.

Castara-Parlatuvier road, in shade on forested slope near Englishman's Bay, Oct. 22nd, S. 1882. Corolla vermilion-crimson, the limb more or less regular.

Looking certainly native in this neighbourhood in spite of Lindau's comment in Urb. Symb. Ant. 2, 197, and the continental distribution is favourable.

Lepidagathis alopecuroidea (Vahl) Griseb.

Above Bloody Bay, on shady bank in cacao plantation, Oct. 23rd, S. 1892.

Aphelandra tetragona (Vahl) Nees.

Lambeau Hill, damp rocky ravine in virgin forest, Oct. 7th, S. 1647. Small tree, 12-15 ft. high. Bracts brownish-mauve and green. Corolla scarlet.

Justicia comata (L.) Lam.

Mason Hall, on rocks in Courland River, Oct. 19th, S. 1859. Corolla very pale whitish-lilac, with purple spots along the central ridge of the lower lip. Also in bed of Betsy's Hope River, 1912, *Broadway* 3873.

Odontonema brevipes Urb.

Slopes of Main Ridge above Parlatuvier, Oct. 24th, S. 1898. Low shrub in deep shade in virgin forest. Flowers white. Endemic.

VERBENACEAE.

Aegiphila perplexa Moldenke.

Ascent of Pigeon Hill, side of path, Oct. 16th, S. 1801. Shrub with dirty yellowish-white flowers.

Citharexylum spinosum L.

Store Bay, on coral cliffs, Oct. 17th, S. 1821. Shrub or small tree with white flowers and pale brownish-red fruit.

LABIATAE.

Ocimum micranthum Willd.

Bacolet, in coconut plantation, Oct. 5th, S. 1612. Corolla pale mauve.

Hyptis atrorubens Poit.

Easterfield road, between Green Hill and Caledonia, Oct. 11th, S. 1714. Herb on shady roadside. Corolla white with purplish-red spots.

H. pectinata (L.) Poit.

Bacolet, dry roadside bank, Oct. 5th, S. 1620. Corolla whitish; lower lip spotted with mauve.

Coleus Blumei auct., an *Bth.*?

Roxborough-Parlatuvier road, completely naturalised by path in forest reserve near 9th milepost, 1000 ft., Oct. 25th, S. 1921. Leaves with crimson-mauve blotch at base, and bronze-purple blotches. Corolla bluish-violet.

NYCTAGINACEAE.

Boerhaavia caribaea Jacq. *B. hirsuta* Willd.

Store Bay, bare ground on top of coral cliffs, Oct. 17th, S. 1827. Sticky. Leaves greyish-white below. Flowers crimson.

Pisonia fragrans Dum. Cours.

Ascent of Pigeon Hill, 800 ft., Oct. 16th, S. 1808. A small tree with pale greenish-white flowers.

AMARANTHACEAE.

Amaranthus dubius Mart.

Great Dog River valley, in cacao plantations, Oct. 12th, S. 1742. Spikes pale green.

Achyranthes indica (L.) Mill.

Bacolet, dry roadside, Oct. 15th, S. 1796.

Alternanthera ficoidea (L.) R. Br.

Store Bay, bare ground on coral cliffs, Oct. 17th, S. 1826.

Philoxerus vermicularis (L.) Pal.

Buccoo Bay, on sand bordering lagoon, Oct. 8th, S. 1671. Stems prostrate, pinkish-brown. Leaves very fleshy, greyish-green.

PHYTOLACCACEAE.

Trichostigma octandrum (L.) H. Walt.

Parlatuvier, dry wooded slope by path to Charlotteville, Oct. 22nd, S. 1888. Climber over tree. Outer perianth segments whitish-green, inner white, turning purple with age like the ovary.

Rivina humilis L.

Bacolet Point, a weed in ruins of lighthouse, Oct. 10th, S. 1702.

Petiveria alliacea L.

Castara, in shade under coconuts by shore, Oct. 18th, S. 1832.

POLYGONACEAE.

Coccoloba venosa L.

Castara, rocks on shore, Oct. 18th, S. 1831. Shrub with red berries.

PIPERACEAE.

Piper peltatum L.

Shady slopes of French Hill, Oct. 9th, S. 1692.

***P. Schackii** (Miq.) C. DC.

Caledonia, damp shady ravine, Oct. 11th, S. 1724. Shrub, about 10 ft. high. Hitherto known only as an endemic of Trinidad. Also from Englishman's Bay, Nov. 1912, *Broadway* 4272 (Brit. Mus.; Conserv., Geneva), from Trafalgar, July 1912, *Broadway* 4190 (Conserv., Geneva), and from the north side forests between Charlotteville and Parlatuvier, Nov. 1912, *Broadway* 4284 (Conserv., Geneva), all det. C. DC.

P. tobagoanum C. DC.

Shady slopes of French Hill, Oct. 9th, S. 1691. Shrub, 3-4 ft. high.

***Peperomia emarginella** (Sw.) C. DC.

Roxborough-Parlatuvier road, in forest reserve of Main Ridge, 8th-9th mileposts, 1000 ft., Oct. 25th, S. 1918. Creeping along rocky, shady bank of track.

P. rotundifolia Kunth var. *ovata* Dahlst. ex C. DC.

Forests of Main Ridge above Parlatuvier, creeping along branch-lets of tree in rocky ravine, Oct. 24th, S. 1908.

LAURACEAE.

Ocotea leucoxylon (Sw.) Mez.

Roxborough-Parlatuvier road, wooded slopes on Roxborough side of Main Ridge, Oct. 14th, S. 1762. A small tree with creamy-yellow flowers.

Nectandra coriacea (Sw.) Griseb.

Bacolet, dry wooded hillside, 200 ft., Oct. 6th, S. 1626. Small tree with white flowers and black berries. Also *Eggers* 5602, from woods at Frenchfield, Oct. 1889.

Omitted from the Notes on Trinidad and Tobago species of *Lauraceae* in Kew Bull. 1933, but recorded from Tobago by Urban in Symb. Ant. 4, and 8.

THYMELAEACEAE.

***Schoenobiblus grandifolia** Urb.

Slopes of Main Ridge above Parlatuvier, Oct. 24th, S. 1900. A shrub in deep shade in virgin forest. Flowers yellow.

Frequent on the Northern Range of Trinidad, but apparently not previously recorded from Tobago. The pedicels of this material are articulate close to the base, much lower than those of most Trinidad collections.

Daphnopsis caribaea Griseb.

French Hill, here and there on slopes, 750 ft., fl. Oct. 9th, S. 1690. Ascent of Pigeon Hill, fr. Oct. 16th, S. 1813. A small tree up to about 30 ft. high. Flowers cream with orange anthers. Fruit white when ripe.

LORANTHACEAE.

Phthirusa pyrifolia (H.B.K.) Eichl.

Great Dog River valley, in cacao plantation near mouth of river, Oct. 12th, S. 1733. On cacao tree. Flowers red.

***P. Theobromae** (Willd.) Eichl.

Bacolet, dry wooded hillside, Oct. 6th, S. 1627. Parasitic on small trees. Flowers cream. *G. L. Meyer* 7, from Roxborough Bay, June 1879, is also referable to this species rather than to *P. Seitzii* Kr. et Urb.

Phoradendron piperoides (H.B.K.) Trel.

Great Dog River valley, in virgin forest, Oct. 12th, S. 1741. Fruits brownish-orange.

P. trinervium (Lam.) Griseb.

Ascent of Pigeon Hill, Oct. 16th, S. 1809. On small tree. Fruit brownish-orange.

EUPHORBIACEAE.

Euphorbia lasiocarpa Kl.

Bacolet, a weed in coconut plantations, Oct. 5th, S. 1614. Whole plant, including fruit, grey-hoary.

E. Oerstediana (Klotzsch et Garcke) Boiss.

Easterfield road, shady roadside between Green Hill and Caledonia, Oct. 11th, S. 1715. Great Dog River valley, in cacao plantations on slopes, Oct. 12th, S. 1743. Leaves and fruits green.

E. thymifolia L.

Mason Hall, prostrate on damp rocks by Courland River, Oct. 19th, S. 1862.

Phyllanthus acuminatus Vahl.

By Easterfield road, 2 miles from Mason Hall, bushy ground, Oct. 19th, S. 1868. Shrub, about 12 ft. high.

P. Niruri L.

Bacolet, dry roadside, Oct. 5th, S. 1619.

Croton gossypifolius Vahl.

Roxborough-Parlatuvier road, dry wooded slopes near Roxborough, Oct. 14th, S. 1759. A small tree with cream-coloured flowers. Also from Campbelton, Nov. 1912, *Broadway* 4267. Both these collections have a great abundance of long simple hairs on the upper surface of the leaves, a character which is absent or not obvious on other collections, although there appear to be intermediate stages in Trinidad material.

C. lobatus L.

Bacolet, open bare spots on dry wooded slopes, Oct. 6th, S. 1633.

Tragia volubilis L.

Bacolet, trailing in coconut plantations, Oct. 5th, S. 1616. Flowers reddish-brown.

MORACEAE.

Trema micranthum (L.) Bl.

Sandy River valley, dry bushy slope, Oct. 9th, S. 1677. Easterfield road, between Caledonia and Green Hill, Oct. 11th, S. 1713. A small tree with orange-brown or red fruit.

Ficus grenadensis Warb.

Roxborough-Parlatuvier road, in open forest of Main Ridge, between 8th and 9th mileposts, about 1000 ft., Oct. 25th, S. 1923. Shrub on bank by path. Receptacles very pale pink.

Agreeing with another collection so named from the Main Ridge (*Broadway* 3910), see Rossberg in Notizbl. Bot. Gart. Berlin, 12, 585 (1935), and specimens in Herb. Berol. and Herb. Mus. Brit.

URTICACEAE.

Fleurya aestuans (L.) Gaud.

Great Dog River valley, a weed in cultivated land, Oct. 12th, S. 1736.

Urera baccifera (L.) Gaud.

Between Parlatuvier and Bloody Bay, shady banks especially in cacao plantations, Oct. 23rd, S. 1889. Shrub. Stems and leaves prickly. Inflorescence pinkish-mauve.

U. caracasana (Jacq.) Gaud. sens. lat., det. E. P. Killip.

Roxborough-Parlatuvier road, wooded slopes, Oct. 14th, S. 1765.

Pilea inaequalis (Juss.) Wedd., det. E. P. Killip.

Caledonia, damp bank by stream in deep shade, Oct. 11th, S. 1725. Inflorescence green.

P. microphylla (L.) Liebm.

Sandy River valley, on rocks, Oct. 9th, S. 1682.

P. tobagensis Urb., det. E. P. Killip.

Caledonia, on rocks in stream in deep ravine, Oct. 11th, S. 1729. Stems and inflorescences brownish.

***Boehmeria ramiflora** Jacq.

Ascent of Pigeon Hill, in shade by path, Oct. 16th, S. 1804. Shrub; inflorescence green.

***Phenax Sonneratii** (Poir.) Wedd.

Caledonia, on rocks in stream in shady ravine, Oct. 11th, S. 1726. Inflorescence brownish-red.

ORCHIDACEAE (det. V. S. Summerhayes).

Habenaria alata Hook.

Near Mason Hall, on dry grassy slopes of Courland River valley, Oct. 19th, S. 1858. Sepals green. Petals and very narrow labellum very pale creamy-yellow.

***Pleurothallis ovalifolia** (Focke) Rchb. f.

Great Dog River, epiphytic on branches of cacao trees, Oct. 12th, S. 1750. Flowers pale greenish-yellow.

Epidendrum fragrans Sw.

Ascent of Pigeon Hill, about 1000 ft., Oct. 16th, S. 1806. Epiphyte. Flower creamy-white. Labellum caudate-acuminate, with longitudinal purple lines.

***Catasetum macrocarpum** Rich.

Roxborough-Parlatuvier road, 8th-9th mileposts, in reserve forest of Main Ridge, 1100-1200 ft., Oct. 25th, S. 1931. Epiphytic on rotten trunk. Pseudobulbs long and sausage-shaped, up to nearly 8 in. long and 1½ in. in diameter. Buds (nearly open) greenish-white, shortly spurred. Scarborough, on trees, 1912, *Broadway* 4288, det. Urban (fide *Broadway's* Register).

***Maxillaria liparophylla** Summerhayes, sp. nov.; *M. pterocarpae* Rodr. similis, sed floribus duplo maioribus, tepalis minus acutis, labello prope medium trilobato lobo medio quam lateralibus multo longiore differt.

Planta epiphytica, rhizomate brevi radicibus numerosis tenuibus ramosis instructo. Pseudobulbi dense caespitosi, anguste oblongo-ovati, compressi, 1-2 cm. longi, circiter 3 mm. diametro, apice

unifoliati, basi cataphyllis chartaceis vestiti. *Folia* anguste oblonga vel oblongo-ligulata, apice inaequaliter et breviter obtuse bilobulata, basi sensim angustata, petiolo vix distincto, 6–12 cm. longa, 7–14 mm. lata, siccitate oleagineo-nitentia. *Scapi* e basi pseudo-bulbi orti, 3–4 cm. longi, vaginis circiter 3 acutis carinatis imbricatis instructi; bractea vaginis similis, ovarium superans, 1.7–2 cm. longa. *Flores* pallide brunnescenti-flavidi. *Sepalum* intermedium lanceolatum, breviter acuminatum, 16 mm. longum, 2.5–3 mm. latum; sepala lateralia oblique lanceolata, breviter acuminata, basi mentum obtusum vix 2 mm. longum formantia, 17 mm. longa, 2.5–3.5 mm. lata. *Petala* sepalo intermedio similia sed paulo minora, leviter obliqua. *Labellum* prope medium trilobatum, 11 mm. longum, 5.5 mm. latum; lobus intermedius late lanceolatus, acutus, 5 mm. longus, 2 mm. latus, incrassatus, apice leviter canaliculatus; lobi laterales rotundati, 0.5 mm. longi, 1.5 mm. lati; discus callo inferne ligulato apice incrassato hemisphaerico fere usque ad basin lobi intermedii decurrente instructus. *Columna* semiteres, superne leviter incurvata, 4.5 mm. longa, pede 2 mm. longo. *Ovarium* circiter 1.5 cm. longum, sparse breviterque nigro-furfuraceum.

TOBAGO. Roxborough-Parlatuvier road, 7th–8th mileposts, in forest reserve near summit of Main Ridge, about 1400 ft., Oct. 25th, 1937, *Sandwith* 1925 (type specimen). Epiphyte on rotten branch. Flower pale biscuit-yellow.

There is also a specimen of this species at Kew collected by Jenman on the Kaieteur Savannah (Potaro River) in British Guiana, no. 1222. These two gatherings agree in all particulars. The species was described from dried material and a flower in spirit. The specific epithet is chosen for its allusion to the shining oily-looking upper surface of the dried leaves.—V. S. S.

ZINGIBERACEAE.

Renealmia bracteosa Griseb.

Caledonia, in ravine by stream, Oct. 11th, S. 1723. Inflorescence erect. Inflorescence and buds scarlet. Petals dirty vermilion, creamy-green in the upper half. Berries scarlet.

MARANTACEAE.

Maranta gibba Sm.

Roxborough-Parlatuvier road, in Forest Reserve of Main Ridge, Oct. 14th, S. 1768. Flowers white.

MUSACEAE.

**Heliconia hirsuta* L.f.

Caledonia, in deep shade in forest, Oct. 11th, S. 1732. Petals orange, slightly tinged with vermilion, with greenish tips.

Possibly also collected by Broadway or Eggers, but no specimen has been seen.

**H. psittacorum* L.f.

Bacolet, plentiful in coconut plantations, Oct. 6th, S. 1618. Bracts vermilion. Petals orange-vermilion. Ovary orange-yellow. Berry dark inky-blue when mature.

Also collected by Eggers 5476 and Broadway 2992, from Scarborough.

BROMELIACEAE.

Tillandsia bulbosa Hook.

Easterfield road, between Green Hill and Caledonia, on tree in cacao plantation, Oct. 11th., S. 1712. Petals and filaments amethyst.

T. usneoides L.

Mason Hall, pendent from trees in valley by river, Oct. 18th, S. 1856. Although three records from Trinidad and Tobago were given in the account of the *Bromeliaceae* of these islands by W. E. Broadway and L. B. Smith (see Contr. Gray Herb. 102, 169 (1933)), not one of them was localised. Eggers 5955, from Craig Hall River, Nov. 1889, is a localised specimen from Tobago in the Kew Herbarium.

T. utriculata L.

Mason Hall, by Courland River, Oct. 19th, S. 1864. Epiphyte on bamboo stem. Bracts green bordered with blackish-blue. Petals pale yellowish-green.

Catopsis sessiliflora (R. et P.) Mez.

Great Dog River valley, on cacao trees, Oct. 12th, S. 1747.

Araecoccus micranthus Brongn.

Above Parlatuvier, in rocky ravine by stream in virgin forest of Main Ridge, Oct. 24th, S. 1907.

HAEMODORACEAE.

Xiphidium caeruleum Aubl.

Caledonia, damp bank in shade of ravine, Oct. 11th, S. 1727. Flowers white.

IRIDACEAE.

Trimezia martinicensis (L.) Herb.

Bacolet, dry grassy hillside, Oct. 21st, S. 1877. Petals bright golden-yellow with brown zones in the lower half.

AMARYLLIDACEAE.

Hypoxis decumbens L.

Between Castara and Englishman's Bay, damp grassy side of track, Oct. 22nd, S. 1880. Flowers golden-yellow.

**Curculigo scorzonrifolia* (Lam.) Baker.

Bacolet, dry grassy hillside, Oct. 21st, S. 1876. Very dwarf specimens. Flowers pale yellow.

DIOSCOREACEAE.

Dioscorea alata L.

French Hill, frequent in thickets and cacao plantations, Oct. 9th, S. 1688.

LILIACEAE.

Smilax cumanensis Willd.

French Hill, climbing over bushes on dry slope, fr. Oct. 9th, S. 1698.

COMMELINACEAE.

Tradescantia geniculata Jacq.

Roxborough-Parlatuvier road, on shady bank in cacao region descending to Bloody Bay, Oct. 25th, S. 1919. Inflorescence violet. Calyx green. Petals whitish.

T. multiflora Sw.

Mason Hall, damp rocky bank above road, Oct. 19th, S. 1865. Flowers white. Also *Eggers* 5693, from rocky places near Cradley, Oct. 1889.

PALMACEAE.

Desmoncus horridus Splitg.

Sandy River valley, climbing in thickets, Oct. 9th, S. 1676. Young fruit green.

CYCLANTHACEAE.

Carludovica cf. **coronata** Gleason.

Easterfield road, between Green Hill and Caledonia, in shady forest adjoining cacao plantations, Oct. 11th, S. 1709. Low shrub, some 10 ft. high, supported against small tree. Flowers yellow when young, green when old.

The specimens are conspecific with *Herb. Trin.* 3711 (coll. *Hart*) from Maracas, Dec. 1889, and both collections resemble closely the Guiana sheets of *C. coronata* in all superficial characters, but the identification remains uncertain in the absence of staminate flowers.

C. insularis Gleason.

Slopes of Lambeau Hill, in shade by Frenchman's River, Oct. 7th, S. 1639. Growing in large clumps. Flowers green. Stamens brown.

The large clumps of this species are frequently seen in shady and rocky streambeds in the island.

ARACEAE.

Xanthosoma Jacquini Schott.

Forests above Parlatuvier, Oct. 24th, S. 1901. Trunk about 1 ft. high and 2-3 in. thick. Petiole winged for a few inches at the base, very long and more or less equalling the lamina. Spathe white except for the green folded tube. Spadix cream.

Exactly resembles *Broadway* 4433 from Englishman's Bay, Nov. 1912, and agreeing with other West Indian material referred to this species by Engler and N. E. Brown.

***Monstera obliqua** (Miq.) Walp. *M. Fendleri* Engl.

Back Hill above Charlotteville, climbing up a tree, Oct. 16th, S. 1797. Spathe cuspidate, falling when plant is gathered, biscuit-brown on back, creamy-yellow within. Spadix greenish-yellow.

The late Dr. N. E. Brown noted in the Kew Herbarium that *M. Fendleri* is a synonym of *M. obliqua* which was placed by Engler in a wrong section of his key in *Pflanzenreich* 4, 23 B, p. 98 (1908).

M. pertusa (L.) de Vriese.

Easterfield road, between Green Hill and Caledonia, on tree in cacao region, Oct. 11th, S. 1711. Spadix greenish-white.

CYPERACEAE.

***Kyllinga monocephala** Rottb.

Roxborough-Parlatuvier road, grassy side of track close to Roxborough, about 500 ft., Oct. 14th, S. 1777. Heads white.

Collected in Trinidad at St. Anns, *Broadway* 7887, 8928.

Dichromena ciliata Vahl.

Bacolet, grassy roadside, Oct. 13th, S. 1751. Bracts snow-white near base on upper side.

D. ebracteata Standl.

Mount St. George-Castara road, on damp clayey banks in shade of dry forest on the S. side of the Main Ridge, c. 800-1200 ft., local, Oct. 18th, S. 1845. Spikelets white when young, turning pale brown with age.

This very interesting species, native of Tobago and Margarita, was previously represented at Kew by *Eggers* 5820, from forests on Morne d'Or at 1500 ft., a collection misidentified as *D. radicans* by C. B. Clarke.

Rhynchospora polyphylla Vahl.

Lambeau Hill, high banks bordering forest, Oct. 7th, S. 1654. Leaves curving up in a whip-like manner. Spikelets very pale.

Fimbristylis ferruginea (L.) Vahl.

Buccoo Bay, abundant on sandy ground behind mangroves, Oct. 8th, S. 1670. Spikelets brown.

F. monostachya (L.) Hassk.

Bacolet, bare ground in dry scrubby thickets on slope above sea, Oct. 20th, S. 1870. Spikelets pale green, whitish when old.

Scleria latifolia Sw.

Mount St. George-Castara road, in forest reserve of Main Ridge, Oct. 18th, S. 1850.

S. pterota Presl.

Bacolet, in dry coconut plantations, Oct. 5th, S. 1617.

Becquerelia cymosa Brongn.

Roxborough-Parlatuvier road, banks in virgin forest of Main Ridge, c. 1300 ft., Oct. 14th, S. 1776.

Calyptracarya glomerulata (Brongn.) Urb.

Mount St. George-Castara road, in forest reserve of Main Ridge, c. 1200 ft., Oct. 18th, S. 1849. Forest Reserve, April 1911, *Broadway* 4153. Also collected in Trinidad, in Quare river forests, March 1934, *Broadway* 9368.

The form with broad leaves, which has been described as *C. intermedia* C. B. Cl.

GRAMINEAE (det. C. E. Hubbard).

Sporobolus virginicus (L.) Kth.

Buccoo Bay, on sandy shore of promontory, Oct. 8th, S. 1672.

Leptochloa virgata (L.) Beauv.

Bacolet, dry banks by sea, Oct. 5th, S. 1608.

***Pharus latifolius** L.

Lambeau Hill, in deep shade of virgin forest, c. 700 ft., Oct. 7th, S. 1663. Spikelets purplish and green.

***Axonopus amplifolius** Chase mss., det. Agnes Chase.

Parlatuvier, dry slope above sea, in shade of bamboos, Oct. 22nd, S. 1887. Only known otherwise from Brazil.

A. compressus (Sw.) Beauv.

Caledonia, damp ravine by Easterfield road, Oct. 11th, S. 1720.

***Paspalum decumbens** Sw.

Great Dog River, on boulders in river-bed, Oct. 12th, S. 1740. Leaves more or less glaucous beneath.

P. paniculatum L.

Bacolet, dry coconut plantation, Oct. 5th, S. 1611.

P. saccharoides Trin.

Caledonia, high bank of Easterfield road, Oct. 11th, S. 1719. Panicle brownish-purple with white hairs.

P. vaginatum Sw.

Pigeon Point, on sea sands, Oct. 10th, S. 1706.

Panicum fasciculatum Sw.

Bacolet, dry banks by the sea, Oct. 5th, S. 1610. Spikelets reddish-brown.

P. maximum Jacq.

Bacolet, dry banks by sea, Oct. 5th, S. 1609. Panicle rhachis glaucous. Stigmas purple.

Ichnanthus pallens (Sw.) Munro.

Bank near Parlatuvier, by path to Castara, Oct. 22nd, S. 1883.

Lasiacis divaricata (L.) Hitchc.

Shady slope near Parlatuvier, Oct. 22nd, S. 1884.

Isachne disperma (Lam.) Doell.

Mount St. George-Castara road, in forest reserve of Main Ridge, about 1200 ft., Oct. 18th, S. 1851. Scandent with green spikelets.

Setaria barbata (Lam.) Kth.

Damp shady roadside banks above Charlotteville, Oct. 7th, S. 1656.

S. paniculifera (Steud.) Fourn. ex Hemsl.

Sandy River valley, in deep shade of gully, Oct. 9th, S. 1683.

Pennisetum polystachyon (L.) Schult. *P. setosum* (Sw.) L. Rich. of Hitchcock's Manual.

Bacolet, grassy roadside, Oct. 13th, S. 1755.

Olyra latifolia L.

Bacolet, climbing in dry woods on hillside, Oct. 6th, S. 1629.

Raddia guianensis (Brongn.) Hitchc.

Mount St. George-Castara road, local in dry forests of the windward slope of Main Ridge, 800–1200 ft., Oct. 18th, S. 1846.

Bothriochloa intermedia (R. Br.) A. Camus var. **acidula** (Stapf) C. E. Hubbard.

Store Bay, bare ground on coral cliffs, Oct. 17th, S. 1824. Spikelets brown.

PTERIDOPHYTA (det. A. H. G. Alston, British Museum).

46 species of Pteridophyta and 4 species of *Selaginella* were collected, of which the following are first records for Tobago:

***Trichomanes crispum** L., sens. lat.

Roxborough-Parlatuvier road, banks in forest reserve of Main Ridge, 1000–1400 ft., Oct. 14th, S. 1789.

***T. polypodioides** L.

Slopes of Main Ridge above Parlatuvier, creeping up trunk of prickly tree fern, Oct. 24th, S. 1911. Very delicate, pale green.

***Dryopteris pyramidata** (Fée) Maxon.

Roxborough-Parlatuvier road, damp banks in forest reserve of Main Ridge, 1000–1400 ft., Oct. 14th, S. 1782. Belmont woods, 1910, *Broadway* 3548, det. Urban (fide *Broadway's Register*).

***Blechnum lanceola** Sw.

Roxborough-Parlatuvier road, damp banks in forest reserve of Main Ridge, 1000–1400 ft., Oct. 14th, S. 1780.

***Acrostichum aureum** L.

Bloody Bay, on damp coast rocks, Oct. 23rd, S. 1891.

***Elaphoglossum Lingua** (Raddi) Brack.

Slopes of Main Ridge above Parlatuvier, creeping along rotten wood in deep rocky ravine in forest, Oct. 24th, S. 1906.

****Gleichenia bifida* (Willd.) Spreng.**

Roxborough-Parlatuvier road, in forest reserve, 1000-1400 ft., Oct. 14th, S. 1779.

****G. flexuosa* (Schrad.) Mett.**

Caledonia, on dry banks by Easterfield road, Oct. 11th, S. 1717.

****Aneimia hirsuta* (L.) Sw.**

Mason Hall, on dry slopes (covered with grass and bamboos) of the Courland River valley, Oct. 19th, S. 1857. Sandstone bank, Les Coteaux, 1909, *Broadway* 3087, det. Urban (fide Broadway's Register).

LVI—ECOLOGICAL ISOLATION.*—W. B. TURRILL.

The taxonomist has found that the classification of organisms into families, genera, and species, and at times into intra-specific groups, to which names are given, has much practical convenience. The species category is, for several reasons, the most important and has been the subject of most dispute. It is probable that the Linnean method of binomials for species has been partly unfortunate in so far as it has tended to increase belief in the fixity of species and, even to the present time, to divert attention from the very important fact that many, and possibly a large majority of, accepted species are groupings of individuals made by the taxonomist for the convenience of biologists. There can be no scientific objection to any method except failure—complete or relative. It is probable that the Linnean system of nomenclature has served a purpose which no other system could have served, but modern research is imposing a very great strain upon it and the desirability of new schemes will have to be considered in the near future. The recent development of cytology, ecology, and genetics, in particular, is directing the attention of biologists to the causes which keep species separate, and it is being found that the separation is due to a considerable diversity of causes, that it is of all degrees, and that it may be from more or less temporary or local to relatively permanent or constant over a wide geographical range.

The taxonomist finds it convenient to insist that his species shall be definable in morphological terms intrinsically and extrinsically. Exceptions occur in specialized bacteriology, but in general an accepted species is defined by all its members having certain characters in common and by certain of these characters not being present in members of any other accepted species, or, at least, not present in a given combination. Such criteria, however, are used for the definition of any taxonomic group, and by themselves do not distinguish a species from a genus or a variety. For delimitation of his species the taxonomist has, therefore, in addition to, not instead of, morphological criteria, to turn his attention to isolation and this

* Paper contributed to a symposium on "The Mechanism of Evolution" at the meeting of the British Association at Cambridge, 1938.

involves a study of what are basically physiological criteria and causes. The species category stands out as of greatest interest and importance because of its practical value to biologists in general and because it is possible to apply to the species methods of analysis which are usually inapplicable to other taxonomic groups, as, for example, experimental methods.

A group is a "better" species the greater its internal uniformity and the greater its isolation. Ecological isolation is undoubtedly important for speciation in plants but it is not easy to find a satisfactory definition of the phrase. One might say that for a species it is living under different conditions from its congeners. This would involve many examples that also showed geographical isolation, and certainly some with genetical, chromosomal, and physiological isolation, but it is a feature of isolation that it tends to become cumulative. The available evidence shows that the first step in isolation may be any one of the factors dealt with in separate papers in this symposium. It is possible that ecological barriers are frequently more easily broken down than others, except geographical barriers, by artificial interference and they are also more subtle, but this does not mean that they are less effective in nature. As a botanist I take my examples from the plant kingdom, and I am uncertain if ecological barriers play as great a part in speciation in animals as they do in plants.

That plants are adapted to the conditions under which they grow in nature is a truism, so long as there is no implication as to how the adaptation has arisen. The factors of the environment can be roughly grouped under climatic, edaphic (soil), and biotic, these being every one complex and showing all kinds of interaction one with the others. They act together and through one another though one can often be distinguished as having major control in a given set of conditions and for a given species. Thus Tansley found that the calcifuge *Galium saxatile* L. would grow on calcareous soil by itself and similarly the calcicole *G. sylvestre* Poll. (*G. asperum* Schreb.) on acid soil, but grown together *G. saxatile* crowded out *G. sylvestre* on acid and *G. sylvestre* speedily dominated *G. saxatile* on calcareous soil. *Rumex Acetosella* L., an acid soil indicator in most communities in this country, is said to grow well on neutral or alkaline soils in the absence of competition with other species. *Bromus erectus* Huds. flourishes on calcareous soils—chalk and oolites—but only in the absence of heavy grazing. Garden cultivation is often successful not because the plants are given good soil, water, warmth, etc., but because they are protected from the competition of plants which would otherwise dominate and literally exterminate them under the same conditions. Many other examples could be given to show the complexity of ecological limitation and therefore of ecological isolation. An attempt will, however, be made to isolate, as far as possible, the influence of the ecological factors, by considering examples where climatic, edaphic, and biotic factors respectively seem outstandingly important.

Climatic factors causing isolation.

Since climate affects large areas of the earth's surface one finds climatic isolation closely linked with geographical isolation. Probably the clearest examples of isolation of taxonomically related species caused by factors usually considered together as climatic are some of the altitudinally vicarious species. Altitude affects the factors of light, temperature, rainfall, and exposure, and is, therefore, itself complex. In working at the flora of the Balkan Peninsula I have found a fair number of species pairs or groups of different altitudinal range but occurring in and sometimes limited to the same geographical area, often on one mountain range or massif. Taxonomic analysis suggests strongly that these species have diverged owing to selective action of climates at different altitudes. A few examples may be given:—

Bellis longifolia Boiss. et Heldr. and *B. silvestris* Cyr.

Crepis auriculaefolia Sieb. and *C. Raulinii* Boiss.

Hypochaeris tenuiflora Boiss. and *H. cretensis* Bory et Chaub.

Convolvulus radicosus Heldr. et Sart. and *C. cantabricus* L.

Chionodoxa cretica Boiss. et Heldr. and *C. nana* Boiss.

A wide field for detailed ecological research, much of it autecological, is opened up by a consideration of the geographical elements of the British flora. The recent analyses by Salisbury and Matthews will suggest many examples. The southern and western elements are particularly interesting. The western distribution of *Ulex Gallii* Planch as compared with the wider range of *U. europaeus* L. is only one instance of the control of milder temperatures and greater humidity. Many of the phytogeographical problems of the British flora can only be solved by intensive studies on single species or small groups of congeneric species and it is much to be desired that botanists undertake such research.

Temperature appears to be important as a limiting factor for the range of microspecies in the *Ajuga chamaepitys-chia* group. Light in part controls the exact distribution of certain species of *Primula* and *Poa*. The reason for certain species flourishing only in "sea-air," not in any limited edaphically peculiar coastal habitat, is a fact which does not appear to have been analyzed. Such plants as *Agropyron pungens* R. et S., *Carduus tenuiflorus* Curt., *Smyrniolum Olusatrum* L., *Plantago Coronopus* L., *Sedum anglicum* Huds., and a number of others chiefly occur "near the coast," but the reasons for this ecological preference are unknown.

Atmospheric humidity is an important factor in the distribution of *Fagus orientalis* Lipsky, at least near the western parts of its range. In Bulgaria, for example, *F. orientalis* is limited to the sheltered relatively damp valleys below 800 m., while at and above 1000 m. on the drier and more exposed hill-sides *F. sylvatica* L. forms extensive woods, where man has not destroyed them. In the intervening zone intermediates sometimes occur but their status is at present rather uncertain.

Edaphic factors causing isolation.

Within an essentially similar climatic area many species are limited in range by soil conditions, or, perhaps it is better to say, conditions of the substratum. Instances of taxonomically closely related calcicole and calcifuge species are well known and the classic examples of *Rhododendron hirsutum* L. (calcicole) and *R. ferrugineum* L. (calcifuge), *Gentiana Clusii* Perr. et Song. (essentially calcicole) and *G. Kochiana* Perr. et Song. (mainly calcifuge), and *Achillea atrata* L. (calcicole) and *A. moschata* Wulf (calcifuge), in the Alps, are often quoted. In the Balkan Peninsula serpentine rocks limit the distribution of a not inconsiderable number of plants. Thus Pančić gives a list of 40 species and varieties which he had observed on the serpentine soils but not elsewhere in Serbia. Novák has recently published interesting accounts of the serpentine flora of S.E. Europe. Typical serpentine species include: *Ephedra macedonica* Košanin, *Halacsya Sendtneri* Dörfler, *Potentilla Visianii* Panč., *Euphorbia serpentini* Novák, *E. glabriflora* Vis., *Sedum serpentini* Janchen, *Viola dukadjinica* W. Becker and many others. It is interesting to note here that interaction of climatic and edaphic factors can cause considerable differences in habitat preferences in different parts of a species range. Thus, in the western Balkan Peninsula *Buxus sempervirens* occurs on serpentine rocks and avoids limestones while in north-western Europe it is naturally limited to calcareous rocks.

Water content of the substratum sometimes separates species ecologically. Thus *Alopecurus pratensis* L. of meadow land and *A. geniculatus* L. of wet marshy places will hybridize but the different ecological preferences keep the species essentially distinct. *Stachys sylvatica* L. (hedge-row banks and woods) and *S. palustris* L. (marshes) are congeners with different water preferences. Hybrids between them (known as $\times S. ambigua$ Sm.) are not infrequent but the two have, for all practical purposes, to be accepted as distinct species. *Lotus corniculatus* L. (of pastures) and *L. major* Scop. (of marshes) are also usually clearly defined in ecological distribution. *Geum urbanum* L., of drier ground and *G. rivale* L., of wetter soil, inbreed when they meet, but the species on the whole keep distinct. Different salinity preferences enable, with some exceptions, *Triglochin maritimum* L. of salt marshes and *T. palustre* L. of fresh-water marshes, to limit themselves to different habitats. *Scirpus lacustris* L., in this country, flourishes in hard waters, and *S. Tabernaemontani* Gmel. usually in brackish waters.

More detailed research has been done on the bladder-campions of the *Silene maritima* group. The widely spread *S. Cucubalus* Wib. (*S. vulgaris*) occurs in grassland, in woods, in brushwoods, and as a weed in arable land. *S. maritima* L. is limited to coastal shingle, sandy shingle, cliff sides, more rarely incompletely closed coastal grassland, and river and mountain shingle. It prefers an open exposed habitat where its more or less prostrate stems and chamaephytic habit are

not at a disadvantage in competition with tall growing vegetation. Other factors of its life-history, such as peculiarities in the germination of the seeds, make it suited to its habitat range as compared with *S. Cucubalus*. The line of demarcation between the two species is rarely overstepped in nature yet the two species are perfectly fertile one with another reciprocally and their hybrids are fertile. Their chromosome numbers are the same and they are not cytologically distinguishable so far as research has gone. Ecologically and genetically a similar result has been reached by research on *Silene glareosa* Jord, and *S. alpina* Thomas when these were compared one with another and with *S. Cucubalus*. Habit differences keep these microspecies separate one from another, except for hybrids in the ecotones, because there is a marked correlation between habit and life-history and habitat, particularly the nature of the substratum which in turn mainly controls the associated plants. The tall-growing *S. Cucubalus* can compete with taller vegetation but cannot maintain itself on open exposed shingle and scree, the prostrate stems of *S. maritima* on shingle and of *S. alpina* on schistose or gneissic screes and the ascending slender stems of *S. glareosa* amid shaded limestone rocks and boulders are able to establish an open vegetation where, but only where, their respective habitat needs are met.

Biotic factors causing isolation.

Biotic factors are probably the most difficult of all ecological factors to study because of their complexity and the difficulty of experimenting with them without unduly modifying their natural action. Man with his large flocks and herds of domesticated animals has geologically speaking only recently appeared on the scene and cannot yet have been responsible for much speciation in the plant kingdom. There is, however, no doubt that man is likely to become increasingly important in modifying nature by enabling new species to establish themselves. Thus by cutting down forests on the hillslopes in the Nearer East species of *Verbascum*, *Thymus*, *Dianthus*, *Silene*, and other genera have been able to extend their areas, to meet, and to hybridize. That certain segregates or allopolyploids resulting from such hybridization may be selected or are in process of selection seems probable. The making of new habitats, by draining, deforestation, and all the processes of cultivation, must also favour certain mutations at the expense of others. The effects of intensive preferential grazing continued over centuries must also be a selective factor of importance.

Competition of plants with plants is most important in studies of succession, and the distribution of even microspecies, etc., is sometimes controlled by this. Thus apomicts of *Taraxacum laevigatum* (Willd.) DC. can, in general, stand much more intensive competition than apomicts of *T. officinale* Web. Complete isolation here is rather through the occurrence of apomixis than by ecological

preferences, but the latter are so well marked that isolation would result even with amphimixis.

The importance of entomophily and the resulting specialization to a limited number of insect visitors is generally recognized and the well-known works on pollination give many details. The greater the specialization of both flower and insect the greater the chance of isolation and establishment of a new mutation or non-segregating hybrid. The occurrence of *Salvia Jurisicii* Košanin with its flowers twisted through 180° may be mentioned in this connexion. A good figure and a description will be found in the Botanical Magazine tab. 9250.

Specialization of parasites for certain hosts has also been important in isolation leading to speciation. The numerous and complicated examples in the bacteria and fungi are beyond my province but even in the flowering plants there are instructive examples. Thus the three subspecies or micro-species of *Viscum* are limited: *V. album* L. to dicotyledonous hosts, *V. laxum* Boiss. to species of *Abies*, and *V. Pini* (Wiesb.) to species of *Pinus*. Morphologically the differences are very slight. In *Orobanch* we find every transition from *O. minor* Sm. with a hundred known hosts to *O. Hederae* Duby limited to the ivy.

The well-known experimental work of Turesson in Sweden has shown that within the taxonomic species some degree of isolation of populations occurs with correlation between a specialized habitat and certain morphological (and presumably also physiological) characters. Such populations Turesson terms ecotypes. Although I am unable to accept the whole of his theoretical scheme without reservations or modifications I express a very great admiration for his researches. These show clearly that individuals with certain characters are selected by the habitat—one might almost say that certain characters are selected by the environment and that others are ignored and therefore the population consists of individuals all homozygous for ecologically important genes but often mixed for ecologically unimportant genes. While it is doubtful if there be any hard and fast line between Turesson's ecotypes and ecospecies, in the sense that it is difficult to know whether a given ecologically isolated population is to be termed an ecotype or an ecospecies, there is no doubt that Turesson's experiments prove the importance of ecological isolation as a factor separating populations differing in morphological characters. That some ecotypes are incipient species is very likely, but this has still to be proved. The work on *Silene*, already briefly mentioned, shows that ecological limitations may alone prevent the amalgamation of two or more species into one still more polymorphic one. Ecological isolation may thus precede, as it may in other examples follow, cytological, geographical, or some other kind of isolation. An accumulation of factors all intensifying isolation may then lead to such an interspecific barrier that the species concerned remain absolutely distinct one from another.

There is a converse to this picture which must be referred to briefly, namely the isolation of areas of similar ecological attributes. Phytogeographers know of a number of rather striking examples of regions widely isolated geographically but with similar climates. There is then frequently a marked resemblance in their plant communities—sometimes only in the habit and life-form of the components but sometimes also in their taxonomy. Thus both the *macchie* of the Mediterranean Region and the chaparral of California have species (though different species) of evergreen oak and *Arbutus*. At the other end of the scale of isolation by distance, areas of marsh, bog, woodland, mountain plateau, etc., within the same geographical region are often now separated by distances wider than can be traversed by normal pollinating agents (especially insects) or fruits and seeds. Of course, such isolation is of all degrees and varies from species to species but it gives a chance for divergent, convergent, or parallel evolution under similar but more or less isolated ecological conditions.

Time has not permitted of my giving more than a very brief survey of the importance of ecological isolation in the separation of species. In preparing this paper I have particularly been struck with the tremendous amount of detailed research which has still to be done on the species of a flora even so well known taxonomically as that of the British Isles or the Balkan Peninsula. This is true not only for autecology but also for intra-specific variation—genetical and ecotypic. Without wishing to overstress the importance of ecological isolation it is highly desirable that it should be intensively studied in wild floras (and faunas) before man's interference is carried so far that natural vegetation becomes only a palaeobotanical phenomenon.

LVII—ADDITIONS TO THE WILD FAUNA AND FLORA OF THE ROYAL BOTANIC GARDENS, KEW: XVIII.*

THE ANTS OF THE ROYAL BOTANIC GARDENS, KEW.
A. NORMAN BRANGHAM.

I. A LIST OF THE COSMOPOLITAN AND INTRODUCED FORMICIDAE RECORDED FROM THE GARDENS.

PONERINAE.

1. *Ectatomma regulare* Mayr. (Mexico, Central America, Brazil.)

Two workers, propagating pits, 1911 (Donisthorpe 1911, 368).

2. *Diacamma rugosum* Le Guill. subsp. *vagans* F. Smith var. *indica* Forel. (India.)

In case, June 1898 (Bingham 1906, 27, as *D. vagans*).

* Continued from K.B. 1936, 66.

3. *Ponera coarctata* Latr. subsp. *boerorum* Forel. (Natal.)
Winged female, palm house; workers, fern house, January 1908. (Donisthorpe 1908 A, 122). Workers, fern house, palm house (common), November 1910 (Donisthorpe 1911 B, 14).

4. *Ponera opaciceps* Mayr. (Brazil, Uruguay, Mexico, Porto Rico, Texas.)

Two workers, propagating pits, May 1911 (Donisthorpe 1911 A, 368).

5. *Ponera punctatissima* Roger. (England, Germany, France, Switzerland, Canary Islands.)

This species has been doubtfully classified as a British species. It was first found in this country in 1860 in London by H. Squire; it has only been found in hot-houses and bakeries, etc., seeming to indicate its introduced or cosmopolitan nature. Donisthorpe (1927) makes no mention of this species having been recorded at Kew Gardens, although he cites other hot-houses in different parts of the country as having yielded it.

During the last four or five years, I have found it commonly in many houses and in the propagating pits.

On October 9th, 1937, I captured one ergatoid male of this species in Pit no. 23, under a flower-pot. The male is invariably apterous in this species as opposed to the great majority of male *Formicidae*, and is extremely rare here; the specimen taken by myself was only the third or fourth one ever recorded in Britain. The first was taken by Britten in Cumberland in 1913, and Donisthorpe has transferred a male from the Oxford collection to the British Museum (Natural History) Collection. H. Britten, Jun., captured a male at York in 1925. This male, captured in Pit 23, was found alone, although there were at least three nests under flower-pots in this pit. Winged and fertile females, workers, and brood were plentiful.

6. *Anochetus mayri* Emery. (Antilles.)

One worker, hot-house, November 1911 (captured by W. C. Crawley).

MYRMICINAE.

7. *Pseudomyrma gracilis* F. (South and Central America.)

Three workers, March 1912 (Donisthorpe 1927).

Living and dead workers on plant from Calcutta, May 1910.

8. *Monomorium destructor* Jerd. (Cosmopolitan species.)
(Donisthorpe 1911 A, 368).

9. *Monomorium minutum* Mayr. (Italy, Corfu, Syria, Algeria.)

On plant, 1908 (Donisthorpe 1908 B, 231). Fern pits, February 1909 (Donisthorpe 1909, 261).

10. *Monomorium pharaonis* L. (Cosmopolitan species.)

This ant has also been classified as a British species although it has been definitely brought into this country from abroad, and, like

Ponera punctatissima, can be found here only in hot places, in high artificial temperatures.

Bingham has recorded *Monomorium pharaonis* from Kew Gardens (Bingham 1906, 28). I have found it occasionally in recent years in the orchid house, although not during my last visit (9.10.37), the most recent records I have being by Donisthorpe, who found it in a restaurant in Windsor Forest, and a recent record of my own from a restaurant in Watford (26.9.37).

11. *Phaidologeton diversus* Jerd. (India, Burma, Malay.)

A dealated female, and small workers in fern pits, November 1909 (Donisthorpe 1911 A, 368).

12. *Cremastogaster scutellaris* Ol. (Mediterranean, North Africa, Tunis.)

In virgin cork, 1906 (Bingham 1906, 28). With *Colobopsis truncata* Spin. in cork, 1909 (Donisthorpe 1909, 251).

13. *Phaidole gertrudae* Forel. (Brazil.)

Winged female, soldiers, workers, propagating pits, May 1911 (Donisthorpe 1911 A, 368).

14. *Phaidole anastasil* Emery var. *cellarum* Forel. (Cosmopolitan species.)

Workers and soldiers abundant, February 1908, in orchid house (Donisthorpe 1908 A, 122).

15. *Phaidole rhombinoda* Mayr. (India, Ceylon.)

A dealated female, soldiers and workers, September 1912 (Donisthorpe 1927).

16. *Tetramorium guineense* F. (Cosmopolitan species.)

Dealated females, and workers, December 1910 (Donisthorpe 1911 A, 368).

17. *Tetramorium simillimum* Smith. (Cosmopolitan species.) (Saunders 1880, 223.)

18. *Tetramorium magitae* Forel. (Ceylon.)

Workers, January 1911 (Donisthorpe 1911 A, 368).

19. *Wasmannia auro-punctata* Rog. (West Indies.)

Common in almost every house since 1907. H. Donisthorpe was the first to discover this tiny yellow species at Kew Gardens in the propagating pits in 1907 (Donisthorpe 1907, 122), mentioning its commonness there, which I was able to confirm amply on October 9th, 1937, particularly in the tropical palm house, where small colonies were found in almost every hollow twig lying on the soil, while regular streams of them were walking slowly up and down in single file along the trunks of the palms to the leaves above. I was unable to locate a central nest, although each twig had its share of larvae, pupae, and workers, but neither of the sexes was discovered.

20. *Triglyphothrix striatidens* Emery. (India, Burma, Ceylon, Tunis, Sierra Leone.)

Propagating pits, 1906 (Bingham 1906, 28, as *T. obesa* st. *striatidens*). Plentifully in the fern and palm houses (Donisthorpe 1908, 122). On October 9th, 1937, I found only one worker of this species in the temperate fern house, walking alone, and no colony was located.

21. *Strumigenys rogeri* Emery. (West Indies.)

A few workers in propagating pits, 1907 (Donisthorpe 1908 A, 122, and 1908 B, 231).

22. *Solenopsis geminata* F. (South and Central America ?)

This species was taken for the first time in the country in the propagating pits by Donisthorpe and myself independently within a few days of each other, in 1932. I have not seen it there for the last few years owing to the vigorous methods taken by the staff to exterminate this ant, which is a particularly tenacious pest.

DOLICHODERINAE.

23. *Tapinoma melanocephalum* F. (Cosmopolitan species.)

In palm house, September 1886 (Billups 1887).

24. *Tapinoma minutum* Mayr. (New South Wales.)

A number of workers, 1911 (Donisthorpe 1911 A, 368, As *T. melanocephalum*).

25. *Technomyrmex albipes* F. Smith. (India, Malay Isles, New Guinea.)

Palm House, 1906 (Bingham 1903, 301, and 1906, 28). In 1908 Donisthorpe discovered an apterous form of the male (Forel 1908, 21). In 1910 Donisthorpe found a short-winged male, suggesting that it might be a mermithaner (Donisthorpe 1911 B, 15). On October 9th, 1937, I found all forms of this species in the palm house.

FORMICINAE.

26. *Plagiolepis alluaudi* Emery. (Seychelles.)

(Saunders 1896, 26, as *P. flavidula*). Common in palm house, December 1907 (Donisthorpe 1908 A, 122).

27. *Brachymyrmex (Brachymyrmex) patagonicus* Mayr. (Central America.)

In orchid house, common, 1909, 1910 (Donisthorpe 1909, 251).

28. *Prenolepis nitens* Mayr. (Ukraine, Balkan Peninsula, Asia Minor, East coast of Black Sea, North-east Italy.)

In 1884 Saunders cited this species as being British, as he had recorded it from the New Forest and Bournemouth (Saunders 1884, 270, as *Tapinoma nitens*, and 1896, 25). Dale captured a single specimen of this species at Bournemouth. F. Smith gives Wales

as the habitat of this ant (F. Smith 1855, 112 as *Tapinoma polita*). Saunders also gives the origin of *Prenolepis nitens* as Wales (Saunders 1880, 211 as *Tapinoma nitens*).

This ant has not been taken again in any of the localities mentioned by these earlier entomologists, and Bingham and Donisthorpe maintain that there is every reason to suppose that it is an introduced ant. Bingham has taken it at Kew in the tropical fern house (Bingham 1906, 28).

29. *Paratrechina (Nylanderia) flavipes* F. Smith. (Japan.)

A complete colony in lily bulbs, 1907 (Donisthorpe 1908, 122).

30. *Paratrechina (Nylanderia) steinheilli* For. var. *minuta* For. (Antilles.)

Workers, palmhouse, 1909 (Donisthorpe 1909, 251).

31. *Paratrechina (Nylanderia) vividula* Nyl. (Cosmopolitan species.)

Workers, palm house, March 1896. Pit 18, 1908 (Donisthorpe 1927).

32. *Paratrechina (Nylanderia) vividula* Nyl. subsp. *antillana* Forel. (Antilles.)

Workers, palm house, 1910 (Donisthorpe 1911 A, 369, as *Prenolepis vividula* subsp. *antillana*, and 1911 B, 15).

33. *Paratrechina (Nylanderia) braueri* Mayr. subsp. *donisthorpei* Forel.

First taken at Kew Gardens by Donisthorpe in 1896. Fern, palm, lily, houses, December 1910 (Donisthorpe 1911 B, 15).

34. *Paratrechina (Paratrechina) longicornis* Latr. (Cosmopolitan species.)

Lily house (Farren-White 1895, 237, as *Tapinoma gracilescens*). Propagating pits, 1906 (Bingham 1906, 28). It has been very common in most of the houses for some years (Crawley and Donisthorpe 1912, 23).

This strange looking species, with its exceptionally long, spindly legs, is common throughout the hot-houses, and may be seen running actively along the supports of the beds. In the fern house a drain was opened, and an enormous colony was found below, reaching down to the hot-water pipes, a few feet below the surface of the floor. I captured a winged female in the temperate house on October 9th, 1937.

35. *Acanthomyops (Donisthorpea) niger* L. subsp. *lasiodeus* Emery. (Italy.)

One dealated female, orchid house, October 1911 (Donisthorpe 1911 A, 369).

36. *Camponotus (Myrmothrix) abdominalis* F. subsp. *stercorarius* Forel. (Central America.)

One large worker on *Laelia gouldiana*, orchid house, 1910 (Donisthorpe 1911 A, 369).

37. *Camponotus (Myrmophaenus) novogranadensis* Mayr. (Central America, Columbia, Brazil.)

Large and small workers, orchid house, December 1912 (Donisthorpe 1927).

38. *Camponotus (Colobopsis) truncatis* Spin. (South and Central Europe, North Africa.)

With *Cremastogaster scutellaria* (see above no. 12) in virgin cork, April 1909, fern house (Donisthorpe 1909).

I have studied the *Formicidae* in the Gardens for a number of years, and it seems to me that there are three species (i.e., *Wasmannia auro-punctata*, *Paratrechina (Paratrechina) longicornis*, and *Technomyrmex albipes*) which may be considered as having definitely established themselves, and which may, for classification purposes, be termed as indigenous *Formicidae*, in the same way that *Monomorium pharaonis* L. has been accepted in the British Lists.

I am indebted to Mr. H. Donisthorpe for verifying the ants described above, and for naming the ergatoid male of *Ponera punctatissima* Rog., which was entirely new to me.

II. BRITISH INDIGENOUS FORMICIDAE TAKEN AT KEW GARDENS.

Apart from the Cosmopolitan and Introduced species numbering about 38 mentioned above, a few of the commoner British ants have been observed by myself in the grounds of the Gardens, and not in the hothouses themselves. While this list is not very striking as a locality list, I am not aware that any such record has been published either in the Kew Bulletin or in any entomological journal. These ants are as follows:—

1. *Myrmica laevinodis* Nyl. I have frequently found nests in the less cultivated parts of the Gardens.

2. *Myrmica ruginodis* Nyl. This species has also been observed on one occasion near the Pagoda.

3. *Myrmica scabrinodis* Nyl. Some workers of this species were found walking along a path on May 8th, 1936, but no nest was located.

4. *Leptothorax acervorum* F. This pretty little ant was taken in a hollow, decayed twig in 1933. Winged and fertile females were found, males, workers (c. 20) and larvae. The twig was half-buried in quartz soil, my attention being first attracted by two workers following each other over a sandy mound.

5. *Acanthomyops niger* L. This ant is quite common in the cultivated beds.

6. *Acanthomyops flavus* F. Although I have not found any colonies of this species outside, I have taken a solitary worker in the temperate palm house in 1933.

7. *Acanthomyops alienus* Forst. Some years ago I found a small colony of ants which was superficially like *A. niger* only smaller in size. At the time, I took them to be *niger*, but in all probability they were *alienus*. I have searched for the colony since, but have been unable to find it.

REFERENCES.

- BILLUPS, R., 1887. *Proc. Ent. Soc. London*, 27 (1887).
BINGHAM, C. T., 1903. *Fauna Brit. Ind. Hym.* 2 (1903).
BINGHAM, C. T., 1906. *Kew Bull.*, Add. Ser 5 (1906).
CRAWLEY, W. C. AND DONISTHORPE, H., 1912. *Int. Ent. Congr.*, Oxf. 1911, 2 (1912).
DONISTHORPE, H., 1908A. *Kew Bull.*, 1908.
DONISTHORPE, H., 1908B. *Trans. Leicester Lit. Phil. Soc.* 12 (1908).
DONISTHORPE, H., 1909. *Kew Bull.*, 1909.
DONISTHORPE, H., 1911A. *Kew Bull.*, 1911.
DONISTHORPE, H., 1911B. *Ent. Rec.* 23 (1911).
DONISTHORPE, H., 1927. *British Ants* (1927).
FARREN-WHITE, 1895. *Ants' Ways*, 65 (1895).
FORD, 1908. *Bull. Soc. Vaud. Sc. Nat.* 44 (1908).
SAUNDERS, E., 1880. *Trans. Ent. Soc. London*, 1880.
SAUNDERS, E., 1884. *Ent. Mon. Mag.* 20 (1884).
SAUNDERS, E., 1896. *Hym.-Acul.* (1896).
SMITH, F., 1885. *Trans. Ent. Soc. London (N.S.)*, 3 (1885).

LVIII—MISCELLANEOUS NOTES.

MR. O. T. FAULKNER, C.M.G.—It was recently announced by the Governing Body of the Imperial College of Tropical Agriculture, that Mr. O. T. FAULKNER had been offered and had accepted the post of Principal, which had fallen vacant owing to the retirement of Sir Geoffrey Evans.

Mr. Faulkner has had a distinguished and varied career. After leaving Cambridge in 1912 where he obtained his Degree in Natural Sciences and also took the Diploma in Agriculture, he proceeded to Malaya as Mycologist and Agricultural Expert to the Rubber Growers' Association. Transferring to the Indian Agricultural Service in 1914, he was posted to the Punjab as Deputy Director of Agriculture, and the experience gained in that wide field undoubtedly proved of great value.

In 1921 he left the Indian Service and went over to Nigeria at the time when the northern and southern divisions were being welded into one Territory by Sir Frederick (now Lord) Lugard. Faulkner made a detailed study of the huge area and was very successful in organizing a properly equipped and well staffed

Agricultural Department during his stay of fourteen years. His study of peasant agriculture was particularly noteworthy. He was transferred to Malaya in 1936 as Director of Agriculture, Straits Settlements and Federated Malay States.

Mr. Faulkner brings most of the requisites for the successful conduct of the work of his new post. His wide knowledge of tropical agriculture and his administrative experience should stand him in good stead and we wish him all success in his new office.

Mr. GWILYM ARTHUR JONES, C.M.G., Commissioner of Agriculture at the Imperial College of Tropical Agriculture, has been appointed Director of Science and Agriculture in Jamaica, in place of Mr. A. C. Barney, who has resigned.

Mr. Jones obtained the Diploma in Agriculture at Bangor, and first went out to the West Indies in 1908 where he worked on a sugar estate in Antigua. After a short time he was appointed Science Master at the Antigua Grammar School and from 1909 to 1919 he was Assistant Curator and Chemist in Dominica. He then joined the staff of the St. Madeleine Sugar Company in Trinidad, being in charge of the cane organization and experimental work. In 1929 he joined the staff of the Imperial College of Tropical Agriculture as Assistant Commissioner and became Commissioner in 1933.

In addition to the agricultural work in the Windward and Leeward Colonies for which the Commissioner is responsible, Mr. Jones served on two Royal Commissions—the Olivier Sugar Commission and the commission that enquired last year into the recent Trinidad disturbances. He was created a C.M.G. in June this year.

Mr. C. B. GIBBINS, Assistant Agriculturist at the Coffee Experimental Station, Moshi, Tanganyika Territory, who was formerly a student gardener at Kew, has been appointed Assistant Superintendent of Plantations at the East African Agricultural Research Station, Amami.

Herbarium specimens and gas-poisoning.—For many years it has been the practice at Kew for all dried specimens intended for the Herbarium to be passed through a special poison-gas chamber before being mounted. In this way it was hoped to kill all insects and their eggs which were likely to cause damage to the specimens at a later stage. In addition, the plants receive the normal hand-poisoning with corrosive-sublimate solution.

The gas employed was carbon bisulphide, and it was applied in a special brick-built building near the Herbarium. The method was slow in action, and doubtfully efficacious, and it became increasingly evident that a more positive and quicker process would have to be evolved; the more so because outbreaks of beetle attacks in the Herbarium itself were becoming more frequent.

Consultations with experts, in particular Dr. A. B. P. Page of the Imperial College of Science & Technology, resulted in a decision to use hydrogen-cyanide as a fumigant. So potent a poison necessitated the design of a special piece of apparatus for its application, and a firm of engineers, Messrs. W. Edwards & Co., in consultation with Dr. Page, were instructed to design and make such apparatus.

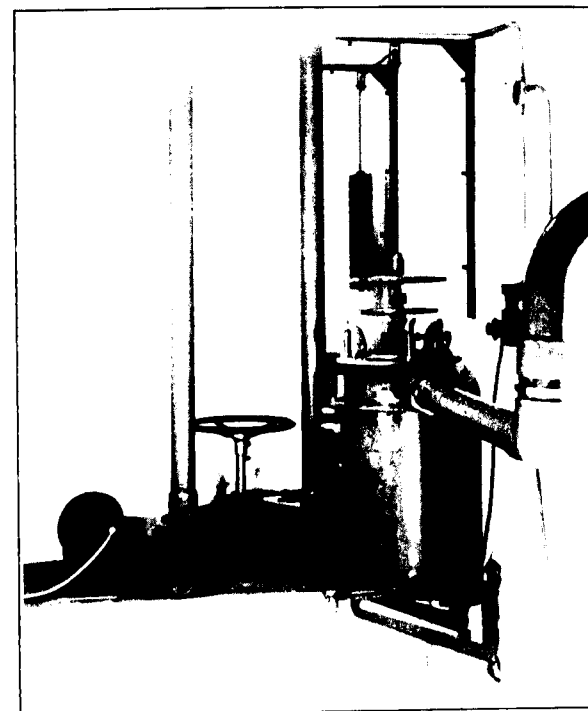
The mechanism, which was installed towards the end of 1937 and is now in full working order, consists of two major parts. The fumigation chamber itself consists of a large steel tank of approximately 200 cubic feet capacity, fitted with a gas-tight steel door. Two trolleys fitted with castors run freely into and out of the chamber and accommodate a large number of wire trays arranged in tiers into which the specimens are placed. Several thousand specimens can be dealt with at one time. (Plate III, *b*.)

The poison gas is passed into the chamber from the gas generating room through various distributing pipes, and a safety device is provided to prevent damage in the event of a sudden increase in pressure. In addition, electric heating elements are present in the chamber, thermostatically controlled, to maintain an even temperature within the chamber of about 65°F.

The hydrogen cyanide used in the process is obtained in hermetically sealed cans ("Zyklon"), in which the gas is absorbed in a porous earthy material. Each can contains 400 grammes of the gas, an amount which produces a very high concentration within the gas chamber. The gas is liberated from the tin in a specially designed vaporiser which gives perfect safety to the operator. The can is placed on a platform provided in the vaporiser and the cover is then replaced to render the system gastight. A water jacket is provided which is heated by electric immersion heaters. By mechanical devices operated externally, the lid of the can is removed, the material tipped out of the can and distributed evenly over the floor of the vaporiser. The gas is generated immediately the can is opened, a process which is greatly accelerated when the material strikes the hot surface of the vaporiser. (Plate III, *a*.)

A powerful electric fan drives the gas into the gas chamber and a circulation of the gas through the specimens is maintained for at least two hours. The specimens are then left in contact with the gas for another twenty hours, after which period special valves are opened and fresh air is forced through the apparatus for two hours. The chamber can then be opened with safety, although the specimens are not normally handled until a few more hours have elapsed.

The question of safety to the operator has been a major consideration in the design of the apparatus and various safety locks have been fitted to ensure that a correct sequence of operations is followed. No precautions are necessary other than those incorporated in the equipment itself. In the unlikely event of a leak occurring in the gas generating room during the initial cutting of the



(*a*) Generating Room.



(*b*) Fumigation Chamber.

can or even subsequently, a Siebe-Gorman oxygen apparatus has been obtained to afford assistance in rescue work.

The total cost of the equipment has been nearly £370, while the cost of the fumigant itself per thousand specimens works out at a figure between 1s. 6d. and 3s., depending largely on the relative proportions of mounted and unmounted material. F. BALLARD.

Botanical Magazine.—The second part of vol. 161 was published on 5th August, 1938, and contains the following plant portraits:—

Rhododendron diaprepes Balf. f. et W. W. Smith (t. 9524) from S.W. Yunnan and N.E. Burma; *Sarcocapnos enneaphylla* (L.) DC. (t. 9525), allied to *Fumaria* and *Corydalis*, a native of southern France and Spain; *Berberis linearifolia* Philippi (t. 9526), a fine barberry introduced by H. F. Comber from the Andes of Chile and Argentina; *Primula sonchifolia* Franchet (t. 9527), discovered by Delavay in 1884 and found later by Forrest; living plants were sent home in the resting stage, having been collected by Forest Ranger Sukoe on the Hpimaw Pass: the plant is a native of W. China, Tibet and N.W. Burma; *Cytisus Battandieri* Maire (t. 9528), figured from the plant long grown in the open at Kew, a native of Morocco; *Anoetochilus Roxburghii* (Wall.) Lindley (t. 9529), found in the Himalayas and Assam to S. China; *Notospartium glabrescens* Petrie (t. 9530), from New Zealand; *Canarina Eminii* Ascherson ex Schweinfurth (t. 9531), a native of Eastern Africa from Abyssinia to the mountains north of Lake Nyasa; *Deutzia longifolia* Franchet var. *Farreri* Airy Shaw (t. 9532), a newly-described variety discovered by Potanin in Eastern Kansu, W. China; *Nomocharis aperta* (Franchet) E. H. Wilson (t. 9533), native of N.W. Yunnan and S.W. Szechwan; and *Rubus tricolor* Focke (t. 9534), a very distinct species discovered by Delavay in Yunnan and found also in Szechwan.

***Callicarpa subpubescens* Hook. et Arn.**—As stated by Hooker and Arnott in Bot. Beechey Voy. 275 (1839–40), the localities of the Mexican plants listed were sometimes doubtful, as the same species was sometimes also found in packets of plants from Bonin and Loo Choo, in the North Pacific. That a wrong locality was given seems to be established beyond doubt in the case of *Callicarpa subpubescens* (op. cit. 305), which was said to come from Tepic. The Beechey specimens in Herb. Hook. and Herb. Benth. have the locality Bonin written by Bentham himself, and were transferred, apparently by the late Dr. Stapf, to their proper places in the Kew Herbarium, and identified with other Bonin specimens. The species was listed as somewhat doubtfully Mexican by Standley on page 1253 of his "Trees and Shrubs of Mexico."

A. A. BULLOCK and C. V. B. MARQUAND.

Works on Diatoms.—An Index to Localities of Diatoms, compiled by Miss Alice M. Mainland, has been presented to the Bentham-Moxon Trustees by Mr. Frederick Adams. It will be added to the two collections of works on this group already presented by Mr. Adams (K.B. 1932, 250, and 1936, 110), and will therefore be available to responsible workers on the *Diatomaceae* who wish to borrow it.

Flora of the City of Madras.*—This is a supplement to the "Flora of Madras City" published in the same Bulletin in 1929 (reviewed in K.B. 1929, 271). It is the fruit of intensive observation and research in the area by Professor E. Barnes. It adds 2 families, 16 genera and 50 species with a few varieties to the list given in the previous work. The first nine pages give a detailed list of the additions with notes for distinguishing them from those previously described and in several cases keys to facilitate the identification of the genus or species are added. The second part furnishes descriptions of the families, genera and species. Finally there are seven plates of black and white drawings depicting 24 of these species. The whole is well got up and provides a useful supplement to those interested in the flora of the area. C. E. C. FISCHER.

Seventh International Botanical Congress, Stockholm, 1940.—We have been asked to publish the following notice:—

Motions dealing with Nomenclature for consideration by the VIIth International Botanical Congress, Stockholm, 1940, should be sent before July 1, 1939, to the Rapporteur général, Dr. T. A. Sprague, The Herbarium, Royal Botanic Gardens, Kew, Surrey, England.

Motions must be presented in the form of additional articles (or amendments) to the International Rules. They should be drafted as briefly as possible. At least 100 printed copies must be presented.

* Supplement to the "Flowering Plants of Madras City and its Immediate Neighbourhood," by E. Barnes, B.Sc. Bulletin of the Madras Government Museum. New Series.—Natural History Section, vol. 4, no. 2, 1938. Printed by the Superintendent, Government Press, Madras, 4to. Pp. 46, pl. 10, paper. Price Rs 1-10-0.

BULLETIN OF MISCELLANEOUS
INFORMATION No. 10 1938
ROYAL BOTANIC GARDENS, KEW

LIX—THE SIAMESE VERBENACEAE. H. R. FLETCHER.

HISTORICAL.

Our knowledge of the *Verbenaceae* of Siam dates from the publication of Dr. F. N. Williams' paper, "Liste des plantes connues du Siam," in Bull. Herb. Boiss. sér. 2, 4 and 5 (1904-1905). This list includes 26 species of *Verbenaceae*.* In 1905, C. H. Ostenfeld in Bull. Herb. Boiss. sér. 2, 5, 709-724, published a list of the plants collected by E. Lindhard in the Raheng district in the Circle of Nakawn Sawan (see map, p. 403). This short list, however, contains only one species of *Verbenaceae*—*Congea tomentosa*. In the same year, Dr. C. C. Hosseus visited Siam and made collections of plants, chiefly in the north-west, and a fairly complete set of his plants is in the Kew Herbarium. Until 1912 he published a series of papers and one of them, "Die Botanischen Ergebnisse meiner Expedition nach Siam," in Beih. Bot. Centralbl. 28, 2, 357-457 (1911), contains 7 species of *Verbenaceae*, including a doubtful one. This, however, is only a list of the plants collected by himself. During this time, from 1900, the various parts of J. Schmidt's "Flora of Koh Chang" were appearing in the Bot. Tidsskr. of Copenhagen, and part 8 (1904) contained 19 species of *Verbenaceae* from that area.

Finally, in 1911, Prof. Craib (in Kew Bull. 1911, 7-60 and 385-475) gave additions to Williams' list, additions accounted for chiefly by the collections of Dr. Kerr; and, in 1912, all the plants received at Kew up to the end of 1911 formed the subject of his "Contributions to the Flora of Siam (Dicots.)," in Aberdeen University Studies, No. 57. This is really a reprint of his 1911 paper with still further additions.

At this time there were 15 genera and 31 species of *Verbenaceae* known from Siam. These were as follows: *Lantana* (2 spp.); *Stachytarpheta* (1); *Duranta* (1); *Callicarpa* (2); *Tectona* (1); *Premna* (4); *Gmelina* (2); *Vitex* (5); *Clerodendrum* (5, including a doubtful one); *Glossocarya* (1); *Hymenopyramis* (2); *Symphorema* (1); *Sphenodesme* (2); *Congea* (1); *Avicennia* (1).

It should be noted that Prof. Craib omits Schmidt's Kaw Chang collections and that the area taken up does not include Siamese Malay Peninsula. This area is accounted for by Ridley, who in 1911, in Journ. Str. Br. Roy. As. Soc. no. 59, 27-234, published his paper, "A Botanical Expedition to Lower Siam." The ground he covers

* No note is taken of varieties.

is approximately from Prachuap south to the Malay Peninsula, an area lying between latitudes 12° and 6°. He deals with 11 genera and 27 species of *Verbenaceae*.

GEOGRAPHICAL REMARKS.

The geographical area considered in this paper is that enclosed by the political boundaries of Siam, together with that part of the Langkawi Islands group which lies south of the boundary (see map, p. 403). Although politically the latter are included in the Malay Peninsula and are so treated by King and Gamble in the "Materials for a Flora of the Malay Peninsula," yet floristically they are similar to the Islands north of the boundary and it is for this reason that they have been included here within the boundary of Siam.

Siam lies between the parallels of 5° and 2° north latitude and between the meridians of 97° and 106° east longitude and can conveniently be divided into four parts, Northern, Central, Eastern, and Southern or Peninsular Siam. On the north, Siam is bounded by Burma and the French Lao States, on the west by Burma, on the east by the French Lao States and French Cambodia, being separated from the latter by the Me-Kong River except in the extreme north where the frontier lies on the west side of the river. Peninsular Siam is flanked on the west partly by Burma and partly by the Indian Ocean, on the east by the South China Sea and the Gulf of Siam and on the south by the Malay Peninsula. The area included is approximately 200,000 square miles.

Topographically Siam is interesting from three points of view. Firstly, the presence of wide plains is very marked; plains with great alluvial deposits like the Menam plain in the centre of Siam; plains in the Peninsula and the north with only thin deposits; and plains without deposits such as the Eastern Korat Plateau. Secondly mountain ranges are very noticeable, stretching from north to south in North, West and South Siam, and from east to west in South-East Siam in Chantaburi and Prachinburi. Eastern Siam on the other hand is devoid of such ranges. These mountain ranges ascend from the plains very steeply and sometimes, as in Northern Siam, there is a narrow zone of low foothills between the plains and the mountain slopes. In all probability these mountain ranges have a granite core. There are granite exposures in the hills of Prachuap, in the hills between Tavoy and Kanburi, in the Peninsula near Trang and Songkla, and in the south in Kao Sabap, a mountain to the east of Chantabun. Limestone outcrops occur intermittently from the Malay Peninsula, north to Chiengrai. These limestone outcrops form isolated sharp peaks, the highest of which is Doi Chiengdao, over 2100 m. high. South-east of Pitsanulok and west of Krabi, Permo-Carboniferous fossils are to be found in the limestone. Sandstone beds form the caps of some of the mountains south of Loi, those around Kanburi, and the mountain Kao Luang to the west of Sukotai. The Korat and the Nakawn Tai Plateaux

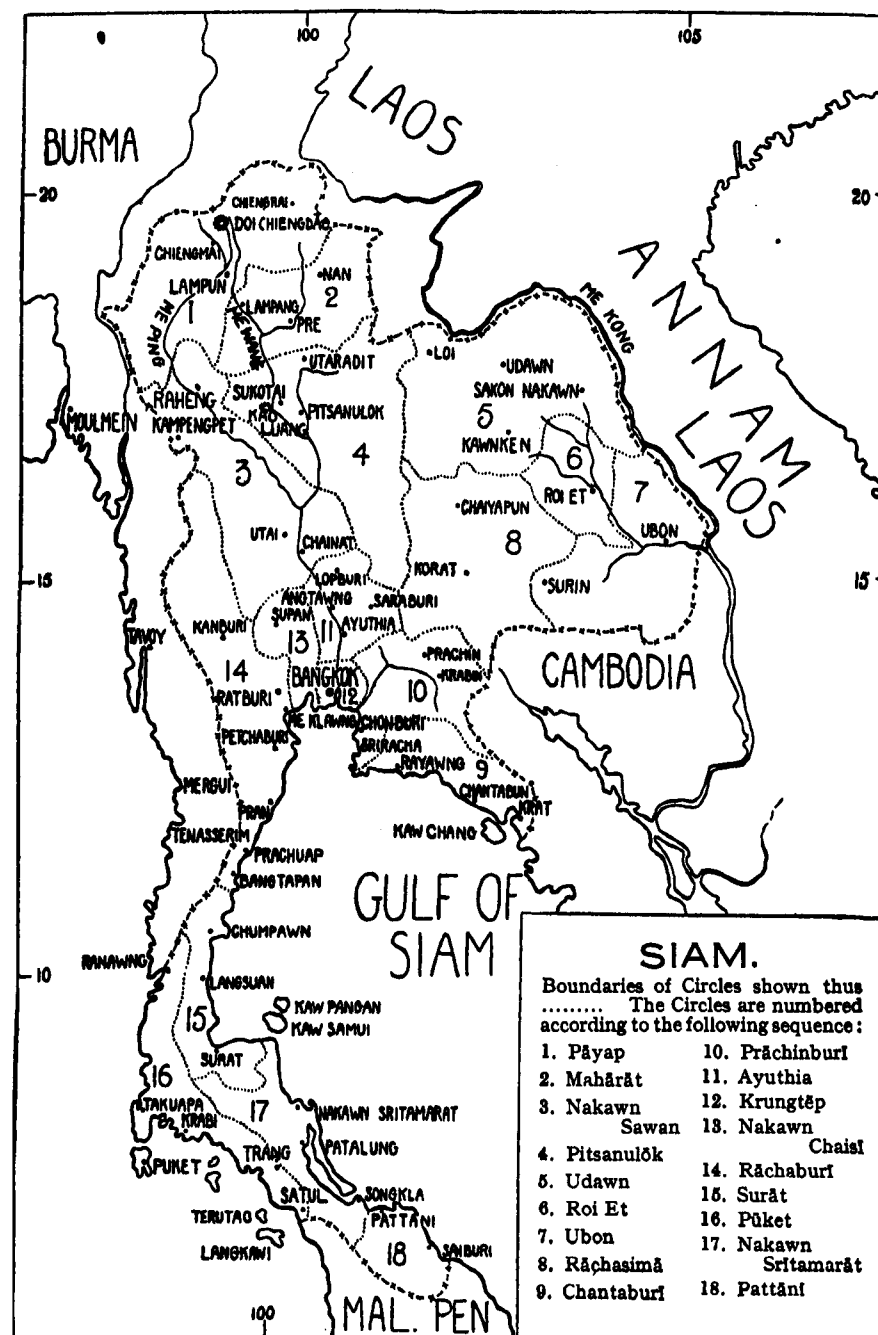


TABLE I.

	India	China (including Hainan)	British Indo- China (Burma & Assam)	French Indo-China	Malay Peninsula	Malay Archipelago	Philippines	Australia
<i>Lantana salviifolia</i> ...	x		x	x				
<i>Stachytarpheta jamaicensis</i> ...	x		x	x	x	x	x	
<i>Callicarpa arborea</i> ...	x	x	x	x	x	x		
<i>C. Maingayi</i> ...					x	x	x	
<i>C. Poilanei</i> ...				x				
<i>C. angustifolia</i> ...					x			
<i>C. lanata</i> ...	x		x				x	
<i>C. macrophylla</i> ...	x	x	x	x		x		
<i>C. cana</i> ...		x		x	x	x		x
<i>C. rubella</i> ...	x	x	x	x		x		
<i>C. longifolia</i> ...			x	x	x	x		x
<i>C. psilocalyx</i> ...			x					
<i>Geunsia pentandra</i> ...					x	x	x	
<i>Tectona grandis</i> ...	x		x	x	x	x		
<i>Premna racemosa</i> ...		x	x					
<i>P. scandens</i> ...	x	x	x	x				
<i>P. dubia</i> ...				x				
<i>P. villosa</i> ...	x	x						
<i>P. cordifolia</i> ...			x	x	x			
<i>P. corymbosa</i> ...	x	x	x	x		x	x	x
<i>P. foetida</i> ...						x		
<i>P. trichostoma</i> ...					x	x		
<i>P. pyramidata</i> ...			x		x	x		
<i>P. flavescens</i> ...			x	x	x	x		
<i>P. fulva</i> ...				x				
<i>P. latifolia</i> ...	x		x	x			x	
<i>P. nana</i> ...			x					
<i>P. herbacea</i> ...	x	x	x	x				
<i>P. amplexans</i> ...			x					
<i>Gmelina arborea</i> ...	x	x	x	x		x	x	
<i>G. Hystrix</i> ...			x	x	x		x	
<i>G. villosa</i> ...			x	x	x	x		
<i>G. asiatica</i> ...	x		x	x	x	x		
<i>Clerodendrum neriiifolium</i> ...		x	x	x	x	x		x
<i>C. inerme</i> ...	x		x	x	x	x		
<i>C. deflexum</i> ...					x	x		
<i>C. disparifolium</i> ...					x	x		
<i>C. lankawiense</i> ...					x			
<i>C. penduliflorum</i> ...			x		x	x		
<i>C. umbratile</i> ...					x	x		
<i>C. venosum</i> ...			x					
<i>C. serratum</i> ...	x		x	x	x	x		
<i>C. paniculatum</i> ...		x	x	x	x	x		

TABLE I—continued.

	India	China (including Hainan)	British Indo- China (Burma & Assam)	French Indo-China	Malay Peninsula	Malay Archipelago	Philippines	Australia
<i>C. villosum</i> ...			x	x	x	x		
<i>C. infortunatum</i> ...	x		x	x	x	x		
<i>C. Garretianum</i> ...				x				
<i>C. Schmidtii</i> ...				x				
<i>C. glandulosum</i> ...			x		x	x		
<i>C. lasiocephalum</i> ...			x					
<i>C. fragrans</i> ...	x	x	x	x	x	x	x	
<i>C. indicum</i> ...	x	x	x	x	x	x		
<i>Vitex trifolia</i> ...	x	x	x	x	x	x	x	
<i>V. Negundo</i> ...	x	x		x	x	x	x	
<i>V. limoniifolia</i> ...			x	x				
<i>V. Pierrei</i> ...				x				
<i>V. canescens</i> ...		x		x				
<i>V. coriacea</i> ...			x		x	x		
<i>V. quinata</i> ...		x	x	x				
<i>V. heterophylla</i> ...		x	x		x	x	x	
<i>V. pubescens</i> ...	x		x	x	x	x		
<i>V. siamica</i> ...				x	x	x		
<i>V. glabrata</i> ...			x	x	x	x		x
<i>V. peduncularis</i> ...			x	x				
<i>V. longiseipala</i> ...					x			
<i>V. vestita</i> ...			x	x	x	x		
<i>V. gamosepala</i> ...					x	x		
<i>Caryopteris paniculata</i> ...		x	x					
<i>Glossocarya mollis</i> ...			x	x				
<i>G. premnoides</i> ...					x			
<i>G. siamensis</i> ...				x				
<i>Hymenopyramis brachiata</i> ...	x		x	x				
<i>H. cana</i> ...				x				
<i>H. siamensis</i> ...				x				
<i>Congea villosa</i> ...			x	x	x			
<i>C. tomentosa</i> ...				x				
<i>Symphorema involucreatum</i> ...	x		x	x				
<i>Sphenodesme involucreata</i> ...		x	x	x				
<i>S. microstylis</i> ...			x	x				
<i>S. triflora</i> ...				x	x			
<i>S. mekongensis</i> ...				x		x		
<i>S. pentandra</i> ...		x	x	x	x	x		
<i>Avicennia alba</i> ...	x		x	x				x
<i>A. sphaerocarpa</i> ...		x			x		x	
<i>A. officinalis</i> ...	x		x	x	x	x		
Total ...	26	23	56	36	48	42	14	6

are also flanked by such beds. Thirdly there are the remnants of plains on flat mountainous country on the higher levels of the land, as in North, North-Eastern and North-Western Siam.

PHYTOGEOGRAPHICAL REMARKS.

There are 22 genera of *Verbenaceae* in Siam. Apart from the two monotypic genera, *Paravitex* and *Garrettia*, *Lantana*, *Lippia*, *Verbena*, *Duranta*, *Stachytarpheta* and *Petraea* are represented by one or at most two species which are either introduced tropical American plants or plants which are more or less cosmopolitan in tropical, subtropical or even temperate regions. *Geunsia* is a small genus confined to Malaya. *Tectona*, *Congea*, *Symphorema*, *Sphenodesme* and *Glossocarya* are Indo-Malayan genera, though *Glossocarya* has a representative in Australia. *Hymenopyramis* is essentially Indian and Indo-Chinese in its distribution. On the other hand *Callicarpa*, *Premna*, *Gmelina*, *Clerodendrum*, *Vitex*, *Caryopteris* and *Avicennia* have a much wider distribution which extends through the warmer regions of the old and sometimes of the new world.

On the whole the members of the family are excellently equipped for distribution. No doubt many are distributed by birds. For example the blue succulent fruits and persistent coloured calyces of many *Clerodendrum*, the white pulpy fruits of *Callicarpa longifolia* and the coloured involucre bracts of *Congea* and *Sphenodesme* are probably adaptations for bird dispersal. Wind dispersal also plays a part, as witness the winged seeds of *Glossocarya*, the balloon-like utricle of *Hymenopyramis*, and in this case also the involucre bracts of *Sphenodesme* and *Congea*. Ocean currents too are important as seed distributors and the fruits of *Clerodendrum inerme*, *Clerodendrum nerifolium*, *Premna corymbosa*, and *Premna obtusifolia* are able to float for many hours because of the air filling one or sometimes more of the loculi of the fruit which are normally occupied by seeds. Also the distribution by ocean currents of the viviparous seedlings of *Avicennia* is well known. At the same time, some of the genera which are so excellently equipped for distribution contain the highest number of endemics, as for example *Hymenopyramis* and *Glossocarya* each with two out of five species and *Congea* with two out of four species endemic.

The distribution of the Siamese *Verbenaceae* in the neighbouring regions of India, China (including Hainan), British Indo-China (the term being used to include Burma and Assam), French Indo-China, Malay Peninsula, Malay Archipelago and the Philippines, is shown in Table I. When a species has a very wide distribution and extends to Australia—a coastal plant like *Clerodendrum nerifolium* for example—the fact is stated. No note is taken either of tropical American plants which have been imported and then quickly spread, or of varieties. In general it can be seen that there exists a close geographical affinity between the Siamese *Verbenaceae* and those of British Indo-China, Malay and French Indo-China, and

a less close affinity with those of India, China, and the Philippines. The table also shows that certain species are found in one region only outside Siam. Of these ten are found only in French Indo-China—*Callicarpa Poilanei*, *Premna dubia*, *Premna fulva*, *Clerodendrum Garrettianum*, *Clerodendrum Schmidtii*, *Vitex Pierrei*, *Glossocarya siamensis*, *Hymenopyramis cana*, *Hymenopyramis siamensis* and *Sphenodesme mekongensis*; six are found only in British Indo-China—*Callicarpa psilocalyx*, *Premna nana*, *Premna amplexans*, *Clerodendrum venosum*, *Clerodendrum lasiocephalum* and *Congea villosa*; and five are found only in the Malay Peninsula—*Callicarpa angustifolia*, *Clerodendrum lankawiense*, *Vitex siamica*, *Vitex longisepala* and *Glossocarya premnoides*.

TABLE II.
DISTRIBUTION IN SIAM OF THE MALAY PENINSULA SPECIES NOT
RECORDED IN BRITISH INDO-CHINA.

Species found in Malay Peninsula and not in British Indo-China.	Distribution in Siam.	North or South of line represented by Latitude 14°.
<i>Callicarpa Maingayi</i> ...	Surat, Puket, Nakawn Sritamarat.	S.
<i>Callicarpa angustifolia</i> ...	Puket	S.
<i>Callicarpa cana</i>	Payap, Nakawn Sawan, Prachinburi, Krungtep, Chantaburi, Rachaburi, Surat, Nakawn Sritamarat.	N. & S.
<i>Geunsia pentandra</i> ...	Rachaburi, Puket	S.
<i>Premna trichostoma</i> ...	Puket	S.
<i>Clerodendrum deflexum</i> ...	Pattani	S.
<i>Clerodendrum disparifolium</i>	Payap, Maharat, Prachinburi, Ayuthia, Krungtep, Puket, Pattani.	N. & S.
<i>Clerodendrum Lankawiense</i>	Surat, Puket	S.
<i>Clerodendrum umbratile</i> ...	Surat, Pattani	S.
<i>Vitex Negundo</i>	Nakawn Sawan, Krungtep, Puket, Pattani.	N. & S.
<i>Vitex siamica</i>	Rachaburi, Surat, Puket ...	S.
<i>Vitex longisepala</i>	Pattani	S.
<i>Vitex gamosepala</i>	Pattani	S.
<i>Glossocarya premnoides</i> ...	Rachaburi, Surat	S.
<i>Sphenodesme triflora</i> ...	Puket, Pattani	S.
<i>Avicennia sphaerocarpa</i> ...	Prachinburi, Nakawn Chaisi, Rachaburi, Surat, Puket.	S.

It is interesting to compare briefly, the distribution within Siam of these three floristic elements. For this purpose Siam may conveniently be divided into five regions, the division being based as far as possible on natural features:

1. NORTHERN SIAM—including the circles of Payap, Maharat, Nakawn Sawan, Pitsanulok.

2. **EASTERN SIAM**—including the circles of Udawn, Roi Et, Ubon, Rachasima.

3. **SOUTHERN SIAM**—including the circles of Chantaburi, Prachinburi, Ayuthia, Krungtep, Nakawn Chaisi.

4. **WESTERN SIAM**—including the circle of Rachaburi.

5. **PENINSULAR SIAM**—including the circles of Surat, Puket, Nakawn Sritamarat, Pattani.

Of the French Indo-Chinese species, seven are to be found in Northern Siam, seven in Southern Siam, four in Eastern Siam, two in Western Siam and none in Peninsular Siam. Thus there are two main areas of concentration of French Indo-Chinese species, Northern and Southern Siam, and two subsidiary areas—Eastern and Western Siam.

Of the British Indo-Chinese species, four are found in Northern Siam, and one each in Southern, Western and Peninsular Siam. Thus British Indo-Chinese species are concentrated in Northern Siam.

The Malay Peninsular species are restricted to Peninsular and Western Siam with all five species in Peninsular and two of the species in Western Siam.

If a species does not occur in British Indo-China and yet occurs in the Malay Peninsula, its distribution in Siam is almost invariably confined to the west, the south, or the Peninsula. Table II shows the distribution in Siam of such species. In general Prachinburi, Krungtep and Nakawn Chaisi would seem to be the northern limit of these Malay Peninsular species which are not found in British Indo-China. There are three exceptions. *Callicarpa cana* and *Vitex Negundo* are found as far north as Payap and Nakawn Sawan respectively, and although not in British Indo-China they are in French Indo-China from whence they probably came to Payap and Nakawn Sawan. *Clerodendrum disparifolium* is a cultivated plant and this may account for its being found as far north as Payap. Apart from these three exceptions it would seem to be possible to draw a line representing the northern limit of Peninsular species. Such a line could be shown by latitude 14°N. The same would apply to Malay Archipelago species which are, with few exceptions, the same as the Peninsula ones.

KEY TO GENERA.

Inflorescence spicate or racemose (Tribe I. *Verbeneae*) :

Inflorescence spicate :

Fertile stamens 4 ; anther cells parallel :

Spikes short ; inflorescence capituliform in flower :

Fruit a drupe with 2 bony pyrenes.....**Lantana**

Fruit dry, separating into two 1-seeded pyrenes.....**Lippia**

Spikes long, inflorescence distinctly spicate at all stages :

Fruit with four 1-seeded pyrenes.....**Verbena**

Fruit with four 2-seeded pyrenes.....**Durant**

Fertile stamens 2 ; anther cells divaricate ; spikes long.....

Stachytarpheta

Inflorescence racemose.....**Petreaea**

Inflorescence cymose :

Cymes paniculate :

Fruit fleshy (Tribe II. *Viticeae*) :

Corolla regular ; stamens isomerous :

Flowers 4-merous ; drupe with 4 pyrenes.....**Callicarpa**

Flowers 4- to 6-merous :

Flowers 5-merous ; calyx not accrescent in fruit ;
drupe with 4-10 pyrenes.....**Geunsia**

Flowers 4- to 6-merous ; calyx accrescent in fruit ;
drupe with 14-celled endocarp.....**Tectona**

Corolla bilabiate ; stamens didynamous :

Anthers opening by a circular pore.....**Premna**

Anthers opening by longitudinal slits :

Fruit with 1 pyrene :

Flowers large, up to 3 cm. long ; calyx usually with
large glands.....**Gmelina**

Flowers small not exceeding 1 cm. in length ; calyx
without large glands :

Pyrene 2-4-celled, 2-4-seeded ; leaves digitate
(except one variety).....**Vitex**

Pyrene 1-celled, 1-seeded (3 rudimentary cells) ;
leaves simple.....**Paravitex**

Fruit with 4 pyrenes.....**Clerodendrum**

Fruit capsular (Tribe III. *Caryopterideae*) :

Cymes axillary :

Calyx deeply 5-fid ; stamens greatly exsert ; leaves always
simple**Caryopteris**

Calyx 5-toothed or almost entire ; stamens slightly exsert ;
leaves often compound... ..**Garrettia**

Cymes terminal :

Panicle dense, corymbiform ; calyx not accrescent in
fruit**Glossocarya**

Panicle lax, pyramidal ; calyx greatly accrescent in fruit...
Hymenopyramis

Cymes capitate :

Cymes involucrate ; calyx 4- to 6-dentate (Tribe IV.
Symphoremeae) :

Involucral bracts 3-4 ; corolla 2-lipped, 5-lobed.....**Congea**

Involucral bracts 6 :

Corolla 6- to 8-lobed ; leaves usually dentate, **Symphorema**

Corolla 5- to 6-lobed ; leaves entire.....**Sphenodesme**

Cymes not involucrate ; calyx of 5 imbricate sepals (Tribe V.
Avicenniae)**Avicennia**

KEY TO SPECIES AND ENUMERATION.*

TRIBE I. VERBENEAE

Lantana Linn.

Branchlets with prickles; bracts ovate, about half as long as the corolla tube(1) *L. aculeata*

Branchlets without prickles; bracts lanceolate, as long as the corolla tube.....(2) *L. salviifolia*

(1) *L. aculeata* Linn. Sp. Pl. 627 (1753); Brand. Ind. Trees, 502; K. and G. Mat. 796; Lam Verb. 12; Ridl. F. M. P. 612. *L. camera* Linn.; C. B. Clarke in F. B. I. 562, *in nota*; P'ei Verb. 9; Dop in F.I.C. 779; F.K.C. 171; Craib 162. *L. mixta* Linn.; Kurz For. Fl. 253.

PAYAP. Chiangmai, 300 m., waste ground, *Kerr* 711. PRACHIN-BURI. Sriracha, c. 5 m., *Mrs. D. J. Collins* 63. KRUNGTEP. Bangkok, *Marcan* 502. *Zimmermann* 33, 170. SURAT. Ban Na, *Yuang* 10. PUKET. Satul, La-Ngu, c. 5 m., common on waste ground, but not a serious pest, *Kerr* 13942. Collected on a journey from Tavoy to Bangkok, common Siamese plant, *Chandler*.

Distribution. Native of Tropical America and now widely spread in many regions of the Old World.

(2) *L. salviifolia* Jacq. Hort. Schoenbr. 3, 18, t. 285 (1798); K. and G. Mat. 786; Lam Verb. 13. *L. indica* Roxb.; C. B. Clarke in F.B.I. 562; Brand. Ind. Trees 502; Craib 162; Ridl. F.M.P. 612; Dop in F.I.C. 778.

PAYAP. Me Ping, Muang Hat, c. 240 m., *Kerr* 2014.

Distribution. India (*type*), Burma, Ceylon, Cambodia (ex F.I.C.). Tropical and South Africa.

Lippia Linn.

L. nodiflora Rich. in Michx. Fl. Bor. Amer. 2, 15 (1803); C. B. Clarke in F.B.I. 563; Brand. Ind. Trees 503; Williams 430; K. and G. Mat. 797; Lam Verb. 16; Ridl. F.M.P. 612; P'ei Verb. 10; Dop in F.I.C. 780.

UDAWN. Nakawn Panom, Muk Dahan, c. 200 m., sandbank in river, *Kerr* 21414. KRUNGTEP. Bangkok, tidal, railway embankment, *Kerr* 3702. *Marcan* 477, 1721. *Zimmermann* 163. PUKET. Krabi, Lanta, open grassy ground near sea, *Kerr* 18867. NAKAWN SRITAMARAT. Songkla, Singora, *Annandale* 1682.

Distribution. Tropical America (*type*). Introduced into Tropical Asia.

Verbena Linn.

V. officinalis Linn. Sp. Pl. 20 (1753); Schauer in DC. Prodr. 11, 547; C. B. Clarke in F.B.I. 565; Lam Verb. 10; P'ei Verb. 7; Dop in F.I.C. 777.

* The abbreviated references cited are given in full in the bibliography at the end of the paper (p. 444). In the enumeration they are cited in chronological order.

PAYAP. Chiangdao, Muang Kawng, c. 1400 m., *Kerr* 5539. UDAWN. Chaibaburi, Nawngkai, c. 200 m., sandbank, *Kerr* 20695.

Distribution. Cosmopolitan in tropical, subtropical and temperate regions.

Duranta Jacq.

D. Plumieri Jacq. Select. Am. 186, t. 176, f. 76 (1763); C. B. Clarke in F.B.I. 560 (*in nota*); K. and G. Mat. 795; Craib 163. Lam Verb. 27; Dop in F.I.C. 784.

PAYAP. Chiangmai, Ban Nawng Hoi, c. 300 m., a big armed shrub cultivated as a hedge plant, *Winit* 252. KRUNGTEP. Bangkok, *Zimmerman* 11, 133, 159.

Distribution. Native of Trop. America, often cultivated in the tropics.

Stachytarpheta Vahl

S. jamaicensis Vahl Enum. 1, 206 (1805); K. and G. Mat. 798; Ridl. i. 155; Lam Verb. 22; Ridl. F.M.P. 613; P'ei Verb. 11; Dop in F.I.C. 783. *S. indica* Vahl; C. B. Clarke in F.B.I. 564; F.K.C. 171; Williams 430.

NAKAWN SAWAN. Raheng, Ban Tak, c. 120 m., waste ground, *Kerr* 2171. KRUNGTEP. Bangkok, c. 20 m., *Smith* 211. SURAT. Chumpawn, Bang Son, c. 20 m., common in scrub and savannah, *Kerr* 11345. PUKET. Trang, Kao Kao, railroad, *Rabil* 381. Satul, very common (ex *Ridl.*). NAKAWN SRITAMARAT. Songkla, Lam Son, near sea coast, waste ground all over Southern provinces, *Kerr* 15137.

Distribution. Indo-Malaya. Tropical America (*type*—Jamaica).

Petreaea Linn.

P. volubilis Linn. Sp. Pl. 626 (1753); Lam Verb. 26.

MAHARAT. Lampang, c. 240 m., cultivated, *Winit* 1602. KRUNGTEP. Bangkok, cultivated, *Kerr*.

Distribution. Native of Trop. America, and introduced into Malaya.

TRIBE II. VITICEAE

Callicarpa Linn.

Glands on the lower surface of the leaf hidden by the dense tomentum:

Tomentum soft, closely stellate:

Leaves at least 2½ times as long as broad, taperingly acuminate at the apex, long-acute or cuneate at the base.....

(1) *C. arborea*

Leaves generally 1½ times, at most twice as long as broad, caudate acuminate at the apex, almost round and then slightly decurrent at the base.....(2) *C. arborea* var. *villosa*

Tomentum minute, adpressed:

Leaves elliptic to obovate, obtuse or very shortly acuminate at the apex; corolla with a close grey stellate tomentum without(3) *C. Maingayi**

Leaves elliptic to oblong-elliptic, long acuminate :
 Leaves shortly tapering at the base ; cymes many-flowered...
 (4) *C. Poilanei*
 Leaves narrowly round or cuneate at the base ; cymes few-flowered.....(5) *C. angustifolia*
 Glands on the lower surface of the leaf not hidden by the dense tomentum which is sometimes absent :
 Leaves at most twice as long as broad :
 Midrib glabrous above, leaf dark tawny below, leaf base rounded or at most only slightly tapering, margin entire or occasionally very slightly toothed.....(6) *C. lanata*
 Midrib covered with stellate hairs above, leaf base tapering into the petiole, leaf light-grey below, margin serrate.....
 (7) *C. cana*
 Leaves at least twice as long as broad :
 Leaves stellately tomentose below :
 Leaves cuneate at the base, petiole 15–25 mm. long.....
 (8) *C. macrophylla*
 Leaves deltoid or cordate at the base, petiole at most 5 mm. long.....(9) *C. rubella*
 Leaves sparsely stellately hairy or almost glabrous below :
 Leaves with numerous red glands above and below.....
 (10) *C. glandulosa*
 Leaves with numerous yellow glands above and below :
 Ovary tufted with white hairs at the tip :
 Leaves very thinly stellately hairy below.....
 (11) *C. longifolia*
 Leaves glabrous below, except the midrib and the lateral nerves.....(12) *C. longifolia* var. *lanceolaria*
 Ovary glabrous ; leaves glabrous below except for stellate hairs on the midrib and the lateral nerves.....
 (13) *C. psilocalyx*
 (1) *C. arborea* Roxb. Hort. Beng. 10 (1814), and Fl. Ind. 1, 390 (1832) ; Kurz For. Fl. 274 ; C. B. Clarke in F.B.I. 567 ; Brand. Ind. Trees 511 ; K. and G. Mat. 803 ; Craib 163 ; Ridl. iv. 110 ; Ridl. F.M.P. 614 ; P'ei Verb. 21 ; Dop in F.I.C. 792. *C. villosissima* Ridl. iv. 110. *C. tomentosa* Bakh. Verb. 20, non Linn.
 PAYAP. Doi Sutep, c. 900 m., deciduous forest, *Kerr* 691. MAHARAT. Pre, Hui Paknai, c. 210 m., *Vanpruk* 321. PRACHINBURI. Sriracha, Kao Chalak, c. 12–120 m., *Mrs. D. J. Collins* 1251, 1454. RACHABURI. Kanburi, Hin Dat, *Put* 48. SURAT. Chumpawn, Bang Son, c. 20 m., savannah, *Kerr* 11326. Tasan, *Kloss* 6851 (type of *C. villosissima* Ridley). Surat, Kantuli, *Put* 4112. PUKET. Ranawng, Lam Lieng, c. 10 m., scrub, *Kerr* 16419. Puket, Khaw Pok Hill, c. 300 m., *Haniff et Nur* 3824. Trang, Bangram, 100 m., *Vanpruk* 745. Satul, Tung Wa, c. 10 m., savannah, *Kerr* 13887. PATTANI. Pattani, Banang Sta, c. 50 m., savannah, *Kerr* 7887. SIAM. *Kerr* 182.

Distrib. India, British Indo-China (type—Chittagong), Yunnan, French Indo-China, Malaya.

(2) *C. arborea* Roxb. var. *villosa* (Roxb.) King et Gamble Mat. 803 (1909) ; Ridl. F.M.P. 614, in nota. *C. villosa* Roxb. Hort. Beng. 10 (1814). *C. lanata* Lam Verb. 79, pro parte, non Linn.

PAYAP. Doi Saket, North Plateau, c. 1000 m., *Hosseus* 618. PATTANI. Pattani, Tomo, Ban Kaung, c. 90 m., *Lakshnakara* 838. *Distrib.* Malay Peninsula, Sylhet (type).

(3) *C. Maingayi* King et Gamble in Kew Bull. 106 (1908) and Mat. 804 ; Lam Verb. 63 ; Ridl. F.M.P. 615. *C. tomentosa* Murr. var. *typica* Bakh. Verb. 21 (1921).

SURAT. Surat, Ban Kawp, c. 100 m., evergreen forest on limestone hill, *Kerr* 13363. PUKET. Puket, Talang, c. 50 m., evergreen forest by stream, *Kerr* 17438. Trang, Chawng, c. 100 m., evergreen forest, *Kerr* 15191. NAKAWN SRITAMARAT. Tung Song, Ao Wang Kram, valley, *Rabil* 208.

Distrib. Malay Peninsula (type—Malacca), Sumatra, Philippines (ex *Bakhuizen*).

(4) *C. Poilanei* Dop in Trav. Lab. forestier Toulouse, 1, art. 21, p. 6 (1932) ; F.I.C. 790.

CHANTABURI. Chantabun, Kao Sabap, *Put* 901. PRACHINBURI. Krabin, Ban Keng, c. 25 m., evergreen forest, *Kerr* 19788.

Distrib. French Indo-China (type) (ex F.I.C.).

(5) *C. angustifolia* King et Gamble in Kew Bull. 106 (1908) and Mat. 804 ; Ridl. i. 155 ; Ridl. F.M.P. 615.

PUKET. Krabi, Ao Luk, c. 50 m., scrub on limestone rock, *Kerr* 18578. Langkawi, *Wilkinson* 20778. *Henderson* 29152. *Ridley* 8330.

Distrib. Malay Peninsula (type).

(6) *C. lanata* Linn. Mant. 1, 331 (1771) ; C. B. Clarke in F.B.I. 567 ; Brand. Ind. Trees 512 ; Hoss. 429 ; Lam Verb. 79, pro parte. *C. tomentosa* Murr. var. *lanata* (Linn.) Bakh. Verb. 21 (1921).

MAHARAT. Nan, Nam Mut, c. 300 m., *Winit* 1773. Lampang, Me Peng, 150 m., evergreen forest, *Winit* 1701.

Distrib. India (type—Ceylon), Burma, Malay Archipelago, Philippines (ex *Lam*).

(7) *C. cana* Linn. Mant. 1, 198 (1771) ; C. B. Clarke in F.B.I. 568 ; F.K.C. 171 ; Williams 430 ; K. and G. Mat. 806 ; Ridl. i. 155 ; Craib 163 ; Lam Verb. 68 ; Ridl. F.M.P. 616 ; P'ei Verb. 25 ; Dop in F.I.C. 793. *C. cana* Linn., var. *typica* Bakh. Verb. 20 (1921).

PAYAP. Chiangmai, c. 300 m., scrub jungle, *Kerr* 1226. NAKAWN SAWAN. Chainat, *Put* 2645. CHANTABURI. Kaw Chang, Lem Ngawp, *Schmidt* 5. PRACHINBURI. Sriracha, c. 5 m., roadside shrub, *Mrs. D. J. Collins* 1252. KRUNGTEP. Bangkok, below 5 m., growing in temple grounds but said to be spontaneous, *Kerr* 4287.

RACHABURI. Kanburi, Hin Dat, *Put* 116. Pran, 5 m., *Marcan* 630. *Ladell* 274. SURAT. Kaw Samui, Ban Bua Put, under 5 m., scrub, *Kerr* 15712. Surat, Kantuli, *Put* 4201. PUKET. Trang, Chawng, c. 120-240 m., *Mrs. D. J. Collins* 2400. NAKAWN SRITAMARAT. Tung Song, Kao Namhom Keo, *Rabil* 236. SIAM. 398. *Kerr* 4287.

Distrib. India, French Indo-China, Malaya (*type*—Java), Hainan, N. Australia.

(8) *C. macrophylla* Vahl Symb. 3, 13, t. 53 (1794); Kurz For. Fl. 274; C. B. Clarke in F.B.I. 568; Brand. Ind. Trees 512; Bakh. Verb. 25; P'ei Verb. 23; Dop in F.I.C. 795.

PAYAP. Chiengrai, 460 m., gregarious in waste places about villages, *Winit* 1152.

Distrib. N. India (*type*), China, British Indo-China, Tonkin, Annam (ex F.I.C.), N. Guinea, Mascarenes, Reunion.

(9) *C. rubella* Lindl. Bot. Reg. t. 883 (1825); Kurz For. Fl. 274; C. B. Clarke in F.B.I. 569; Brand. Ind. Trees 512; Lam Verb. 53; P'ei Verb. 38; Dop in F.I.C. 796. *C. cuspidata* Roxb.; Bakh. Verb. 23, *pro parte, quoad syn. C. rubella*.

PAYAP. Chiengdao, Muang Kawng, c. 1400 m., *Kerr* 5541. Doi Angka, Doi Pa Mawn, c. 1320 m., *Garrett* 1028. PITSANULOK. Sukotai, Kao Luang, c. 1000 m., evergreen forest, *Kerr* 5934. CHANTABURI. Krat, Kao Kuap, *Put* 3028. PUKET. Krabi, Panom Bencha, c. 1300 m., *Kerr* 19384.

Distrib. E. Himalaya, China (*type*), Indo-China, Malay Archipelago (ex *Lam*).

(10) *C. glandulosa* Fletcher in Kew Bull. 199 (1938).

SURAT. Chumpawn, Ta Ngaw, c. 50 m., by stream in evergreen forest, *Kerr* 11469 (*type*).

(11) *C. longifolia* Lamk. Dict. 1, 563 (1785) and Ill. t. 69; Kurz For. Fl. 275; C. B. Clarke in F.B.I. 570; Brand. Ind. Trees 512; F.K.C. 171; Williams, 430; K. and G. Mat. 807; Ridl. i. 155; Ridl. iii. 165; Lam Verb. 86; Bakh. Verb. 26; Ridl. F.M.P. 616; P'ei Verb. 30; Dop in F.I.C. 802.

CHANTABURI. Kaw Chang, *Schmidt* 861. PUKET. Satul, *Lakshnakara* 326. Langkawi, *Curtis* 2134. RACHABURI. Bangtapan, *Keith* (ex *Ridl.*). NAKAWN SRITAMARAT. Songkla, Lem Son, scrub near sea, *Kerr* 15123. Kaw Lem Soon, *Annandale*. Nakawn, Kuan Mai Deng, c. 100 m., *Vanpruk*, 712. Rawnpibun, *Hill* 470. PATTANI. Pattani, Tomo, Bukit Nasi, c. 90 m., *Lakshnakara* 326. Naratiwat, Sungai Padi, *Bourke*.

Distrib. Indo-China, Malaya (*type*—Malacca), N. Australia.

(12) *C. longifolia* Lamk. var. *lanceolaria* C. B. Clarke in F.B.I. 570 (1885). *C. longifolia* Lamk. var. *subglabrata* Schauer; Lam Verb. 87 (1919); Bakh. Verb. 26.

MAHARAT. Lampang, Me Salop, secondary growth forest, *Winit* 1465. CHANTABURI. Chantabun, Kao Sabap, *Put* 924.

Kaw Chang, near sea level, *Vanpruk* 962. *Vanpruk* 5568. Kaw Chang, c. 50 m., stream side, *Marcan* 1250. SURAT. Langsuan, Ban Kraye, c. 50 m., scrub, *Kerr* 12114.

Distrib. British Indo-China (*type*—Sylhet), Malay Archipelago (ex *Bakhuizen*).

(13) *C. psilocalyx* C. B. Clarke in F.B.I. 569 (1885); Brand. Ind. Trees 512. *C. cuspidata* Roxb.; Bakh. Verb. 23, *pro parte, quoad syn. C. psilocalyx*.

PRACHINBURI. Sriracha, Hup Bon, c. 60 m., *Mrs. D. J. Collins* 1667. Ban Dan, evergreen forest, *Marcan* 149.

Distrib. Burma (*type*).

Geunsia Blume.

G. pentandra (Roxb.) Merrill in Phil. Journ. Sc. Bot. 11, 309 (1916). *G. farinosa* Blume; C. B. Clarke in F.B.I. 566 (1885); K. and G. Mat. 801; Ridl. i. 155; Ridl. F.M.P. 614. *G. farinosa* var. *typica* forma *farinosa* (Blume) Bakh. Verb. 13 (1921).

RACHABURI. Bangtapan, *Keith* (ex *Ridl.*). PUKET. Langkawi, *Curtis* 2532.

Distrib. Malaya, Philippines.

Tectona Linn. f.

T. grandis Linn. f. Suppl. 151 (1781); Kurz For. Fl. 259; C. B. Clarke in F.B.I. 570; Brand. Ind. Trees 505; F.K.C. viii. 172; Williams 430; K. and G. Mat. 809; Craib 163; Lam Verb. 95; Ridl. F.M.P. ii. 607, *in nota*; Dop in F.I.C. 804.

PAYAP. Chiengmai 24. Doi Sutep, c. 330 m., mixed forest, *Kerr* 1297. KRUNGTEP. Bangkok, *Marcan* 957.

Distrib. India (*type*), Burma, French Indo-China, Malaya.

Premna Linn.

Calyx 2-lipped; lips entire or upper lip 2-toothed, lower lip subentire:

Lips entire:

Cymes condensed, forming an interrupted spike-like panicle... (1) *P. racemosa*

Cymes forming a compound corymb:

Leaves firmly chartaceous, strongly pubescent along the petiole groove.....(2) *P. coriacea* var. *oblonga*

Leaves membranous, glabrous or faintly pubescent along the petiole groove.....(3) *P. scandens*

Upper lip distinctly 2-toothed, lower lip subentire:

Calyx markedly pubescent within.....(4) *P. dubia*

Calyx glabrous or at most only faintly pubescent within:

Leaves elliptic to obovate, mucronate.....(5) *P. Garretii*

Leaves ovate to elliptic or oblong:

Leaves villous beneath, ovate to elliptic.....(6) *P. villosa*

Leaves glabrous beneath, except for local hairs:

Leaves generally cordate at the base :
 Leaves ovate to oblong-elliptic, taperingly acuminate at the apex.....(7) *P. cordifolia*
 Leaves almost orbicular, broadly obtuse at the apex... (11) *P. corymbosa* var. *obtusifolia*
 Leaves often round, but never cordate at the base :
 Corymbs up to 18 cm. broad :
 Leaf margin generally repand above.....(8) *P. foetida*
 Leaf margin entire :
 Leaves obovate or orbicular.....(9) *P. trichostoma*
 Leaves oblong-ovate.....(10) *P. corymbosa*
 Corymbs up to 3 cm. broad :
 Leaves at least 3 cm. long, with a line of hairs along either side of the basal half of the midrib below.....(12) *P. corymbosa* var. *angustior*
 Leaves at most 2 cm. long, glabrous below except for a few pubescent hairs on the midrib..... (13) *P. corymbosa* var. *minor*
 Calyx 2-lipped, sometimes obtusely so, of 5-4 teeth :
 Calyx of 5 teeth, lower lip 2-toothed, upper lip 3-toothed :
 Plants with stellate hairs.....(14) *P. pyramidata*
 Plants with simple hairs :
 Corymbs rather lax :
 Leaves setulose above, the hairs more numerous on the nerves :
 Leaves strongly or faintly pubescent below, the hairs very short and adpressed.....(15) *P. Collinsae*
 Leaves villous below, sometimes pubescent, but then the hairs longer than in *P. Collinsae*, curly and slightly spreading :
 Leaves villous below, and with numerous short hairs on the nerves above.....(16) *P. flavescens*
 Leaves pubescent below, with larger, more tawny hairs on the nerves above :
 Hairs on the lower surface short, leaf margin irregularly toothed.....
 (17) *P. flavescens* var. *glabrior*
 Hairs on the lower surface longer and more spreading, dark tawny, margin always toothed
 (18) *P. fulva*
 Leaves minutely tomentose or glabrous except for a faint pubescence on the midrib above and below :
 Leaf base shallowly cordate, round or slightly cuneate... (19) *P. latifolia*
 Leaf base always cuneate :
 Leaves minutely tomentose beneath.....
 (20) *P. latifolia* var. *cuneata*
 Leaves minutely pubescent on the midrib above and below.....(21) *P. latifolia* var. *mucronata*

Corymbs smaller and more compact :
 Leaves very hairy on both surfaces.....(22) *P. nana*
 Leaves glabrous or minutely pubescent on both surfaces :
 Leaves ovate, cordate, lower surface conspicuously glandular(23) *P. serrata*
 Leaves ovate to elliptic to oblong to obovate :
 Leaves sharply serrate, narrowly round at the base... (24) *P. amplexans*
 Leaves mostly entire, occasionally with a few teeth towards the apex, or lobed :
 Leaves entire :
 Branchlets glabrous at the nodes :
 Leaves elliptic to obovate to oblong-elliptic... (25) *P. herbacea*
 Leaves ovate to elliptic.....(26) *P. paniculata*
 Branchlets with a ring of hairs at the nodes..... (27) *P. annulata*
 Leaves lobed.....(28) *P. repens*
 Calyx with 4 teeth, upper and lower lips each of 2 teeth :
 Leaves thickly tomentose beneath, cordate...(29) *P. siamensis*
 Leaves glabrous beneath except for axillary tufts and short hairs on either side of the midrib at the base, round at the base (30) *P. quadridentata*
 (1) *P. racemosa* Wall. ex Schauer in DC. Prodr. 11, 633 (1847) ; Kurz For. Fl. 263 ; C. B. Clarke in F.B.I. 571 ; Brand. Ind. Trees 509.
 PAYAP. Doi Pa Kao, c. 1500 m., common in evergreen forest, Kerr 5379.
 Distrib. British Indo-China (type—Sylhet), Yunnan.
 (2) *P. coriacea* C. B. Clarke var. *oblonga* C. B. Clarke in F.B.I. 573 (1885).
 PAYAP. Chawm Tawng, Me Kang, c. 600 m., on rocks by stream, deciduous forest, Kerr 5353. PITSANULOK. Nakawn Tai, c. 500 m., mixed forest, Kerr 5815. UDAWN. Nawngkai, Chaiyaburi, c. 200 m., deciduous forest, Kerr 21322.
 Distrib. N.E. India, British Indo-China (type—Khasia).
 (3) *P. scandens* Roxb. Fl. Ind. 3, 82 (1832) ; Kurz For. Fl. 262 ; C. B. Clarke in F.B.I. 573 ; Brand. Ind. Trees 510 ; Dop in F.I.C. 817.
 PAYAP. Chawm Tawng, Me Kang, c. 450 m., common on trees along stream, Kerr 5272.
 Distrib. N.E. India, British Indo-China (type—Sylhet), Cochinchina (ex F.I.C.), Yunnan.
 (4) *P. dubia* Craib in Kew Bull. 283 (1914) ; Dop in F.I.C. 812.
 MAHARAT. Lampang, scrub jungle, c. 225 m., Kerr 2562 (type). PRACHINBURI. Sriracha, c. 10 m., Mrs. D. J. Collins 765. RACHABURI. Prachuap, Hui Yang, Put 3228.
 Distrib. Laos, Annam (ex F.I.C.).

(5) *P. Garrettii* Fletcher in Kew Bull. 200 (1938).

PAYAP. Chiengrai, Doi Tam Tu Pu, summit West Peak, c. 530 m. limestone rock, *Garrett* 296 (type).

(6) *P. villosa* C. B. Clarke in F.B.I. 573 (1885); Brand. Ind. Trees 510

PAYAP. Chiengrai, below Dai Tam Tu Pu, edge of old Me Kok bed, c. 380 m., *Garrett* 224. Chiengrai, c. 430 m., open swampy forest, *Winit* 1160. Doi Suteh, c. 65 m., mixed forest, *Kerr* 3258. MAHARAT. Nan, c. 220 m., lower mixed forest, *Winit* 1779.

Distrib. Deccan Peninsula (type—Kurg Mountains), Yunnan.

(7) *P. cordifolia* Roxb. Fl. Ind. 3, 78 (1832); C. B. Clarke in F.B.I. 572; Brand. Ind. Trees 510; K. and G. Mat. 818; Ridl. i. 156; Lam Verb. 111; Ridl. F.M.P. 621; Dop in F.I.C. 816.

NAKAWN SRITAMARAT. Songkla, Ban Prakawp, c. 50 m., scrub, *Kerr* 15827. PATTANI. Pattani, Banang Sta, c. 100 m., scrub jungle, *Kerr* 7370.

Distrib. Assam, Malay Peninsula (type—Penang), French Indo-China (ex F.I.C.).

(8) *P. foetida* Reinw. ex Blume Bijdr. 816 (1825); K. and G. Mat. 814; Ridl. i. 155; Ridl. F.M.P. 619; *P. integrifolia* Lam Verb. 140 (1919) *pro parte*, non Linn.

NAKAWN SRITAMARAT. Songkla, Kaw Deng, *Annandale*. Lower Siam, Punjab, *Haniff et Nur* 3987.

Distrib. Java, Borneo.

(9) *P. trichostoma* Miq. Fl. Ind. Bat. 2, 892 (1856); K. and G. Mat. 816; Lam Verb. 128; Ridl. F.M.P. 620. *P. parasitica* C. B. Clarke in F.B.I. iv. 574 (1885), non Blume; Brand. Ind. Trees 510; Ridl. i. 155; Ridl. ii. 58.

PUKET. Langkawi, *Curtis* 2796. Pulau Adang, *Ridley* 15855.

Distrib. Java, Borneo, Malay Peninsula.

(10) *P. corymbosa* (Burm. f.) Rottl. et Willd. in Ges. Nat. Fr. Neue Schr. 4, 187, 188 (1803); C. B. Clarke in F.B.I. 573; *P. integrifolia* Linn. Mant. 2, 252 (1771); C. B. Clarke in F.B.I. 574; Brand. Ind. Trees 510; F.K.C. 172; Williams 431; Craib 164; Lam Verb. 140 *pro parte*; Ridl. F.M.P. 618; Dop in F.I.C. 818. *P. serratifolia* Linn. Mant. 2, 253 (1771); Kurz For. Fl. 262. *Cornutia corymbosa* Burm. f. Fl. Ind. 132, t. 41, f. 1 (1768).

CHANTABURI. Krat, *Put* 502. Kaw Chang, Klawng Mayom, grassy land near stream, *Rabil* 27. Kaw Lom, *Schmidt* 716. Kaw Chang, near sea-level, *Vanpruk* 956. PRACHINBURI. Sriracha, beach, *Kerr* 2099. Mrs. D. J. Collins 249. KRUNGTEP. Bangkok, tidal, river bank, *Kerr* 3681. *Marcan* 985. RACHABURI. Nawng Ke forest, c. 5 m., Mrs. D. J. Collins 1604. Ban Cha Am, c. 2 m., scrub jungle, *Marcan* 1680. PUKET. Satul, Adang, beach, *Kerr* 14076.

Distrib. Tropical Asia (type—Ceylon), Australia, Africa.

(11) *P. corymbosa* (Burm. f.) Rottl. et Willd. var. *obtusifolia* (R. Br.) Fletcher in Notes Roy. Bot. Gard. Edinb. 19, 178 (1936). *P. integrifolia* Linn. var. *obtusifolia* (R. Br.) P'ei Verb. 75 (1932); Dop in F.I.C. 820. *P. integrifolia* Linn.; Lam Verb. 140, *pro parte*. *P. obtusifolia* R. Br. Prodr. 512 (1827); F.K.C. 172; Williams 431.

KRUNGTEP. Bangkok, tidal river bank, *Kerr* 3681. RACHABURI. Nawng Ke forest, c. 5 m., Mrs. D. J. Collins 1604.

Distrib. Malay Archipelago, Australia (type).

(12) *P. corymbosa* (Burm. f.) Rottl. et Willd. var. *angustior* (C. B. Clarke) Fletcher in Notes Roy. Bot. Gard. Edinb. 19, 178 (1936). *P. integrifolia* Linn. var. *angustior* C. B. Clarke in F.B.I. 572 (1885); K. and G. Mat. 813; Ridl. i. 155; Dop in F.I.C. 819. *P. angustior* (C. B. Clarke) Ridl. F.M.P. 619 (1923).

RACHABURI. Prachuap, *Put* 260. PUKET. Langkawi, *Curtis* (ex Ridl.).

Distrib. Malay Peninsula (type—Malacca).

(13) *P. corymbosa* Linn. var. *minor* (Ridley) Fletcher in Notes Roy. Bot. Gard. Edinb. 19, 178 (1936). *P. integrifolia* Linn. var. *minor* Ridl. F.M.P. 619 (1923).

PUKET. Puket, Lem La, branches prostrate, in sand by sea, *Kerr* 17395.

Distrib. Mergui, Ceylon, Pahang (type).

(14) *P. pyramidata* Wall. ex Schauer in DC. Prodr. 11, 633 (1847); C. B. Clarke in F.B.I. 576; Brand. Ind. Trees 510; K. and G. Mat. 822; Lam Verb. 155; Ridl. F.M.P. 622. *P. tomentosa* Kurz For. Fl. 260 (1877).

PAYAP. Chiengdao, Muang Kawng, c. 600 m., mixed forest by stream, *Kerr* 5529. Me Teng, c. 400 m., mixed forest by stream, *Kerr* 5632. Lampun, Me Kaw, upper mixed forest, *Winit* 414. NAKAWN SAWAN. Kampengpet, Me Klawng, c. 500 m., mixed deciduous forest, *Kerr* 6138. RACHABURI. Kanburi, Baw Re, *Put* 208. Prachuap, Bangtapan, 15 m., moist mixed forest, *Winit* 572. Prachuap, Kao Luang, c. 400 m., evergreen forest, *Kerr* 11012. SURAT. Surat, Kanchanadit, c. 5 m., scrub, *Kerr* 13117. PUKET. Langkawi, *Curtis* 2552. PATTANI. Pattani, Bukit, c. 50 m., evergreen forest, *Kerr* 7109.

Distrib. Burma (type), Malaya.

(15) *P. Collinsae* Craib in Kew Bull. 283 (1914); Dop in F.I.C. 812.

MAHARAT. Lampang, Me Kang, c. 230–330 m., shady banks of stream, *Winit* 1405, 729. Me Peng, c. 150 m., village scrub, *Winit* 1934. NAKAWN SAWAN. Kampengpet, c. 50 m., mixed deciduous forest, *Kerr* 5991. PITSANULOK. Petchabun, c. 50 m., mixed forest, *Kerr* 5677. UDAWN. Udaun, Nawng Bua, c. 300 m., rocky limestone hill, *Kerr* 8621. Kawn Ken, c. 100 m., mixed forest by stream, *Kerr* 20686. PRACHINBURI. Kaw Pai, 1 m.,

clearing near sea, *Marcan* 2320. Sriracha, 10 m., pathside, *Marcan* 168. c. 5 m., *Mrs. D. J. Collins* 109 (*type*). KRUNGTEP. Bangkok, fruit garden, *Marcan* 2018. RACHABURI. Kanburi, Bawngti, c. 200 m., deciduous forest, on rocky hill, *Kerr* 10596.

(16) *P. flavescens* *Ham. ex C. B. Clarke* in F.B.I. 578 (1885); Brand. Ind. Trees 511; Lam Verb. 136; Dop in F.I.C. 810.

MAHARAT. Lampang, Muang Ngao, *Put* 4011. RACHABURI. Kanburi, Hin Dat, *Put* 28.

Distrib. Burma, Assam (*type*—Goalpara), French Indo-China (ex F.I.C.), Malaya.

(17) *P. flavescens* *Ham. var. glabrior* C. B. Clarke in F.B.I. 578 (1885); Lam Verb. 137.

SURAT. Chumpawn, Siepyuan, c. 10 m., scrub, *Kerr* 16243. Surat, Yan Yao, c. 50 m., savannah, *Kerr* 18178. NAKAWN SRITAMARAT. Nakawn Sritamarat, Lam Saka, under 50 m., scrub, *Kerr* 15383.

Distrib. Burma, Assam (*type*—Sylhet).

(18) *P. fulva* *Craib* in Kew Bull. 442 (1911); Craib 163; Dop in F.I.C. 809.

PAYAP. Doi Sutep, c. 660 m., *Kerr* 1085 (*type*). Lampun, Me Li, c. 510 m., near stream, *Winit* 262. NAKAWN SAWAN. Kampengpet, Me Lamung, c. 500 m., woody climber, scrub jungle, *Kerr* 6099.

Distrib. French Indo-China (ex F.I.C.).

(19) *P. latifolia* *Roxb.* Hort. Beng. 46 (1814), *nomen tantum*, et Fl. Ind. 3, 76 (1832); C. B. Clarke in F.B.I. 577; Brand. Ind. Trees 511; Lam Verb. 150; P'ei Verb. 77; Dop in F.I.C. 808.

PAYAP. Chiangmai, Pang Tawn, *Put* 3937. Muang Fang, c. 500 m., scrub jungle, *Kerr* 5226. Lampun, Me Kaw, c. 270–390 m., near stream, *Winit* 261. MAHARAT. Pre, c. 200 m., open dry forest, *Winit* 1659. NAKAWN CHAIS. Supan, Dom Bang, c. 20 m., scrub jungle, *Kerr* 6997. RACHABURI. Ratburi, c. 30 m., scrub, *Marcan* 1778.

Distrib. India (*type*—Coromandel), Burma, Cambodia, Philippines (ex Lam).

(20) *P. latifolia* *Roxb. var. cuneata* C. B. Clarke in F.B.I. 578 (1885); Lam Verb. 151; Dop in F.I.C. 809. *P. viburnoides* *Wall.*; Kurz For. Fl. 261 (1877).

MAHARAT. Pre, Me Chawa, c. 150 m., *Vanpruk* 462, 142. Doi Din Deng, c. 420 m., mixed jungle, *Kerr* 2557.

Distrib. Burma (*type*), French Indo-China (ex F.I.C.).

(21) *P. latifolia* *Roxb. var. mucronata* (*Roxb.*) C. B. Clarke in F.B.I. 578 (1885); Lam Verb. 151. *P. mucronata* *Roxb.* Fl. Ind. 3, 635 (1832); Brand. Ind. Trees 511, *in nota*.

NAKAWN SRITAMARAT. Nakawn Sritamarat, Wat Kiriwong, c. 100 m., scrub, *Kerr* 15579.

Distrib. N. India, Burma, Assam (*type*—Sylhet). Philippines (ex Lam).

(22) *P. nana* *Coll. et Hemsl.* in Journ. Linn. Soc. 28, 109 (1891); Brand. Ind. Trees 511; Dop in F.I.C. 816; Craib 164.

PAYAP. Chiangrai, Muang Payao, *Put* 3966. Doi Sutep, c. 300–600 m., deciduous forest, *Kerr* 1127. Lampun, Me Li, c. 390 m., deciduous forest, *Winit* 263. Lampun, Me Ta, c. 360 m., *Winit* 731. NAKAWN SAWAN. Nakawn Sawan, Hua Wai, *Put* 4064.

Distrib. Upper Burma (*type*).

(23) *P. herbacea* *Roxb.* Hort. Beng. 46 (1814), *nomen tantum*, et Fl. Ind. 3, 80 (1832); C. B. Clarke in F.B.I. 581; Brand. Ind. Trees 511; P'ei Verb. 71; Dop in F.I.C. 815; Craib 164.

PAYAP. Chiangrai, Muang Payao, *Put* 3983. Doi Sutep, c. 330–600 m., deciduous forest, *Kerr* 1218. NAKAWN SAWAN. Nakawn Sawan, Huz Wai, *Put* 4040. UDAWN. Nakawn Panom, Muk Dahan, c. 100 m., deciduous forest, *Kerr* 21819. PRACHINBURI. Krabin, Aranya, *Put* 2045, 3124.

Distrib. India (*type*—Bengal), Assam, Hainan, French Indo-China (ex F.I.C.).

(24) *P. serrata* *Fletcher* in Kew Bull. 202 (1938).

NAKAWN SAWAN. Kampengpet, Kao Hua Mot, c. 900 m., savannah limestone, *Kerr* 6122 (*type*).

(25) *P. amplexans* *Wall. ex Schauer* in DC. Prodr. 11, 636 (1847); Kurz For. Fl. 262; C. B. Clarke in F.B.I. 580; Brand. Ind. Trees 511.

NAKAWN SAWAN. Muang Tak, Me Sawt, c. 200 m., mixed deciduous forest, *Kerr* 6159.

Distrib. Burma (*type*—Rangoon).

(26) *P. paniculata* *Fletcher* in Kew Bull. 201 (1938).

RACHABURI. Prachuap, Pak Tawan, c. 20 m., dry evergreen forest, *Kerr* 20536 (*type*).

(27) *P. annulata* *Fletcher* in Kew Bull. 199 (1938).

NAKAWN SRITAMARAT. Patalung, Sak, under 50 m., scrub by stream, *Kerr* 19269 (*type*).

(28) *P. repens* *Fletcher* in Kew Bull. 202 (1938).

RACHABURI. Prachuap, Sam Roi Yawt, c. 500 m., *Kerr* 10950 (*type*).

(29) *P. slamensis* *Fletcher* in Kew Bull. 203 (1938).

PAYAP. Chiangmai, Pang Tawn, *Put* 3810 (*type*).

(30) *P. quadridentata* *Fletcher* in Kew Bull. 201 (1938).

PUKET. Ranawng, Kaw Chang, edge of evergreen forest bordering beach, *Kerr* 16563 (*type*).

Gmelina Linn.

Inflorescence a small compact terminal panicle; calyx with 4 teeth and corolla with 4 lobes:

Leaves at most 5 cm. broad and strongly tapering at the base.....

(1) *G. attenuata*

Leaves at least 5 cm. broad, hardly cuneate at the base.....

(2) *G. paniculata*

Inflorescence a large terminal panicle, or a small terminal raceme of cymes:

Inflorescence a large terminal panicle; calyx with 5 small teeth and corolla with 5 lobes.....(3) *G. arborea*

Inflorescence a small terminal raceme of cymes; calyx with 4 small teeth and corolla with 4 lobes:

Bracts leafy.....(4) *G. Hystrix*

Bracts small, linear:

Leaves tomentose below:

Leaves elliptic, mature leaves slightly cuneate, faintly pubescent, but more often glabrous above.....

(5) *G. villosa*

Leaves ovate to slightly elliptic, mature leaves deltoid at the base, tomentose above.....(6) *G. tomentosa*

Leaves glabrous or occasionally faintly pubescent below.....

(7) *G. asiatica*

(1) *G. attenuata* Fletcher in Kew Bull. 203 (1938).

PAYAP. Chiangmai, c. 1100 m., open grassy forest, *Kerr* 6224 (type).

(2) *G. paniculata* Fletcher in Kew Bull. 204 (1938).

PRACHINBURI. Krabin, Aranya, *Put* 2086 (type).

(3) *G. arborea* Roxb. Hort. Beng. 46 (1814), *nomen tantum*, et Cor. Pl. 3, 41, t. 246 (1819) et Fl. Ind. 3, 84; Kurz For. Fl. 264; C. B. Clarke in F.B.I. 581; Brand. Ind. Trees 509; Lam Verb. 219; Bakh. Verb. 68; P'ei Verb. 117; Dop in F.I.C. 843; Craib 164.

PAYAP. Doi Sutep, c. 700-900 m., *Hosseus* 576—"as to flowers only, the leaves being those of *Colona floribunda* (Kurz)"—Craib. Ibid., c. 690 m., deciduous at time of flowering, *Kerr* 540. MAHARAT. Lampang, c. 240 m., scrub jungle, *Kerr* 2331. RACHASIMA. Chaiyapum, Pu Kio, c. 900 m., evergreen forest, *Kerr* 20271. Korat, Bukanum, c. 400 m., savannah, *Kerr* 9856. SURAT. Surat, Ta Kanawn, under 50 m., open deciduous forest, *Kerr* 12356. PUKET. Langkawi, *Curtis*. NAKAWN SRITAMARAT. Songkla, Singora, *Annandale*.

Distrib. India (type), Yunnan, Burma, French Indo-China (ex F.I.C.), Malay Archipelago, Philippines.

(4) *G. Hystrix* Schult. ex Kurz in Journ. As. Soc. Beng. 39, 2, 81 (1870); For. Fl. 265; C. B. Clarke in F.B.I. 582; Brand. Ind. Trees 509; Williams 431; K. and G. Mat. 823, *in nota*; Ridl. F.M.P.

623; Dop in F.I.C. 842. *G. asiatica* Lam Verb. 221, *non* Linn. *G. asiatica* Linn. var. *philippinensis* (Cham.) Bakh. Verb. 70 (1921).

PAYAP. Lampun, Me Li, c. 480 m., deciduous forest, *Winit* 412. • MAHARAT. Lampang, Me Ta, 360 m., moist mixed forest, *Winit* 1653. Pre, Me Chawa, c. 150 m., trunk armed with spines 2" long, *Vanpruk* 461. PITSANULOK. Pamak, 100 m., scrub, *Kerr*. KRUNGTEP. Bangkok, *Zimmermann* 71. *Schomburgk* 197, 331. *Murton* 33. *Teysmann* 5946 (type). *Kerr* 10704. *Marcen* 847. RACHABURI. Petchabun, c. 100 m., deciduous forest, *Kerr* 5724. SURAT. Surat, Nawng Wai, c. 50 m., scrub, *Kerr* 12293. Surat, Kaw Samui, *Put* 1319. NAKAWN SRITAMARAT. Tungsong, in rice field, *Rabil* 145. Nakawn, Kuan Krot, 90 m., *Vanpruk* 714. PATTANI. Pattani, Kok Po, under 50 m., scrub, *Kerr* 15067.

Distrib. Tenasserim, French Indo-China (ex F.I.C.). Philippines, Malay Peninsula.

(5) *G. villosa* Roxb. Hort. Beng. 46 (1814), *nomen tantum*, et Fl. Ind. 3, 86 (1832); C. B. Clarke in F.B.I. 582; Brand. Ind. Trees 509; K. and G. Mat. 824; Ridl. i. 156; Craib 164; Lam Verb. 217; Ridl. F.M.P. 623; Dop in F.I.C. 846. *G. asiatica* Kurz For. Fl. 265, *non* Linn. *G. asiatica* Linn. var. *villosa* (Roxb.) Bakh. Verb. 70 (1921).

NAKAWN SAWAN. Raheng, Kempengpet, c. 90 m., common along bank of Me Ping, *Kerr* 2991. Paknampo, 15-50 m., *Vanpruk* 1013. PITSANULOK. Petchabun, *Bourke*. PRACHINBURI. Sriracha, Ban Dan, forest clearing, *Marcen* 153. Nawng Kaw, c. 70 m., *Marcen* 1207. Kao Din, c. 18 m., *Mrs. D. J. Collins* 2065, 934. KRUNGTEP. Bangkok, hedgerow, *Kerr* 10666. RACHABURI. Kanburi, *Teysmann* 5941. Hin Dat, *Put* 74. *Marcen* 914. c. 100 m., bamboo forest, *Kerr* 10577. Rachaburi, Ta Ruu, c. 6 m., scrub jungle, *Winit* 411. Prachuap, Hui Yang, under 50 m., scrub, *Kerr* 10740. PUKET. Pang-nga, Kaw Yao Yai, c. 10 m., scrub, *Kerr* 17330. Satul, Terutao, scrub behind beach, *Kerr* 14171. Langkawi, *Curtis* (ex *Ridl.*). NAKAWN SRITAMARAT. Songkla, Na Tawa, *Rabil* 76. Tapa, *Lakshnakara* 358.

Distrib. Burma, French Indo-China (ex F.I.C.), Malaya (type—Penang), Philippines.

The above collections may contain more than one species. *Kerr* 10740, 10577, *Put* 74, *Marcen* 914, all have the ovary tufted with tawny hairs and a strongly tapering leaf base, whereas the true *villosa* has a glabrous ovary and a cuneate leaf base. The material however, is so scanty that separation is not justified.

(6) *G. tomentosa* Fletcher in Kew Bull. 204 (1938).

RACHASIMA. Korat, Ban Chum Seng, *Noe* 211 (type).

(7) *G. asiatica* Linn. Sp. Pl. 626 (1753); C. B. Clarke in F.B.I. 582; Brand. Ind. Trees 509; K. and G. Mat. 823; Lam Verb. 221 *pro parte*; Ridl. F.M.P. 622; P'ei Verb. 119; Dop in F.I.C. 845. *G. asiatica* L. var. *typica* Bakh. Verb. 69 (1921).

UDAWN. Nakawn Panom, Dawn Tam, c. 100 m., rocky ground in open deciduous forest, *Kerr* 21527. UBON. Ubon, near river *Lakshnakara* 859. RACHASIMA. Chaiyapum, Chawng Sam Maw c. 200 m., scrubby deciduous forest, *Kerr* 19974. AYUTHIA Angtawng, *Pui* 2552. NAKAWN CHAISI. Supan, Dom Bang, c. 20 m. on river bank, *Kerr* 7005.

Distrib. S. India (*type*), Burma, French Indo-China (ex *F.I.C*) Malaya.

Clerodendrum Linn.

Corolla hypocrateriform, the tube less than 5 cm. in length (subgenus

1. *Euclerodendrum*, C. B. Clarke):

Cymes axillary or in terminal leafy panicles, the lower branches being axillary:

Cymes axillary:

Cymes few-flowered from most axils; calyx teeth very short:

Leaves elliptic to lanceolate; calyx only faintly glandular without.....(1) *C. nerifolium*

Leaves ovate to elliptic; calyx markedly glandular without.....(2) *C. inerme*

Cymes in deflexed pedunculate close panicles from the upper axils; calyx lobes linear-lanceolate.....(3) *C. deflexum*

Cymes in terminal leafy panicles, the lower branches being axillary:

Calyx lobes glabrous within:

Leaves elliptic, glabrous above or occasionally with a slight pubescence on the nerves....(4) *C. disparifolium*

Leaves oblong to obovate, thinly covered with jointed hairs above.....(5) *C. lankawiense*

Calyx lobes markedly pubescent within:

Leaves markedly pubescent above with jointed hairs; corolla tube at most 2.5 cm. long....(6) *C. Lloydianum*

Leaves slightly pubescent above with short hairs; corolla tube at least 2.5 cm. long.....(7) *C. Garretianum*

Cymes in definite terminal panicles:

Panicle more or less pendulous:

Leaves glabrous below, occasionally very faintly pubescent along the midrib:

Leaves at most 6 cm. broad and slightly tapering at the base; calyx lobes lanceolate.....(8) *C. penduliflorum*

Leaves at least 6 cm. broad, and round, sometimes slightly attenuate at the base; calyx lobes ovate, cuspidate....

(9) *C. umbratile*

Leaves pubescent below, almost deltoid to lobed at the base....

(10) *C. Schmidtii*

Panicle erect:

Panicle elongate or pyramidal:

Panicle elongate:

Main peduncles to the cymes 0.5-1 cm. long; calyx teeth at least 1 mm. long; leaf margin very deeply serrate.....(11) *C. Vanprukii*

Main peduncles to the cymes 1.5-5.5 cm. long; calyx often truncate, teeth at the most 0.75 mm. long; leaf margin distantly serrate or denticulate:

Leaves and bracts in pairs, petiole at least 2 cm. long, leaf margin generally subentire; inflorescence at most 15 cm. long:

Leaves glabrous above and below....(12) *C. venosum*

Leaves strongly pubescent above on the midrib and the lateral nerves and on all the nerves below...

(13) *C. venosum* var. *pubescens*

Leaves often ternate and the bracts generally so, leaves subsessile or petiolate, leaf margin distantly serrate or denticulate; inflorescence at least 15 cm. long:

Leaves subsessile, cuneate at the base.....

(14) *C. serratum*

Leaves generally petioled, but sometimes only slightly so when bordered by the decurrent margins of the leaf-blade, acuminate narrowed at the base.....(15) *C. serratum* var. *Wallichii*

Panicle pyramidal:

Leaves lobed.....(16) *C. paniculatum*

Leaves ovate, generally cordate, not lobed:

Leaves entire; calyx lobes divided little more than half-way down the tube.....(17) *C. villosum*

Leaves often dentate; calyx lobes divided almost to the base of the tube.....(18) *C. infortunatum*

Panicle corymbose or subcapitate:

Panicle corymbose; calyx-teeth small, at most 1 mm. long.....(19) *C. glandulosum*

Panicle subcapitate; calyx-lobes large, at least 8 mm. long:

Corolla tube at least 3 cm. long; calyx-lobes triangular-lanceolate, at least 10 mm. long.....

(20) *C. lasiocephalum*

Corolla tube at most 2 cm. long; petals 10; calyx lobes triangular, acuminate, at most 10 mm. long.....

(21) *C. fragrans*

Corolla infundibuliform, tube more than 5 cm. long (subgenus 2.

Siphonanthus, C. B. Clarke); leaves usually verticillate, lanceolate.....(22) *C. indicum*

(1) *C. nerifolium* Wall. ex Schauer in DC. Prodr. 11, 660 (1847);

C. B. Clarke in F.B.I. 589; Brand. Ind. Trees 507; Ridl. i. 156;

Craib 165; Ridl. iv. 111. *C. inerme* Gaertn. var. *nerifolium* Wall.;

Kurz For. Fl. 266 (1877). *C. inerme* Gaertn.; Lam Verb. 251

(1919) *pro parte*; Bakh. Verb. 77; Dop in F.I.C. 854, *pro parte*.

PRACHINBURI. Sriracha, sea shore, *Kerr* 2039, *Kerr* 2127, *Mrs. D. J. Collins* 96. PUKET. Ranawng, Nam Chut, near sea-level, bank of tidal creek, *Kerr* 11693. Trang, Klawng Pao, prostrate shrub, sand bank, edge of mangrove swamp, *Vanpruk* 839. Langkawi, *Curtis* (ex *Ridl.*).

Distrib. Burma (*type*), French Indo-China (ex *F.I.C.*), Malaya, China, Australia, Polynesia.

(2) *C. inerme* Gaertn. Fruct. 1, 271, t. 57, fig. 1 (1788); Kurz For. Fl. 266, *pro parte*; C. B. Clarke in F.B.I. 589; Brand. Ind. Trees 507; F.K.C. 173; Williams 431; Lam Verb. 251, *pro parte*; Ridl. F.M.P. 624; P'ei Verb. 127; Dop in F.I.C. 854, *pro parte*. *C. neriifolium* Wall.; K. and G. Mat. 827 (1909).

PRACHINBURI. Sriracha, Na Kati, c. 12 m., *Mrs. D. J. Collins* 1440. KRUNGTEP. Bangkok, tidal, common along banks of rivers and canals, *Kerr* 3672. Bangkok, sea level, *Smith* 928. RACHABURI. Prachuap, Hua Hin, open scrub near the sea, *Kerr* 16133. Kao Tao, sea level, cleft in rocks on sea shore, *Marcan* 2456. SURAT. Chumpawn, Bang Son, *Put* 1538. Langsuan, Tako, *Put* 1701. PUKET. Pang-nga, Kaw Yao Yai, edge of sandy beach, *Kerr* 17037. Trang, *Bourke*.

Distrib. India, Ceylon (*type*), Burma, French Indo-China (ex *F.I.C.*), Malaya.

(3) *C. deflexum* Wall. Pl. As. Rar. 3, 10, t. 215 (1832); C. B. Clarke in F.B.I. 593; K. and G. Mat. 829; Lam Verb. 263; Bakh. Verb. 82; Ridl. F.M.P. 624.

PATTANI. Pattani, Betong, c. 600 m., evergreen forest, *Kerr* 7653.

Distrib. Malaya (*type*—Penang).

(4) *C. disparifolium* Blume Bijdr. 809 (1826); C. B. Clarke in F.B.I. 589; K. and G. Mat. 829; Lam Verb. 250; Bakh. Verb. 83; Ridl. F.M.P. 625.

PAYAP. Chiangmai, 300 m., cultivated, *Kerr* 3495, 6702. waste ground, c. 310 m., *Garrett* 899. MAHARAT. Pre, 120 m., cultivated, *Winit* 1690. Lampang, often with many root suckers, cultivated, probably exotic, *Winit* 643. PRACHINBURI. Sriracha forest, c. 24 m., *Mrs. D. J. Collins* 85, 1078. AYUTHIA. Angtawng, *Put* 2547. KRUNGTEP. Bangkok, *Kerr* 14357. *Marcan* 484, 2301. PUKET. Trang, Kao Soi Dao, c. 400 m., evergreen forest, *Kerr* 19146. PATTANI. Pattani, Kao Kalakiri, c. 600 m., clearing in evergreen forest, *Kerr* 7762. c. 50 m., *Kerr* 7821. Tomo, Ban Rubi, c. 150 m., *Lakshnakara* 665.

Distrib. Malaya (*type*—Java).

(5) *C. lankawiense* King et Gamble in Kew Bull. 110 (1908) et Mat. 830; Ridl. i. 156; Lam Verb. 249; Bakh. Verb. 95; Ridl. F.M.P. 625.

SURAT. Chumpawn, Tasan, c. 50 m., evergreen forest, *Kerr* 16283. *Kerr* 16283A. Langsuan, Ban Trang, c. 50 m., by stream in

evergreen forest, *Kerr* 11979. Surat, Klawng Nam Wing, c. 300 m., evergreen forest, *Kerr* 12927. PUKET. Ranawng, Nam Chut, near sea level, scrub by stream, *Kerr* 11722. Kao Pawta Luang Keo, c. 900 m., evergreen forest, *Kerr* 17535. Kopah, Ban Krap, c. 210 m., *Haniff et Nur* 2735, 2084. Langkawi, Burau, *Robinson* 6257, 2515 (ex *Ridl.*). Terutao, *Curtis* 3789 (*type*).

Distrib. Malay Peninsula.

(6) *C. Lloydianum* Craib in Kew Bull. 284 (1914); Dop in F.I.C. 871.

PAYAP. Lampun, Me Kaw, c. 480 m., mixed forest, *Winit* 1532. MAHARAT. Lampang, Pratu Pa, c. 450 m., mixed forest, *Winit* 1809. Pre, c. 180 m., *Vanpruk* 499 (*type*). NAKAWN SAWAN. Me ping Rapids, Keng Fa Pin, c. 200 m., *Kerr* 3049. Keng Chum, c. 150 m., mixed forest by stream, *Kerr* 4618. AYUTHIA. Saraburi, Muak Lek, c. 200 m., evergreen forest near stream, *Marcan* 1846.

(7) *C. Garrettianum* Craib in Kew Bull. 444 (1911); Craib 165. Dop in F.I.C. 868. *C. disparifolium* Bakh. Verb. 83 (1921), *pro parte*, non Blume.

PAYAP. Chiangrai, c. 520 m., evergreen forest, *Winit* 780. Doi Sutep, c. 690 m., c. 1050 m., evergreen forest, *Kerr* 1309, 1435 (*types*). c. 180 m., *Kerr* 3392. c. 530 m., *Winit* 1170. MAHARAT. Lampang, Me Het, c. 200 m., evergreen forest, *Winit* 1476. Ban Tang Chai, *Winit* 1475. NAKAWN SAWAN. Ban Takli, c. 25 m., *Marcan* 1073. RACHASIMA. Korat, Chantuk, Kao Sisiat A, c. 400 m., crevices of limestone rocks, *Kerr* 9101. AYUTHIA. Ban Nawng Bua, *Put* 1143. PRACHINBURI. Krabin, Watana, *Put* 1939.

Distrib. Laos (ex *F.I.C.*).

(8) *C. penduliflorum* Wall. ex Schauer in DC. Prodr. 11, 664 (1847); C. B. Clarke in F.B.I. 591; Brand. Ind. Trees 508; K. and G. Mat. 830; Ridl. i. 156; Lam Verb. 265; Ridl. F.M.P. 626. *C. nutans* Wall.; Bakh. Verb. 81.

PAYAP. Chiangmai, Doi Nang Ka, *Put* 3284. PRACHINBURI. Sriracha, *Put* 435. Nawng Nam Kio, c. 180–240 m., *Mrs. D. J. Collins* 1283. Kao Pi, low hill near Nawng Nam Kio, *Mrs. D. J. Collins* 1283A. CHANTABURI. Krat, Baw Rai, c. 50 m., by stream in bamboo forest, *Kerr* 9448. RACHABURI. Kanburi, Ta Kanum, c. 300 m., limestone rocks, *Kerr* 10282. SURAT. Chumpawn, Kuring, c. 50 m., scrub, *Kerr* 11614. Tasan, c. 50 m., evergreen forest, *Kerr* 16284. PUKET. Trang, Chawng, *Fox* 3830. Satul, Tola, c. 50 m., light evergreen forest, *Kerr* 14379. Langkawi, *Haniff et Nur* 7530. *Dolman* 6784. NAKAWN SRITAMARAT. Nakawn Sritamarat, Ta Samet, under 50 m., evergreen forest, *Kerr* 14291A. PATTANI. Yala, *Anandale*.

Distrib. Burma (*type*—Tavoy), Malay Peninsula, cultivated in the Archipelago (ex *Bakhuizen*).

(9) *C. umbratile* King et Gamble in Kew Bull. 110 (1908) et Mat. 831; Lam Verb. 265; Ridl. F.M.P. 626. *C. macrophyllum* Bl. var. *myrmecophilum* Ridl.; Bakh. Verb. 82 (1921).

SURAT. Chumpawn, Kao Tung, c. 500–700 m., evergreen forest, Kerr 11532. Surat, Klawng Nam Wing, c. 100 m., evergreen forest, Kerr 12247. PATTANI. Pattani, Bukit, Put 3602.

Distrib. Malaya (type—Perak).

(10) *C. Schmidtii* C. B. Clarke apud Schmidt in Bot. Tidsskr. 26, 173 (1904), ex descr.; Williams 432; Dop in F.I.C. 877. *C. hastato-oblongum* C. B. Clarke apud Schmidt l.c. 174, ex descr.; Dop in F.I.C. 877.

CHANTABURI. Chantabun, Makam, near path in open forest, *Lakshnakara* 469. Near mouth of Chantabun river, c. 5 m., evergreen scrub, Kerr 18063. Kaw Chang, Klawng Salakpet, Klawng Nonsi, Schmidt 740, 475 (types). Kaw Chang, Klawng Son, Schmidt 692A (type of *C. hastato-oblongum*). Kaw Chang, Salak Kawk, c. 10 m., evergreen forest by stream, Kerr 9217. Krat, Kao Saming, c. 20 m., evergreen forest, Kerr 9398. PRACHINBURI. Krabin, Ban Keng, c. 25 m., Kerr 19804. Sriracha, c. 9 m., Mrs. D. J. Collins 281, 1379, 367. Put 443. Near Sriracha, c. 12 m., Mrs. D. J. Collins 1003. Sriracha, Nawng Kaw forest, Mrs. D. J. Collins 623.

Distrib. Laos (ex F.I.C.).

(11) *C. Vanprukii* Craib in Kew Bull. 444 (1911); Dop in F.I.C. 883; Craib 166.

MAHARAT. Lampang, Me Peng, c. 110–200 m., moist mixed forest, Winit 1695. Pre, Hui Kammi, 240 m., Vanpruk 207 (type).

(12) *C. venosum* Wall. ex C. B. Clarke in F.B.I. 592 (1885); Brand. Ind. Trees 508. *C. serratum* (Linn.) Spreng.; Bakh. Verb. 78 (1921), pro parte.

RACHABURI. Kanburi, Baw Re, Put 191.

Distrib. Assam, Burma (type).

(13) *C. venosum* Wall. var. *pubescens* Fletcher in Kew Bull. 205 (1938).

PAYAP. Chiangmai, Me Tun, c. 600 m., mixed forest, Kerr 6190 (type).

(14) *C. serratum* (Linn.) Spreng. Syst. Veg. 2, 758 (1825); Kurz For. Fl. 267; C. B. Clarke in F.B.I. 592; Brand. Ind. Trees 508; Lam Verb. 267; Bakh. Verb. 78; Ridl. F.M.P. 626; P'ei Verb. 129; Dop in F.I.C. 856.

PAYAP. Chiengrai plain, right bank of Me Kok, west of town, c. 380 m., edge of open grassland, Garrett 180. RACHASIMA. Korat, Ban Chum Seng, Noe 214. Put 3064. KRUNGTEP. Bangkok, below 5 m., Kerr 4228. Marcan 243. RACHABURI. Ratburi, c. 30 m., deciduous forest, Marcan 1780. SURAT. Ban Tong Tao, c. 10 m., scrub, Kerr 13158. PUKET. Trang, Chawng, c. 120–240 m., Mrs. D. J. Collins 2399.

Distrib. India (type), Ceylon, Bengal, Burma, Malaya, French Indo-China.

(15) *C. serratum* (Linn.) Spreng. var. *Wallichii* C. B. Clarke in Fl. Br. Ind. 592 (1885); K. and G. Mat. 834; Craib 166; Lam Verb. 268.

PAYAP. Doi Suteh, c. 900 m., evergreen forest, Kerr 735, 735A. Doi Suteh, c. 300 to 450 m., deciduous forest, Kerr 754. Lampun, Me Li, c. 390 m., Winit 417. NAKAWN SAWAN. Nakawn Sawan, Hau Wai, Put 4061. UDAWN. Udawn, Nawng Ham, sandy soil, *Lakshnakara* 1038. PRACHINBURI. Krabin, Aranya, Put 2036. RACHABURI. Kanburi, Hin Dat, Put 134.

Distrib. British Indo-China (type—Sylhet), Malaya, Cambodia.

(16) *C. paniculatum* Linn. Mant. 1, 90 (1767); C. B. Clarke in F.B.I. 593; Brand. Ind. Trees 508; Williams 432; K. and G. Mat. 839; Ridl. i. 156; Ridl. iii. 165; Lam Verb. 269; Bakh. Verb. 92; Ridl. F.M.P. 628; P'ei Verb. 144; Dop in F.I.C. 864.

PAYAP. Chiangmai, c. 300 m., cultivated, Garrett 1010. Doi Suteh, deciduous forest, c. 300–720 m., Kerr 762. Lampun, Me Kaw, c. 420 m., scrub jungle, Winit 415. UBON. Ubon, Warin, *Lakshnakara* 875. AYUTHIA. Saraburi, Muak Lek, c. 200 m., open space in evergreen forest, Kerr 9072. PRACHINBURI. Sriracha, c. 9 m., Mrs. D. J. Collins 210. Kao Chalak, c. 12–120 m., Mrs. D. J. Collins 1475. KRUNGTEP. Bangkok, under 5 m., village thicket, Kerr 4436. Marcan 414. *Lakshnakara* 439. RACHABURI. Kanburi, Hin Dat, Put 31. Sai Yok, c. 50 m., bamboo forest, Marcan 2383. Prachuap, Hui Yang, under 50 m., cultivated, Kerr 10739. Bangtapan, Keith (ex Ridl.). PUKET. Trang, Chawng, c. 30 m., Mrs. D. J. Collins 2831. NAKAWN SRITAMARAT. Nakawn Sritamarat, Ta Sala, under 50 m., scrub, Kerr 15616. Kao Keo and Rawnpibun, Kerr 513. SIAM. Schomburgk 249.

Distrib. Burma, Laos, Annam, Malay Peninsula (type—Penang), Sumatra, Java (ex Bakhuizen), Hainan, Formosa.

(17) *C. villosum* Blume Bijdr. 811 (1826); Kurz For. Fl. 268; C. B. Clarke in F.B.I. 595; Brand. Ind. Trees 507; F.K.C. 173; Williams 432; K. and G. Mat. 837; Ridl. i. 156; Lam Verb. 289; Bakh. Verb. 89; Ridl. F.M.P. 627; Dop in F.I.C. 861.

MAHARAT. Doi Wao, c. 90 m., old clearing, Kerr 2441. Lampang, Me Tawn, c. 900 m., Winit 701. CHANTABURI. Chantabun, *Lakshnakara* 448. Krat, Kao Kuap, c. 200 m., clearing in evergreen forest, Kerr 17696. PRACHINBURI. Nawng Yai Bu to Nawng Kaw, c. 30–60 m., near railway, Mrs. D. J. Collins 348. Kao Din, Sriracha forest, c. 12 m., Mrs. D. J. Collins 1876. Hot Springs, Sriracha forest, c. 12 m., Mrs. D. J. Collins 1789. Kaw Chang 318. RACHABURI. Bangtapan, Keith (ex Ridl.). PUKET. Kopah, Yanyan Haniff et Nur 2051. Ranawng, Kao Pawta, Chongdong, c. 500 m., bamboo scrub, Kerr 16747. La-un, c. 10 m., scrub, Kerr 16505. Satul, Tapan Lek, c. 50 m., common in scrub, Kerr 14397.

NAKAWN SRITAMARAT. Kao Keo, 483. Songkla, Kaw Deng, Annandale. PATTANI. Tomo, Ban Pari, c. 150 m., *Lakshnakara* 789. Yala, Put 3684. SIAM. Schmidt 12.

Distrib. Burma, Tonkin, Laos (ex *F.I.C.*), Malaya (*type*—Java).

(18) *C. infortunatum* Linn. Sp. Pl. 637 (1753); Kurz For. Fl. 267; C. B. Clarke in F.B.I. 594; Brand. Ind. Trees 507; Williams 432; K. and G. Mat. 836; Ridl. i. 156; Hoss. 429; Craib 165; Lam Verb. 284; Ridl. iv. 111; Bakh. Verb. 91; Ridl. F.M.P. 629, *in nota*; Dop in F.I.C. 859.

PAYAP. Doi Suteh, c. 300–750 m., *Kerr* 1094. Lampun, Me Li, c. 420 m., a gregarious shrub in open places, *Winit* 258. MAHARAT. Lampang, Me Lawng, c. 130 m., moist mixed and evergreen forest, *Winit* 1638. KRUNGTEP. Bangkok, tidal, waste ground, *Kerr* 4068. Marcan 94. Schomburgk 106. RACHABURI. Prachuap, Klawng Wan, Hamid 3790. SURAT. Chumpawn, Siepyuan, Put 990. Surat, Klawng Nam Wing, c. 200 m., by stream in evergreen forest, *Kerr* 12228. PUKET. Tapli, Kloss 6784. Ranawng, Nam Chut, Kloss 6673. SIAM. Teysmann 5957.

Distrib. India, Ceylon (*type*), Burma, Tonkin, Laos (ex *F.I.C.*), Malaya.

(19) *C. glandulosum* Colebr. ex Wall. list no. 1806 (1829), *nomen tantum*; Lindl. Bot. Reg. 30 sub t. 19 (1844); P'ei Verb. 158. *C. Colebrookianum* Walp. Rep. 4, 114 (1848); C. B. Clarke in F.B.I. 594; Brand. Ind. Trees 507; K. and G. Mat. 837; Craib 165; Lam Verb. 271; Bakh. Verb. 87; Ridl. F.M.P. 629, *in nota*; Dop in F.I.C. 860.

PAYAP. Chiangmai, edge of a clearing on Doi Suteh, 720 m., *Kerr* 812. Lampun, Me Kaw, 300 m., *Winit* 1536. c. 360 m., mixed forest, *Winit* 416.

Distrib. Indo-China (*type*), Malay Peninsula, Sumatra (ex *Bakhuizen et Lam.*).

(20) *C. lasiocephalum* C. B. Clarke in F.B.I. 594 (1885); Brand. Ind. Trees 507.

PAYAP. Chiangrai, Me Ta Mao, c. 550 m., secondary growth forest, *Winit* 784.

Distrib. Burma (*type*—Mishmi).

(21) *C. fragrans* (Vent.) Willd. Enum. Hort. Berol. 659 (1809); C. B. Clarke in F.B.I. 589, *in nota*; K. and G. Mat. 826, *in nota*; Lam Verb. 259; Bakh. Verb. 88; Ridl. F.M.P. 629, *in nota*; P'ei Verb. 133; Dop in F.I.C. 857.

PAYAP. Lampun, Me Li, c. 320 m., near road, *Winit* 260. RACHASIMA. Korat, Kao Lem, waste ground, *Kerr* 9902. Lam Nang Rawng, Suksakorn 895. KRUNGTEP. Bangkok garden, cultivated, Marcan 2014.

Distrib. A native of China, imported into all tropical countries and cultivated there.

(22) *C. indicum* O. Ktze. Rev. Gen. 586 (1891); Bakh. Verb. 85; P'ei Verb. 125. *C. siphonanthus* (R. Br.) C. B. Clarke in F.B.I. 595 (1885); Brand. Ind. Trees 508; F.K.C. 173; Williams 432; K. and G. Mat. 839; Ridl. i. 156; Lam Verb. 306; Ridl. F.M.P. 628; Dop in F.I.C. 853.

PAYAP. Chiangmai, c. 300 m., banks of irrigation ditches, *Kerr* 2738, 393. PRACHINBURI. Sriracha, c. 6 m., Mrs. D. J. Collins 287. Pan Sadet, c. 120 m., Mrs. D. J. Collins 1312. Aran Pratet, Put 1985. AYUTHIA. Angtawng, Put 2539. KRUNGTEP. Bangkok, tidal, waste ground, *Kerr* 3904. *Lakshnakara* 428. Marcan 2033. RACHABURI. Rachaburi, c. 10 m., cultivated, or wild about cultivated ground, *Winit* 544. Bangtapan, Put 1394. Bangtapan Noi, Keith 172. PUKET. Kopah, Haniff 12612.

Distrib. India (*type*), Burma, S. China, French Indo-China (ex *F.I.C.*), Malaya.

“*Clerodendron calamitosum* Linn. (ex parte).” Hosseus in Bot. Centralbl. Beih. 28, 2, 429 (1911).

NAKAWN SAWAN. Wang Chao, 100 m., Hosseus 84 (ex Hosseus). I have not seen this plant and am unable to say what it may be.

Vitex Linn.

Calyx subequally 5-toothed or truncate (Subgen: *Euagnus* Schauer): Inflorescence terminal, penultimate axillary peduncles often added:

Leaves covered with a fine closely matted white tomentum below:

Leaves 1- to 3-foliolate:

Leaves 1- to 3-foliolate.....(1) *V. trifolia*

Leaves 1-foliolate.....(2) *V. trifolia* var. *ovata*

Leaves 3- to 5-foliolate; panicle lax with long peduncled cymes or crowded with sessile cymules... (3) *V. Negundo*

Leaves glabrous or hairy beneath, but never with a fine closely matted white tomentum:

Cymes condensed in clusters along the panicle branches:

Under surface of the leaf hairy:

Petiole winged (4) *V. limoniifolia*

Petiole not winged:

Calyx teeth at most 0.5 mm. long, both the teeth and the upper half of the tube pubescent within;

leaf margin entire..... (5) *V. Pierrei*

Calyx teeth at least 0.75 mm. long, pubescent within, tube glabrous within; leaf margin entire or faintly crenate-serrate..... (6) *V. canescens*

Under surface of leaf glabrous, nerves elevated..... (7) *V. coriacea*

Cymes more lax:

Calyx at least 2 mm. deep, including teeth and tube:

Calyx at most 3 mm. deep including teeth and tube:

Leaves ovate to oblong-elliptic:

- Petiole up to 8 cm. long; median leaflet at most 10 cm. long, petiolule of median leaflet at most 2 cm. long.....(8) *V. quinata*
- Petiole up to 12 cm. long; median leaflet at least 15 cm. long, petiolule of median leaflet at least 2 cm. long.....(9) *V. heterophylla*
- Leaves obovate or oblong to obovate:
- Corolla villous within.....
- (10) *V. heterophylla* var. *undulata*
- Corolla glabrous within.....
- (11) *V. sumatrana* var. *urceolata*
- Calyx at least 4 mm. deep, including teeth and tube.....
- (12) *V. pubescens*
- Calyx at most 2 mm. deep, including teeth and tube.....
- (13) *V. siamica*
- Inflorescence axillary:
- Leaves 5- to 3-foliolate.....(14) *V. glabrata*
- Leaves 3-foliolate:
- Cymes longer than the petioles.....(15) *V. peduncularis*
- Cymes shorter than the petioles:
- Calyx lobes oblong-lanceolate, up to 10 mm. long; bracts large.....(16) *V. longisepala*
- Calyx lobes short, acute, up to 0.5 mm. long; bracts minute
- (17) *V. vestita*
- Calyx unequally 2-lipped, deeply 3-toothed; inflorescence axillary, cymes shorter than the petioles (subgen. *Glossocalyx* C. B. Clarke)
- (18) *V. gamosepala*
- (1) *V. trifolia* Linn. Sp. Pl. 638 (1753); C. B. Clarke in F.B.I. 583; Brand. Ind. Trees 504; F.K.C. 173; K. and G. Mat. 842; Ridl. i. 156; Craib 164; Lam Verb. 180; Ridl. F.M.P. 630; P'ei Verb. 99; Dop in F.I.C. 834. *V. Agnus-castus* Linn. var. *trifolia* (Linn.) Kurz For. Fl. 270 (1877).
- PAYAP. Chiangmai, c. 330 m., scrub jungle, *Kerr* 1248. Chiangmai, 391. NAKAWN SAWAN. Raheng, Doi Tung Cha, c. 500 m., limestone rocks, *Kerr* 4602. CHANTABURI. Rayawng, Schmidt. Kaw Chang, Ban Dan, by beach, *Rabil* 55. KRUNGTEP. Bangkok, temple compound, cultivated, *Marcan* 2109. *Marcan* 1901. RACHABURI. Prachuap, Hua Hin, prostrate near sea-shore, *Lakshnakara* 78. Bangtapan, *Keith* (ex *Ridl.*). PUKET. Trang, Kaw Mu, *Robinson* 6461. Palau Tebun, Kasum river, *Haniff et Nur* 3584. Langkawi, Buran Bay (ex *Ridl.*).
- Distrib.* India (type), Ceylon, Burma, French Indo-China (ex F.I.C.), Philippines, Hainan, China, Japan, N. Australia.
- (2) *V. trifolia* Linn. var. *ovata* (Thunb.) Makino in Bot. Mag. Tokio, 17, 192 (1903). *V. ovata* Thunb. Fl. Jap. 257 (1784). *V. trifolia* Linn. var. *unifoliolata* Schauer; F.K.C. 173; Williams 431; Lam Verb. 182; P'ei Verb. 100; Dop in F.I.C. 835. *V. trifolia*

Linn. var. *repens* Ridl. F.M.P. 631 (1923). *V. repens* Blanco Fl. Filip. 513 (1837).

RACHABURI. Prachuap, Hua Hin, creeping along sandy ground by the sea, *Kerr* 16127. *Lakshnakara* 78. *Marcan* 2262. *Marcan* 332. Bangtapan Noi, *Keith* (ex *Ridl.*). NAKAWN SRITAMARAT. Songkla, sandy shore, *Bourke-Burrows*. Singora, *Annandale*. *Distrib.* Indo-Malaya, Mauritius (type), Australia, Japan.

(3) *V. Negundo* Linn. Sp. Pl. 638 (1753); C. B. Clarke in F.B.I. 583; Brand. Ind. Trees 503; Williams 431; K. and G. Mat. 843; Lam Verb. 189; Ridl. F.M.P. 631; P'ei Verb. 101; Dop in F.I.C. 835.

NAKAWN SAWAN. Me Ping Rapids near Ban Na, c. 140 m., limestone rocks, *Kerr* 3657. KRUNGTEP. Bangkok, c. 5 m., cultivated, *Kerr* 4286. Temple gardens, cultivated, *Marcan* 263. Zimmermann 2. PUKET. Ranawng, Kaw Chang, edge of beach, *Kerr* 16627. Langkawi, *Curtis*. *Wilkinson* 20799. PATTANI. Tomo, Ban Rubi, c. 150 m., near village clearing, *Lakshnakara* 664. *Distrib.* E. Africa, India (type), Ceylon, French Indo-China, Philippines, Hainan, China, Japan, W. Polynesia.

(4) *V. limonifolia* Wall. ex Kurz For. Fl. 271 (1877); C. B. Clarke in F.B.I. 584; Brand. Ind. Trees 504; Williams 431; Craib 164; Dop in F.I.C. 822.

PAYAP. Me Ping, Doi Noi, c. 300 m., *Kerr* 2011. MAHARAT. Pre, c. 150-240 m., *Vanpruk* 184. NAKAWN SAWAN. Ban Takli, c. 25 m., open forest, *Marcan* 1102. Paknampo, c. 15-50 m., *Vanpruk* 1009. PRACHINBURI. Sriracha, c. 5 m., used for houseposts, *Mrs. D. J. Collins* 9. RACHABURI. Kanburi, Ta Salao, c. 50 m., open deciduous forest, *Kerr* 19488. Prachuap, Hua Hin, c. 18 m., *Marcan* 367, *Kiah* 24414.

Distrib. Burma (type—Prome Hills), Laos, Cambodia (ex F.I.C.).

(5) *V. Pierrei* Craib in Kew Bull. 367 (1915); Dop in F.I.C. 823. MAHARAT. Pre, Rawng Kwang, c. 300 m., mixed forest, *Kerr* 4851. PRACHINBURI. Sriracha, c. 5 m., *Mrs. D. J. Collins* 72, 73 (types). Sriracha, Nawng Kaw forest, *Mrs. D. J. Collins* 706.

Distrib. Cochinchina.

(6) *V. canescens* Kurz in Journ. As. Soc. Beng. 42, 2, 101 (1873) et For. Fl. 270; C. B. Clarke in F.B.I. 586; Brand. Ind. Trees 504; Craib 164; P'ei Verb. 98; Dop in F.I.C. 837.

PAYAP. Chiangmai, c. 300 m., *Kerr* 1705. Me Tang, c. 390 m., scrub jungle, *Winit* 34. Doi Sute, c. 330 m., *Kerr* 1766. Lampun, Me Li, c. 390 m., deciduous forest, *Winit* 256. MAHARAT. Pre, c. 120-180 m., *Vanpruk* 143, 425. NAKAWN SAWAN. Kampengpet, c. 50 m., mixed deciduous forest, *Kerr* 5970. UDARN. Nakawn Panom, Tat Panom, c. 200 m., scrub, *Kerr* 21408. RACHABURI. Kanburi, Wang Kanai, c. 50 m., deciduous forest, *Kerr* 12845. Kanburi, c. 100 m., *Marcan* 2170. NAKAWN SRITAMARAT. Kao

Ram, c. 300 m., *Smith* 761. Nakawn Sritamarat, Lam Saka, under 50 m., grown as support for pepper, *Kerr* 15382. Patalung Sak, under 50 m., scrub, *Kerr* 19246.

Distrib. Indo-China (*type*—Prome), Yunnan.

(7) *V. coriacea* C. B. Clarke in F.B.I. 586 (1885); Brand. Ind. Trees 504; K. and G. Mat. 846; Lam Verb. 200; Ridl. F.M.P. 632. PATTANI. Pattani, Bukit, c. 400 m., evergreen forest, *Kerr* 7100.

Distrib. Burma, Malay Peninsula (*type*—Malacca), Sumatra.

(8) *V. quinata* (Lour.) Williams in Bull. Herb. Boiss. sér. 2, 5, 431 (1905); P'ei Verb. 94, *pro parte*; Dop in F.I.C. 833. *V. heterophylla* Roxb.; Lam Verb. 187, *pro parte*. *Cornutia quinata* Lour. Fl. Cochinch. 387 (1790).

UDAWN. Udawn, Nawng Bua, c. 200 m., mixed deciduous forest, *Kerr* 8612. Muk Dahan, Pu Mano, c. 200 m., deciduous forest, *Kerr* 21441. UBON. Ubon, Warin, *Lakshnakara* 886. RACHASIMA. Lam Nang Rawng, *Suksakorn* 941. Korat, Ban Chum Seng, *Noe* 201. *Put* 2841. RACHABURI. Kanburi, Ta Salao, c. 50 m., bamboo forest, *Kerr* 19519. Kanburi, Hin Dat, *Put* 118. Kanburi, c. 30 m., mixed forest, *Winit* 566, 546. Rachaburi, Chawm Bung, c. 100 m., mixed forest, *Kerr* 10637. Prachuap, Pak Tawan, c. 20 m., evergreen forest, *Kerr* 20503. Prachuap, Hua Hin, c. 20 m., open forest, on rocky, granite hill, *Kerr* 16211. Pran, Ban Pak Tawan, 30 m., evergreen forest, *Marcen* 265.

Distrib. Annam, Indo-China, China (*type*—Canton).

(9) *V. heterophylla* Roxb. Hort. Beng. 46 (1814), *nomen tantum*, et Fl. Ind. 3, 75 (1832); C. B. Clarke in F.B.I. 585; Brand. Ind. Trees 504; K. and G. Mat. 848; Lam Verb. 187, *pro parte*; Ridl. F.M.P. 633. *V. quinata* Dop in F.I.C. 833, *pro parte*.

PAYAP. Chiangmai, c. 750–1300 m., evergreen forest, *Winit* 1373. *Kerr* 3209. NAKAWN SRITAMARAT. Hui Mut, *Kiah* 24403.

Distrib. Assam (*type*), Burma, Malaya, Philippines, China, Hainan, Formosa.

(10) *V. heterophylla* Roxb. var. *undulata* C. B. Clarke in F.B.I. 585 (1885). *V. heterophylla* Roxb.; Kurz For. Fl. 270 (1877). *V. heterophylla* Roxb. var. *typica* Lam Verb. 188 (1919), *pro parte*.

PAYAP. Chiangmai, Pang Tawn, *Put* 3803.

Distrib. Burma (*type*—Rangoon), Sumatra, Java, Philippines (ex Lam).

(11) *V. sumatrana* Miq. var. *urceolata* (C. B. Clarke) King et Gamble Mat. 849 (1909); Lam Verb. 187; Dop in F.I.C. 826. *V. urceolata* C. B. Clarke in F.B.I. 585 (1885); Ridl. F.M.P. 633; P'ei Verb. 97.

SURAT. Chumpawn, Bang Son, *Put* 1507. Siepyuan, *Put* 992.

Distrib. India, Malaya (*type*—Malacca), French Indo-China (ex F.I.C.).

(12) *V. pubescens* Vahl Symb. 3, 85 (1794); Kurz For. Fl. 271; C. B. Clarke in F.B.I. 585; Brand. Ind. Trees 504; F.K.C. 173; Williams 431; K. and G. Mat. 848; Ridl. i, 157; Craib 164; Ridl. ii, 58; Lam Verb. 183; Ridl. iv, 111; Ridl. F.M.P. 632; Dop in F.I.C. 824.

RACHASIMA. Korat, Bua Yai, *Put* 4273. CHANTABURI. Kaw Chang, jungle, 304. Kaw Chang, Salak Kawk, near sea-level, rocky slope, open deciduous forest, *Kerr* 6893. Kaw Chang, Lem Dan, open forest, *Rabil* 21. KRUNGTEP. Bangkok, c. 5 m., cultivated, *Kerr* 4455. PRACHINBURI. Sriracha, Nawng Kaw, evergreen forest, c. 30 m., *Kerr* 2039. Sriracha, Mrs. D. J. Collins 186. Sriracha forest, 16 miles inland, Mrs. D. J. Collins 167. RACHABURI. Prachuap, Hua Hin, c. 5 m., open scrub, *Marcen* 2281. Hui Yang, c. 50 m., edge of evergreen forest, *Kerr* 10885. SURAT. Chumpawn, Ban Pak Klawng, c. 20 m., evergreen forest, *Kerr* 11389. Kaw Samui, *Put* 834. Kaw Pangan, *Put* 1258. PUKET. Takuapa, Bangwan, c. 10 m., common in secondary growth, *Kerr* 17085. Trang, Kao Kao, Kuan Pra, timber used for making house-posts, *Rabil* 243. Trang, *Vanpruk* 607. Chawng, *Fox* 3828. Satul, Tung Wa, c. 20 m., savannah, *Kerr* 13875. Satul, *Ridley* 14938. NAKAWN SRITAMARAT. Songkla, Natawi, *Rabil* 80. Singora, *Anandale* 1667. PATTANI. Pattani, Tomo, c. 60 m., road-side, *Lakshnakara* 611. Betong, c. 200 m., scrub, *Kerr* 7491. SIAM. West Coast and Islands of Peninsular Siam, *Kloss* 6607.

Distrib. S. India (*type*), Burma, Assam, French Indo-China, Malaya.

(13) *V. siamica* Williams in Bull. Herb. Boiss. sér. 2, 5, 431 (1905); Williams 431; K. and G. Mat. 847; Ridl. i, 157; Lam Verb. 197; Ridl. F.M.P. 632; Dop in F.I.C. 829.

RACHABURI. Prachuap, Sam Roi Yawt, c. 500 m., rocky limestone hill, *Kerr* 10948. Bangtapan, *Put* 1378. SURAT. Chumpawn, Sapli, *Put* 1025. Langsuan, Tako, *Put* 1643. Surat, Ban Kawp Kep, c. 100 m., rocky limestone hill, *Kerr* 13175. Kantuli, *Put* 4149. PUKET. Pang-nga, Kaw Kalat, c. 10 m., rocky limestone ground, *Kerr* 17317. Krabi, Tambon, Kao Panom, c. 400 m., evergreen on limestone hill, *Kerr* 18775. Kaw Pipe-le, c. 200 m., limestone hill, *Kerr* 18923. Trang, Kao Kao, Kao Chom Lem, hill summit, *Rabil* 307. Langkawi (*type*). Langkawi, Dayang, Bunting and Kwah, *Fox* 12720. *Curtis* 1683. Terutao, Telok Apan, *Haniff et Nur* 7079. Selat Panchor, *Henderson* 21385. Kaw Rabana, off coast of Perlis, c. 60 m., limestone ridge top, *Henderson* 23094.

Distrib. Malay Peninsula.

Kerr 18923 and *Rabil* 307 have been referred to this species in spite of the fact that the ovary is distinctly pilose. In every other way the plants are so identical with this species that the writer does not feel justified in separating them.

(14) *V. glabrata* R. Br. Prodr. Fl. Nov. Holl. 512 (1810); C. B. Clarke in F.B.I. 588; Brand. Ind. Trees 505; K. and G. Mat. 852;

Lam Verb. 203 ; Ridl. F.M.P. 634 ; Dop in F.I.C. 840. *V. leucoxydon* Linn. ; Kurz For. Fl. 273 (1877).

PAYAP. Doi Sutep, c. 330 m., scrub jungle, *Kerr* 3369. NAKAWN SAWAN. Nakawn Sawan, Me Wong, c. 200 m., mixed deciduous forest, *Kerr* 6031. Muang Tak, Me Sawt, c. 20 m., mixed deciduous forest, *Kerr* 6156. UDAWN. Muk Dahan, Ban Won, dry evergreen forest, *Lakshnakara* 960. RACHASIMA. Korat, Ban Chum Seng, *Noe* 202. PRACHINBURI. Sriracha, Kaw Loy, c. 3 m., *Mrs. D. J. Collins* 1247. Nawng Kaw, 16 miles inland, *Mrs. D. J. Collins* 165. KRUNGTEP. Bangkok, Temple compound, probably cultivated, *Marcen* 2086. *Marcen* 1722. Hedgerow, *Kerr* 4391. SURAT. Langsuan, Tako, *Put* 1612. PUKET. Takuapa, c. 10 m., scrub, *Kerr* 17103. Krabi, Kaw Lanta, *Vanpruk* 725. Trang, Palien, under 50 m., scrub, *Kerr* 19121. Chum Het, c. 100 m., edge of evergreen forest, *Kerr* 15211. Trang, Kao Kao, *Rabil* 383. NAKAWN SRITAMARAT. Nakawn Sritamarat, Ban Tasan, under 50 m., scrub on river bank, *Kerr* 15370. PATTANI. Pattani, Kao Kalakiri, c. 50 m., evergreen forest, *Kerr* 7748.

Distrib. Indo-China, Malaya, New Guinea, North Australia (*type*).

(15) *V. peduncularis* Wall. ex Schauer in DC. Prodr. 11, 687 (1847) ; C. B. Clarke in F.B.I. 587 ; Brand. Ind. Trees 505 ; Craib 164 ; Dop in F.I.C. 838.

PAYAP. Chiangmai, c. 300–400 m., mixed forest at foot of Doi Sutep and in deciduous forest on lower slopes of Doi Sutep, *Kerr* 572, 34, 34A. Doi Angka, c. 900 m., open evergreen forest, *Kerr* 5275. Lampun, Me Li, c. 570 m., deciduous forest, *Winil* 255. MAHARAT. Lampang, Me Sung, c. 450 m., *Vanpruk* 300. Pre, c. 150–240 m., *Vanpruk* 122. RACHASIMA. Korat, Ban Chum Seng, *Put* 2788. SURAT. Chumpawn, Bang Son, *Haniff et Nur* 4242.

Distrib. Indo-China (*type*—Moulmein).

(16) *V. longisepala* King et Gamble in Kew Bull. 112 (1908) et Mat. 853 ; Lam Verb. 202 ; Ridl. F.M.P. 634.

PATTANI. Bukit, c. 100 m., evergreen forest, *Kerr* 7113, *Kiah* 24275. Tomo, c. 210 m., scandent shrub, *Lakshnakara* 634.

Distrib. Malay Peninsula (*type*).

(17) *V. vestita* Wall. ex Kurz For. Fl. 272 (1877) ; C. B. Clarke in F.B.I. 587 ; Brand. Ind. Trees 505 ; F.K.C. 172 ; Williams 431 ; K. and G. Mat. 854 ; Lam Verb. 205 ; Ridl. F.M.P. 635 ; P'ei Verb. 112 ; Dop in F.I.C. 839.

PAYAP. Chiangmai, Me Tun, c. 900 m., edge of open marshy ground, *Kerr* 6238. SIAM. Schmidt 434.

Distrib. Burma, China, Laos (ex F.I.C.), Malaya (*type*—Penang).

(18) *V. gamosepala* Griff. Notul. 4, 178 (1854), et Ic. Pl. Asiat. t. 448, fig. 2 (1854) ; C. B. Clarke in F.B.I. 588 ; K. and G. Mat. 855 ; Lam Verb. 209 ; Ridl. F.M.P. 635.

PATTANI. Pattani, Betong, c. 400 m., evergreen forest, *Kerr* 7440. Tomo, Ban Wo, c. 180 m., near stream in evergreen forest, *Lakshnakara* 695.

Distrib. Malay Peninsula (*type*—Malacca), Sumatra, Borneo (ex Lam).

Paravitex Fletcher

P. siamica Fletcher in Kew Bull. 74 (1937) fig. 2.

PRACHINBURI. Krabin, Aran Pratet, under 50 m., evergreen forest by stream, *Kerr* 19329. AYUTHIA. Angtawng, *Put* 2573. Bangpain, c. 6 m., waste ground, *Marcen* 1004. NAKAWN CHAISI. Supan, Dom Bang, c. 20 m., banks of river, *Kerr* 7002 (*type*).

TRIBE III. CARYOPTERIDEAE

Caryopteris Bunge

C. paniculata C. B. Clarke in F.B.I. 597 (1885) ; Brand. Ind. Trees 512 ; Dop in F.I.C. 885. *Clerodendrum gratum* Kurz For. Fl. 268, non Wall.

PAYAP. Doi Sutep, c. 1450 m., evergreen forest, *Kerr* 3137.

Distrib. Burma (*type*), Yunnan.

Garrettia Fletcher

G. siamensis Fletcher in Kew Bull. 71 (1937) fig. 1.

PAYAP. Doi Chiangdao, north of Ban Tam, c. 420 m., *Garrett* 988 (*type*).

Glossocarya Wall.

Under surface of leaf not glandular-punctate :

Leaves thinly tomentose below :

Capsule patently grey-hairy.....(1) *G. mollis*

Capsule grey-strigose.....(2) *G. longiflora*

Leaves glabrous below.....(3) *G. siamensis*

Under surface of leaf glandular-punctate :

Leaves crenate, mature at most 4 cm. long.....(4) *G. crenata*

Leaves entire, mature at least 5 cm. long.....(5) *G. premnoides*

(1) *G. mollis* Wall ex Griff. in Calc. Journ. Nat. Hist. 3, 366 (1843) ; Kurz For. Fl. 257 ; C. B. Clarke in F.B.I. 598 ; Brand. Ind. Trees 512 ; Hoss. 430 ; Craib 166 ; Dop in F.I.C. 886.

PAYAP. Me Ping Rapids, evergreen forest, *Kerr* 3061. NAKAWN SAWAN. Kao Ngaw, Ban Den, c. 100 m., climbing over limestone rocks, *Kerr* 4541. PITSANULOK. Petchabun, Prassals River, *Bourke*. UDAWN. Loi, Wang Sapung, c. 300 m., rocky limestone hill, *Kerr* 8770. AYUTHIA. Saraburi, Menam Sak, c. 40 m., along river bank, *Kerr* 4047. Muak Lek, c. 400 m., limestone hill-top, *Marcen* 1890. PRACHINBURI. Sriracha, by beach, *Mrs. D. J. Collins* 26, 39. KRUNGTEP. Menam, Bang-Ma-Lun, *Hosseus* 5. RACHABURI. Prachuap, Sam Roi Yawt, c. 50 m., scrub, *Kerr* 10963, rocky limestone hill, *Put* 236. SURAT. Chumpawn, Siepyuan, *Put* 996. Surat, Kantuli, *Put* 4127. PUKET.

Trang, Robinson 6406. NAKAWN SRITAMARAT. Patalung, Kao Hua Tek, c. 50 m., on limestone rocks, *Kerr* 19279.

Distrib. Burma (type—Sagaing), Annam (ex *F.I.C.*).

(2) *G. longiflora* Fletcher in Kew Bull. 205 (1938).

AYUTHIA. Saraburi, Keng Koi, *Lakshnakara* 284 (type). LOWER SIAM. Kao Kaw Sawan, c. 150 m., *Annandale* 1832.

(3) *G. siamensis* Craib in Kew Bull. 240 (1922); Dop in *F.I.C.* 888.

NAKAWN SAWAN. Chainat, *Pui* 2673. AYUTHIA. Angtawng, *Pui* 2575. KRUNGTEP. Bangkok, under 5 m., along canal, *Kerr* 4502 (type). RACHABURI. Kanburi, Ta Salao, c. 50 m., along river bank, *Kerr* 19530.

Distrib. French Indo-China (ex *F.I.C.*).

(4) *G. crenata* Fletcher in Kew Bull. 205 (1938).

UDAWN. Kawnken, near railway lines, *Lakshnakara* 1083 (type).

(5) *G. premnoides* Ridl. in Journ. Str. Br. Roy. As. Soc. 59, 157 (1911); *F.M.P.* 636.

RACHABURI. Kanburi, 30 m., growing gregariously on inundated banks of river, *Winit* 545. SURAT. Surat, Ta Kanawn, c. 50 m., on trees along river bank, *Kerr* 12312.

Distrib. Perlis (type).

Hymenopyramis Wall.

Utricle at least 2 cm. long, up to 4 cm. long:

Utricle almost glabrous; leaves with a thick short adpressed tomentum beneath and with numerous sessile amber glands almost completely hidden by the tomentum:

Leaves ovate to elliptic, up to 15 cm. long.....(1) *H. vesiculosa*

Leaves elliptic, up to 8 cm. long.....(2) *H. acuminata*

Utricle strongly pubescent; leaves with a thinner tomentum of longer hairs beneath and numerous sessile amber glands not hidden by the tomentum.....(3) *H. siamensis*

Utricle at most 2 cm. long:

Leaves with a short tomentum of white rather adpressed hairs below(4) *H. brachiata*

Leaves with a thick tomentum of longer white hairs below.....(5) *H. cana*

(1) *H. vesiculosa* Fletcher in Kew Bull. 206 (1938).

MAHARAT. Pang Pui, c. 420 m., limestone rocks, *Kerr* 3626. NAKAWN SAWAN. Ban Dan, near Paknampo, c. 40 m., *Kerr* 3011 (type). Kawnken, Pu Wieng, c. 100 m., deciduous forest, *Kerr* 20657.

(2) *H. acuminata* Fletcher in Kew Bull. 206 (1938).

CHANTABURI. Krat, Kao Saming, under 50 m., evergreen forest, *Kerr* 17917 (type).

(3) *H. siamensis* Craib in Kew Bull. 154 (1912); Dop in *F.I.C.* 890; Craib 166.

RACHASIMA. Korat, Pak Chawng, c. 300 m., scrub, *Marcan* 1557. PRACHINBURI. Sriracha, Nawng Kaw, 30 m., in evergreen forest, *Kerr* 2087 (type). Mrs. D. J. Collins 620. Nawng Nam Kio, c. 120 m., Mrs. D. J. Collins 1855. Nawng Nok Takrun, c. 24 m., Mrs. D. J. Collins 1826.

Distrib. French Indo-China (ex *F.I.C.*).

(4) *H. brachiata* Wall. ex Kurz For. Fl. 258 (1877); C. B. Clarke in *F.B.I.* 598; Brand. Ind. Trees 505; Craib 166; Dop in *F.I.C.* 889.

MAHARAT. Pre, c. 120 m., *Vanpruk* 178. Me Ping, Ban Na, *Kerr* 2017A. Muang Hawt, *Kerr* 2017. UDAWN. Udawn, Nawng Han, *Lakshnakara* 1040. PRACHINBURI. Sriracha, Mrs. D. J. Collins 539, 248. Kao Chalak, near Sriracha, c. 12–120 m., Mrs. D. J. Collins 1263. All over the Sriracha forest, Mrs. D. J. Collins 1525. Sriracha, c. 20 m., hedgerow, *Marcan* 1364. AYUTHIA. Saraburi, Muak Lek, Kao Mak Mawk, *Noe* 131. RACHABURI. Nawng Ke, c. 12 m., forest, West Coast, Gulf of Siam, Mrs. D. J. Collins 1577. Kanburi, Kao Tawng, c. 50 m., bamboo forest, *Kerr* 19634. Hua Hin, *Marcan* 363. Hua Hin, Baw Tai, c. 2 m., *Marcan* 2485. Petchaburi, c. 100 m., deciduous forest, *Kerr* 5721. Petchaburi, Cha Am, *Lakshnakara*. Prachuap, Kao Tao, in scrub, by sea, *Kerr* 16146. Hui Yang, under 50 m., scrub, *Kerr* 10742. Pak Tawan, c. 150 m., light evergreen forest, *Kerr* 20515.

Distrib. N. & C. India, Burma (type), Cochinchina (ex *F.I.C.*).

(5) *H. cana* Craib in Kew Bull. 240 (1922); Dop in *F.I.C.* 890. PAYAP. Me Ping Rapids, Keng Soi, c. 400 m., on rocks, *Kerr* 4637 (type). UDAWN. Sakon Nakawn, *Lakshnakara* 1010.

Distrib. French Indo-China (ex *F.I.C.*).

TRIBE IV. SYMPHOREMEAE

Congea Roxb.

Involucre of 4 bracts, very rarely of 3 bracts; bracts free or connate at the base to form a very shallow cup 0.75–1 mm. deep.....

(1) *C. villosa*

Involucre always of 3 bracts; bracts free or connate at the base to form a cup up to 6 mm. deep:

Bracts free or connate at the base to form a very shallow cup 0.75–1 mm. deep:

Leaves round or more often cordate at the base; involucre bracts elliptic; calyx-teeth 1.8–2 mm. long.....

(2) *C. tomentosa*

Leaves often round but never cordate at the base; involucre bracts oblong; calyx teeth 3 mm. long.....

(3) *C. tomentosa* var. *azurea*.

Bracts connate at the base forming a cup 4–6 mm. deep :

Involucral cup 4 mm. deep.....(4) *C. siamensis*;

Involucral cup 6 mm. deep.....(5) *C. connata*

(1) *C. villosa* Wight Ic. t. 1479/1, fig. B. (1850) ; C. B. Clarke in F.B.I. 603 ; Brand. Ind. Trees 513 ; Bakh. Verb. 100, *pro parte*.

SURAT. Kao Meo, c. 50 m., bamboo forest, *Kerr* 12470. PUKET. Ranawng, Kaw Bangben, c. 50 m., evergreen forest, *Kerr* 16656. Puket, Katu, c. 50 m., evergreen forest, *Kerr* 17466. Kopah, *Haniff* 3858. NAKAWN SRITAMARAT. Songkla, Wang Yai, under 50 m., scrub, *Kerr* 14762. Kao Ram, c. 450 m., near stream, *Smith* 650.

Distrib. Burma (*type*).

(2) *C. tomentosa* Roxb. Cor. Pl. 3, 90, t. 293 (1819) ; Kurz For. Fl. 256 ; C. B. Clarke in F.B.I. 603 ; Brand. Ind. Trees 513 ; Ostenfeld 717 ; K. and G. Mat. 866 ; Hoss. 430 ; Craib 167 ; Ridl. i. 158 ; Lam Verb. 338 ; Ridl. iv. 111 ; Bakh. Verb. 100 ; Ridl. F.M.P. 640, *in nota* ; Dop in F.I.C. 911.

MAHARAT. Pre, c. 120–180 m., *Vanpruk* 163. NAKAWN SAWAN. Raheng, Wang Chao forest, *Lindhard*. Nakawn Sawan, Takli, *Put* 2101. c. 30 m., hill foot, forest, *Marcan* 1072. RACHASIMA. Korat, Pak Chawng, c. 300 m., scrub jungle, *Marcan* 1550. CHANTABURI. Chantabun, Makam, *Lakshnakara* 491. Krat, Baw Rai, c. 50 m., climbing in scrub, *Kerr* 9516. PRACHINBURI. Sriracha, near railway, c. 10 m., *Mrs. D. J. Collins* 359. Near Sriracha, c. 20 m., *Mrs. D. J. Collins* 2073. RACHABURI. Prachuap, Kan Kradai, *Put* 2283. Bangtapan, *Keith* (ex *Ridl.*). PUKET. Kopah, *Haniff* (ex *Ridl.*).

Distrib. Burma (*type*), French Indo-China (ex *F.I.C.*), Malay Peninsula.

(3) *C. tomentosa* Roxb. var. *azurea* (Wall. ex Wight) C. B. Clarke in F.B.I. 604 (1885) ; Brand. Ind. Trees 513 ; Williams 432 ; K. and G. Mat. 866, *in nota* ; Dop in F.I.C. 913. *C. villosa* Wight ; Bakh. Verb. 100 (1921) *pro parte*. *C. azurea* Wall. ; Hoss. 429.

PAYAP. Chiangmai plain, c. 300 m., on bushes in scrub jungle, *Kerr* 533. *Hosseus* 370. PITSANULOK. Petchabun, c. 50 m., mixed forest, *Kerr* 6368. CHANTABURI. 20 miles inland from Chantabun, *Murton* 85.

Distrib. Burma (*type*), Malay Peninsula. Cultivated in N. India.

(4) *C. siamensis* Fletcher in Kew Bull. 209 (1938).

PRACHINBURI. Krabin, Ban Keng, c. 20 m., savannah, *Kerr* 19792. RACHABURI. Kanburi, Sisawat, c. 50 m., climbing on bamboo along river bank, *Kerr* 10166 (*type*).

(5) *C. connata* Fletcher in Kew Bull. 208 (1938).

CHANTABURI. Krat, Kao Saming, under 50 m., evergreen forest, *Kerr* 17913 (*type*). Kaw Chang, Klawng Mayom, c. 50 m., evergreen forest by stream, *Kerr* 6810. East Coast, on high banks of stream below waterfall, *Mrs. D. J. Collins* 569. Kaw Chang, 306.

Symphorema Roxb.

S. involucratum Roxb. Cor. Pl. 2, 46, t. 186 (1819) et Fl. Ind. 2, 262 ; Kurz For. Fl. 254 ; C. B. Clarke in F.B.I. 599 ; Brand. Ind. Trees 514 ; Craib 167 ; Dop in F.I.C. 898.

PAYAP. Chawn Tawng, c. 270 m., mixed deciduous forest, *Kerr* 2932. Muang Fang, c. 700 m., mixed dry forest, *Kerr* 5234. MAHARAT. Lampang, Me Saloi, c. 200 m., mixed deciduous forest, *Winit* 1268. Pre, Hui Kammin, c. 18 m., *Kerr* 991.

Distrib. S. India (*type*), Burma.

Sphenodesme Jack

Corolla lobes narrowly lanceolate or oblong or obovate ; anthers included in the corolla tube ; style very short ; leaves with branched hairs (Sect. I. BRACHYNEMA C. B. Clarke) :

Calyx equally 5-toothed ; corolla lobes obovate.....(1) *S. involucrata*

Calyx bilabiate ; corolla lobes linear or narrowly oblong :

Corolla lobes at least 1 mm. broad :

Leaves orbicular, round or slightly cordate at the base ; ovary non-glandular.....(2) *S. orbiculare*

Leaves ovate to slightly elliptic, obtuse or cuneate at the base ; ovary glandular at the apex.....(3) *S. odorata*

Corolla lobes at most 1 mm. broad ; leaves elliptic, cuneate or obtuse at the base.....(4) *S. microstylis*

Corolla lobes oblong ; anthers exserted ; style long, exserted ; leaves glabrous or with straight jointed hairs (Sect. II. EUSPHENODESMA C. B. Clarke) :

Cymes of 3 flowers :

Ovary glabrous ; lateral nerves 4–5 pairs.....(5) *S. triflora*

Ovary hairy ; lateral nerves 1–2 pairs.....(6) *S. mekongensis*

Cymes of 7 flowers :

Involucral bracts glabrous on both surfaces, except for small axillary tufts below ; calyx glabrous without except for a few scattered hairs, 7–9 mm. deep, including the teeth and the tube ; leaves glabrous.....(7) *S. pentandra*

Involucral bracts crisply tomentose on both surfaces ; calyx tomentose without, 5–7 mm. deep, including teeth and tube ; leaves markedly tomentose below.....(8) *S. mollis*

(1) *S. involucrata* (Presl) Robinson in Proc. Am. Acad. 51, 531 (1916). *S. unguiculata* (Schauer) C. B. Clarke in F.B.I. 601 (1885) ; Brand. Ind. Trees 513 ; Dop in F.I.C. 900. *Symphorema unguiculatum* Kurz For. Fl. 255 (1877). *Vitex involucratus* Presl Bot. Bernerk. 148 (1844).

MAHARAT. Lampang, Me Luang, c. 260 m., evergreen forest, *Winit* 1586. UDAWN. Loi Sitan, c. 200 m., evergreen forest, *Kerr* 20030. PRACHINBURI. Krabin, Tungpo, c. 100 m., evergreen forest, *Kerr* 9812.

Distrib. Burma (*type*), Hainan, Indo-China.

(2) *S. orbicularis* Fletcher in Kew Bull. 208 (1938).

PUKET. Ranawng, Lamlieng, c. 10 m., climbing in scrub, *Kerr* 16411 (*type*).

(3) *S. odorata* Fletcher in Kew Bull. 207 (1938).

MAHARAT. Lampang, Me Salop, 190 m., *Winit* 1264. PUKET. Ranawng, Kao Talu, c. 50 m., scrub, *Kerr* 11815 (*type*).

(4) *S. microstylis* C. B. Clarke in F.B.I. 600 (1885); Brand. Ind. Trees 513; F.K.C. 175; Williams 432; Ridl. iv. 111; Ridl. F.M.P. 638. *S. ferruginea* Briquet in Engl. und Prantl Pflanzenf. iv. 3a, 181 (1894); K. and G. Mat. 861 (1909); Ridl. i. 157; Dop in F.I.C. 899.

MAHARAT. Nan, Doi Wao, c. 900 m., *Kerr* 2437. UBON. Ubon, Kemarat, c. 100 m., mixed deciduous forest, *Kerr* 8376. CHANTABURI. 20 miles inland from Chantabun, *Murton* 62. Kaw Chang, Salak Kawk, *Rabil* 28. Kaw Chang, Klawng Mayom, scrub near sea, *Kerr* 6866. PRACHINBURI. Sriracha, c. 6-12 m., *Mrs. D. J. Collins* 329, 329A, 360. Sriracha forest, on the way from Ban Dan to Hot Springs, *Mrs. D. J. Collins* 585. RACHABURI. Kanburi, Wangka, c. 200 m., bamboo forest, *Kerr* 10305. SURAT. Surat, Kao Wong, c. 100 m., scrub, *Kerr* 18271. PUKET. Langkawi, Terutao, *Curtis* (ex *Ridl.*). NAKAWN SRITAMARAT. Nakawn Sritamarat, Ban Natawn, under 50 m., savannah, *Kerr* 15633.

Distrib. Burma (*type*), Malay Peninsula, Cambodia, Cochinchina. (ex F.I.C.).

(5) *S. triflora* Wight Ic. t. 1478 (1850); C. B. Clarke in F.B.I. 601; K. and G. Mat. 863; Ridl. i. 158; Lam Verb. 332; Ridl. F.M.P. 638.

PUKET. Langkawi, *Fox* (ex *Ridl.*). PATTANI. Betong, c. 400 m., evergreen forest, *Kerr* 7681.

Distrib. Malay Peninsula (*type*—Malacca), Sumatra (ex *Ridl.*).

(6) *S. mekongensis* Dop in Bull. Soc. Bot. France, 1914, 61, 318 (1915), ex descr., et F.I.C. 901 (1936).

MAHARAT. Lampang, Me Sui, c. 100 m., moist forest, *Winit* 1961. UDAWN. Loi, Pu Tong, c. 900 m., evergreen forest, *Kerr* 8825.

Distrib. Laos (*type*).

(7) *S. pentandra* Jack in Mal. Misc. 1, i, 19 (1820); C. B. Clarke in F.B.I. 602; Brand. Ind. Trees 513; F.K.C. viii. 174; Williams 432; K. and G. Mat. 863; Craib 167; Ridl. i. 158; Lam Verb. 335; Ridl. iv. 111; Ridl. F.M.P. 639; P'ei Verb. 183; Dop in F.I.C. 904. *Symphorema Jackianum* Kurz For. Fl. 255 (1877).

PAYAP. Doi Sutep, c. 750 m., evergreen forest by stream, *Kerr* 1741. Chiangdao, Me Ping, c. 390 m., evergreen forest, *Kerr* 1059. PITSANULOK. Nakawn Tai, c. 200 m., mixed deciduous forest, *Kerr* 5849. PRACHINBURI. Krabin, Bupram, c. 300 m., evergreen forest, *Kerr* 9832. Sriracha, Nawng Kaw, c. 70 m., evergreen forest, *Marcan* 1204. Sriracha, near railway line, c. 10 m., *Mrs. D. J. Collins* 358. Sriracha to Nawng Yai Bu, *Mrs. D. J. Collins* 632.

Near Sriracha, c. 5-10 m., *Mrs. D. J. Collins* 1416, 1388, 1969. RACHABURI. Bangtapan Noi, *Keith* (ex *Ridl.*). SURAT. Chumpawn, Ta Ngaw, c. 50 m., evergreen forest, *Kerr* 11603. Surat, Kaw Samui, c. 200 m., by stream, *Kerr* 12583. PUKET. Ranawng, Kraburi, c. 10 m., scrub, *Kerr* 16376. Ranawng, c. 10 m., scrub, *Kam La in Herb. Kerr* 16535. Ranawng, Kao Talu, c. 50 m., scrub, *Kerr* 11816. Trang, near road, c. 10 m., *Vanpruk* 848. Satul, Kuan Po, c. 20 m., scrub, *Kerr* 13825. Satul, Adang, by beach, *Kerr* 14070. Satul, Bukit Rajah Wang, *Ridley* 14937. Langkawi, Kwah, *Curtis* (ex *Ridl.*). Langkawi, *Curtis* 2522. *Haniff* 15478. *Ridley et Curtis* 8320. *Haniff et Nur* 7070. NAKAWN SRITAMARAT. Nakawn Sritamarat, Lam Saka, under 50 m., scrub, *Kerr* 15396. Songkla, Kaw Suan Toon, *Annandale*. Kao Ram, c. 360 m., 607. West Coast and Islands of Peninsular Siam, *Kloss* 7038, 6707.

Distrib. Burma, French Indo-China, Malay Peninsula (*type*—Penang), Borneo, Hainan, China.

(8) *S. mollis* Craib in Kew Bull. 154 (1912); Craib 167; Dop in F.I.C. 904.

RACHASIMA. Korat, Pak Chawng, c. 300 m., scrub jungle, *Marcan* 1590. CHANTABURI. Chantabun, Tap Sai, c. 200 m., scrub, *Kerr* 9688. PRACHINBURI. Sriracha, Nawng Kaw, c. 30 m., evergreen forest, *Kerr* 2075 (*type*). Sriracha, *Put* 457. KRUNGTEP. Bangkok, cultivated, *Kerr* 11035. AYUTHIA. Saraburi, Muak Lek, c. 200 m., evergreen forest, *Kerr* 9117. Saraburi, Ban Nawng Bua, *Put* 1107. Saraburi, Keng Koi, c. 50 m., climbing on trees along river bank, *Kerr* 7971. RACHABURI. Petchaburi, c. 10 m., scrub on limestone hill, *Kerr* 11063. Petchaburi, Bo Tai, c. 100 m., forest on granite hill, *Marcan* 2739. Petchaburi, c. 50 m., base of hill, *Marcan* 552. Prachuap, Hua Hin, near sea-level, scrub, *Kerr* 13436. *Marcan* 2227. Prachuap, Sam Roi Yawt, under 50 m., scrub, *Kerr* 10966.

TRIBE V. AVICENNIEAE

Avicennia Linn.

Style and stigma at most 1 mm. long, scarcely separable and forming a conical tip to the ovary; leaves grey or very pale tawny below, ovate to lanceolate:

Fruit beaked; flowers in short distichous spikes; leaves elliptic to lanceolate.....(1) *A. alba*

Fruit not beaked; flowers in small heads; leaves ovate to elliptic.....(2) *A. sphaerocarpa*

Style at least 2.5 mm. long; leaves light to dark tawny below, obovate.....(3) *A. officinalis*

(1) *A. alba* Blume Bijdr. 821 (1826); Brand. Ind. Trees 515; K. and G. Mat. 868; Ridl. F.M.P. 641. *A. officinalis* (Linn.) Kurz For. Fl. 275 (1877); Lam Verb. 340, *pro parte*. *A. officinalis*

Linn. var. *alba* (Bl.) C. B. Clarke in F.B.I. 604 (1885). *A. marina* Forsk. var. *alba* (Bl.) Bakh. Verb. 207 (1921); Dop in F.I.C. 894.

CHANTABURI. Chantabun, Klung, mangrove forests, *Kerr* 17948. KRUNGTEP. Paknam, tidal swamp forest near sea, *Kerr* 3920. NAKAWN CHAIS. Tachin, growing below high tide level, *Kerr* 9163, tidal forest, *Kerr* 4027. RACHABURI. Prachuap, Sam Roi Yawt, low lying ground near sea, *Kerr* 10969. SURAT. Langsuan, Tako, Put 1721. PUKET. Ranawng, Kaw Chang, on sandy flats flooded at high tide, *Kerr* 16581. Trang, Kaw Libang, on shore between high and low tide marks, *Kerr* 19070. Satul, Tanjong Po, forming a nearly pure open formation below high tide mark, *Kerr* 14236.

Distrib. India, Cochinchina, Malay Archipelago (*type*) to N. Australia.

(2) *A. sphaerocarpa* Stapf ex Ridley in Journ. Fed. Mal. States Mus. 10, 151 (1920) et F.M.P. 642.

PRACHINBURI. Sriracha, below high water mark, *Kerr* 2095. Lemfam Island, near Sriracha, almost submerged at high tide, Mrs. D. J. Collins 1028. NAKAWN CHAIS. Tachin, just above high tide level, *Kerr* 9162. Marcan 855. RACHABURI. Prachuap, Sam Roi Yawt, low-lying ground near sea, *Kerr* 11017. SURAT. Kaw Samui, Ban Nua Put, on tidal mud, *Kerr* 15702. PUKET. Krabi, Lanta, in mangroves, *Kerr* 18861.

Distrib. Malay Peninsula (*type*-Penang), Philippines, China.

(3) *A. officinalis* Linn. Sp. Pl. 110 (1753); C. B. Clarke in F.B.I. 604; Brand. Ind. Trees 514; F.K.C. 175; Williams 432; K. and G. Mat. 867; Craib 168; Ridl. i. 158; Lam Verb. 340, *pro parte*; Bakh. Verb. 214; Dop in F.I.C. 895. *A. tomentosa* Roxb.; Kurz For. Fl. 276 (1877).

PUKET. Krabi, Ao Luk, mangrove forest, *Kerr* 18593, 17474. Trang, Bourke. Satul (ex Ridl.).

Distrib. Coasts of India (*type*), Ceylon, Burma, Cochinchina, Malay Peninsula, Java, eastwards to the Pacific.

BIBLIOGRAPHY.

Alphabetical list of abbreviated references quoted in the enumeration.

BAKH. VERB. (Bakhuizen, R. C., Revision of the Verbenaceae of the Dutch East Indies, in Bull. Jard. Bot. Buit., sér. 3, 3 : 1921).

BRAND. IND. TREES (Brandis, D., Indian Trees : 1895).

CRAIB (Craib, W. G., Contributions to the Flora of Siam (Dicotyledons), in Aberd. Univ. Studies, no. 57 : 1912).

DOP IN F.I.C. (Dop, P., Verbenaceae of French Indo-China, in Fl. Gén. Indo-Chine, 4, pt. 8 : 1936).

F.B.I. (Hooker, J. D., Flora of British India, 4 : 1885).

F.K.C. (Schmidt, J., Flora of Koh Chang, pt. 8, in Bot. Tidsskr. 26 : 1904).

HOSS. (Hosseus, C. C., Die botanischen Ergebnisse meiner Expedition nach Siam, in Bot. Centralbl. 28, pt. 2, p. 357 : 1911).

K. AND G. MAT. (King, G. and Gamble, J. S., Materials for a Flora of the Malay Peninsula : 1909).

KURZ FOR. FL. (Kurz, S., Forest Flora of British Burma, 2 : 1877).

LAM VERB. (Lam, H. J., Verbenaceae of the Malay Archipelago : 1919).

OSTENFELD (Ostenfeld, C. H., A List of Plants collected in the Raheng District, Upper Siam, by Mr. E. Lindhard, in Bull. Herb. Boiss., sér. 2, 5, 709 : 1905).

P'EI VERB. (P'ei, Chien, Verbenaceae of China, in Mem. Sci. Soc. China, 1, no. 3 : 1932).

RIDL. F.M.P. (Ridley, H. N., Flora of the Malay Peninsula, 2 : 1923).

RIDL. i (Ridley, H. N., An Account of a Botanical Expedition to Lower Siam, in Journ. Str. Br. R. As. Soc., no. 59, p. 27 : 1911).

RIDL. ii (Ridley, H. N., A Botanical Excursion to Pulau Adang, in Journ. Str. Br. R. As. Soc., no. 61, p. 45 : 1912).

RIDL. iii (Ridley, H. N., The Plants of Koh Samui and Koh Pennan, in Journ. F.M.S. Mus. 5, 158 : 1915).

RIDL. iv (Ridley, H. N., On a Collection of Plants from Peninsular Siam, in Journ. F.M.S. Mus. 10, 65 : 1920).

WILLIAMS (Williams, F. N., Liste des Plantes connues du Siam, in Bull. Herb. Boiss., sér. 2, 5, 430 : 1905).

LX—CONTRIBUTIONS TO THE FLORA OF SIAM. ADDITAMENTUM L.*

Meladerma Kerr, gen. nov. [Asclepiadaceae-Periploceae]; ab affini *Atherandra* Dcne. inflorescentia foliis multo brevior, lobis corollae oblongo-ovatis nec lineari-lanceolatis, translato brevius stipitato differt.

Suffrutices volubiles. *Folia* opposita. *Inflorescentia* pauciflora, saepius axillaris, foliis multo brevior, a basi 2-fida vel breviter pedunculata, ramis bracteis parvis vestitis. *Alabastrum* ovoideum, puberulum, corollae lobis dextrorsum se tegentibus. *Corolla* rotata, alte 5-fida, viridula; tubus brevissimus, fauce incrassatus, squamulis 5 obtusis staminibus interpositis instructus; lobi oblongo-ovati, patentes vel reflexi. *Coronae* segmenta simplicia, filiformia, inferne parum dilatata, basi filamentorum affixa. *Stamina* glabra, exserta, fauce corollae affixa; filamenta brevia, distincta; antherae circa stigma connatae, apice appendicibus triangularibus conniventibus; pollen granulosum, translati breviter stipitato applicitum. *Carpella* basi saepius in receptaculo leviter immersa. *Folliculi* cylindrici, late divaricati. *Semina* comosa.

Species tres, insulae Langkawi et regni Siamici incolae.

Meladerma puberulum Kerr, described below, is the type species of this proposed genus. The squamulae noted in the description are slight projections of the thickened ring at the throat of the corolla.

* Continued from K.B. 1938, 209.



Meladerma puberulum Kerr. 1, flowering branch, nat. size; 2, flower, $\times 4$; 3, calyx, $\times 12$; 4, part of calyx from within, $\times 16$; 5, corolla lobe from without, $\times 8$; 6, corolla lobe from within, $\times 8$; 7, part of corolla and stamens (from bud) from within, $\times 12$; 8, stamen and corona segment, $\times 16$; 9, stigmatic head and translators, $\times 16$; 10, translator, $\times 24$; 11, fruiting branch, nat. size; 12, seed, $\times 2$.

It seems probable that all three species have their habitat on rocky limestone hills. Such a habitat is mentioned for two of the species, while the third is recorded only from localities known to have such hills.

The generic name refers to the dark bark of the three species so far known.

Meladerma deciduum Kerr; a congeneribus habitu deciduo, inflorescentia dense tomentosa distinguendum.

Suffrutex volubilis, ramulis siccitate irregulariter corrugatis cortice nigro-brunneo paucilenticellato obtectis. *Folia* non visa. *Inflorescentia* ut videtur terminalis, omnino dense cinereo-tomentosa, pauciflora, usque circiter 1 cm. longa, bracteis ovatis subacutis circiter 2 mm. longis, pedicellis 5–8 mm. longis. *Calyx* 5-partitus, extus dense cinereo-tomentosus, lobis triangularibus circiter 2.5 mm. longis intus basi glandulis minutis instructis. *Corolla* rotata, viridula; tubus brevissimus, circiter 0.5 mm. longus; lobi oblongo-ovati, apice parum emarginati, extus dense cinereo-pubescentes, intus glabri, circiter 3.75 mm. longi, 1.5 mm. lati. *Coronae* segmenta filiformia, longitudine variabilia, saepius antheris paulo breviora, interdum filamentis vix aequilonga. *Stamina* circiter 1.5 mm. longa. *Translatores* 0.75 mm. longi, breviter stipitati. *Stylus* perbrevis, stigmatis capite convexo, carpellis basi in receptaculo leviter immersis multiovulatis. *Folliculi* ignoti.

Chiengmai, Ban Pa Sak, 540 m., on rocky limestone hill, Kerr 2834.

Meladerma insularum (King et Gamble) Kerr, comb. nov. *Gymnanthera insularum* King et Gamble in Journ. As. Soc. Beng. 74, pt. 2, 514 (1907).

King and Gamble referred this species to *Gymnanthera*, from which, however, it differs in several important points, notably in its rotate corolla and filiform corona segments. It is clearly congeneric with the two species here described under *Meladerma*. The authors describe the corona segments of *Gymnanthera insularum* as bifid. In Herb. Kew. there is a drawing, apparently by Gamble, of the floral parts of *Curtis* 3684, the type of *Gymnanthera insularum*, which shows two isolated coronal segments with a very short dorsal branch. In the flowers examined by the writer the corona segments appeared to be simply filiform: no dorsal branch was detected.

Meladerma puberulum Kerr; a *M. insularum* (King et Gamble) Kerr foliis late ellipticis puberulis differt.

Suffrutex volubilis, innovationibus puberulis, ramulis gracilibus longitudinaliter striatis cortice nigro-brunneo paucilenticellato obtectis. *Folia* late elliptica, basi cuneata, apice rotundata, leviter apiculata, ad 5.2 cm. longa et 4 cm. lata, chartacea, siccitate supra nigro-brunnea, subtus olivacea, supra costa nervisque minute puberula, subtus omnino dense puberula, costa supra parum impressa subtus cum nervis lateralibus prominente, nervis lateralibus

6-9-paribus prope marginem arcuatis anastomosantibusque, rete venularum supra impresso subtus inconspicuo; petiolus gracilis, supra convexus, 1.6-2.2 cm. longus, minute puberulus. *Inflorescentia* puberula, axillaris, petiolo multo brevior, ad 1 cm. longa, e basi bifida vel brevissime pedunculata, pauciflora, ramis bracteis parvis vestitis, pedicellis puberulis 5 mm. longis. *Calyx* suburceolatus, 5-lobatus, minute puberulus, lobis triangularibus circiter 0.75 mm. longis, intus basi glandulis minutis instructis. *Corollae* tubus circiter 1.5 mm. longus; lobi oblongo-ovati, extus sparse minuteque puberuli, circiter 3 mm. longi et 1.5 mm. lati. *Coronae* segmenta filiformia, staminibus saepius aequilonga, interdum breviora. *Stamina* circiter 1.5 mm. longa, siccitate appendicibus triangularibus nigro-brunneis. *Translatores* breviter stipitati, circiter 0.5 mm. longi. *Stylus* perbrevis, stigmatis capite convexo. *Folliculi* angulo 180° divaricati, cylindrici, apicem versus sensim attenuati, 7.5 cm. longi; semina leviter tuberculata, 6 mm. longa, coma alba 11 mm. longa.

Prachuap, rocky limestone hill, *Put* 285.

Periploca purpurea Kerr [Asclepiadaceae-Periploceae]; a *P. calophylla* (Wight) Falconer, cui affinis, floribus majoribus, petalis glabris distinguenda.

Suffrutex volubilis, glaber, ramulis gracilibus leviter striatis. *Folia* lineari-lanceolata, basi cuneata, apice longe et anguste acuminata, margine plana, ad 7 cm. longa et 0.8 cm. lata, coriacea, supra nitida, subtus opaca et pallidiora, costa subtus supraque prominenti, nervis lateralibus numerosis subparallelis cum nervo intramarginali junctis; petiolus 2-3 mm. longus, supra alte canaliculatus. *Cymae* glabrae, terminales, raro axillares, laxae 2-4-florae, foliis multo breviores; bractee subulatae, 1-2 mm. longae; pedicelli tenues, 5-8 mm. longi, apice bracteolis binis minutis instructi. *Calyx* 5-partitus, glaber, intus glandulis parvis 5 instructus, lobis triangularibus acutis 2 mm. longis. *Corolla* rotata, glabra, saturate purpurea; tubus perbrevis, circiter 1 mm. longus; lobi anguste lanceolati, apice attenuati, acuti, 13 mm. longi, prope basin 2.5 mm. lati. *Coronae* segmenta filiformia, puberula, ad 3 mm. longa. *Stamina* circiter 1 mm. longa; filamenta distincta, perbrevia; antherae dorso pilosae, apice in appendicem barbatam productae. *Ovarium* cum stigmate circiter 1.25 mm. altum, stigmatis capite convexo. *Folliculi* ignoti.

Doi Chiangdao, circiter 1,600 m., open evergreen forest, *Kerr* 5576.

Secamone siamica Kerr [Asclepiadaceae-Secamoneae]; species *S. emeticae* (Retz.) R. Br. affinis, foliis pro rata latioribus subtus puberulis, stigmatis capite rotundato differt.

Suffrutex volubilis, ramis gracilibus ferrugineo-pubescentibus tardius glabrescentibus leviter striatis. *Folia* lanceolata vel elliptica, basi subacute cuneata, apice acuta et minute apiculata,

ad 3-6 cm. longa, 1-7 cm. lata, chartacea, siccitate supra fusco-viridia, subtus pallidiora, supra minute parceque puberula praesertim ad costam, infra ubique minute breviterque puberula, costa subtus prominula supra plana vel leviter impressa, nervis lateralibus 4-6-paribus subtus prominulis supra inconspicuis; petiolus 2-2.5 mm. longus, ferrugineo-pubescentis, supra canaliculatus. *Inflorescentia* axillaris, interdum terminalis, cymosa, divaricata, omnino sat dense ferrugineo-pubescentis, pedunculo communi 0.4-1.5 cm. longo incluso 1.5-2.5 cm. longa; bractee ovatae, circiter 0.75 mm. longae; pedicelli ad 2.5 mm. longi. *Calyx* 5-partitus, lobis oblongo-lanceolatis obtusis eglandulosis, extus praesertim basin versus sparse puberulis, 0.75 mm. longis. *Corolla* pallide viridis, 5-partita, glabra; tubus brevissimus; lobi oblongo-elliptici, apice minute emarginati, 2 mm. longi, 1 mm. lati, lobus quisque basin versus callis binis minute papillosis instructus. *Gynostegium* circiter 1.5 mm. altum; coronae processus antherae dorso affixi, gynostegio breviores; stigmatis caput rotundatum, minute papillosum, ultra stamina manifeste exsertum. *Folliculi* ignoti.

Muang Pai, circiter 600 m., in scrub, *Kerr* 5504.

Toxocarpus lagenifer Kerr [Asclepiadaceae-Secamoneae]; a *T. Griffithii* Dcne., cui affinis, petiolis longioribus inflorescentia ampliore differt.

Suffrutex volubilis, ramulis glabris subquadratis, cortice lenticellis parvis prominulis sat dense obsito vestitis. *Folia* vulgo oblanceolata, interdum elliptica vel oblongo-elliptica, basi cuneata vel rotundata, apice subito acuminata et minute mucronata, ad 9.5 cm. longa, 5 cm. lata, chartacea, glabra, costa supra impressa subtus prominente, nervis lateralibus 6-7-paribus patentibus leviter arcuatis, supra leviter impressis subtus prominulis; petiolus gracilis, 1.4-2 cm. longus, supra anguste canaliculatus, juventute minute puberulus, apice ad laminae basin glandulis minutis instructus. *Inflorescentia* axillaris, cymosa, e basi divaricata, multiflora, omnino minute brunneo-puberula, ad 4 cm. longa et lata; bractee oblongae, circiter 0.75 mm. longae; pedicelli graciles, circiter 4 mm. longi, apicem versus bracteolis binis minutis instructi. *Calyx* alte 5-partitus, extus minute puberulus, intus basi glandulis 5 minutis praeditus, lobis ovatis ciliatis apice obtusis 1.5 mm. longis. *Corollae* tubus 1 mm. longus, intus velutinus; lobi lineares, obtusi, 4.5 mm. longi, 1 mm. lati, intus basin versus velutini. *Gynostegium* 2.5 mm. altum; coronae segmenta subulata, dorso antherae affixa, antheras excedentia; antherae appendix brevis, erosa; stigmatis caput lageniforme, apice minute bilobum, circiter 1.5 mm. longum. *Folliculi* late divaricati, lignosi, e basi sensim attenuati, circiter 14.5 cm. longi; semina complanata, 12 mm. longa, 4.5 mm. lata, apice coma alba 5 cm. longa praedita.

Prachuap, Kan Kradai, *Put* 2292.

Toxocarpus oblanceolatus Kerr [Asclepiadaceae-Secamoneae]; *T. Elmeri* Merrill valde affinis, foliis tenuioribus oblanceolatis basi subcuneatis distinguitur.

Suffrutex volubilis, ramulis gracilibus juventute brunneo-puberulis striatis, internodiis sat longis. *Folia* oblanceolata vel obovata, basi subcuneata, minute auriculata, apice breviter acuminata, ad 12 cm. longa, 5 cm. lata, coriacea, siccitate supra pallide cinerea, nitida, subtus pallidiora, opaca, glabra nisi costa utrinque tenuiter puberula, costa supra impressa subtus prominente, nervis lateralibus 5-6-paribus patentibus, a margine sat distanter arcuatis anastomosantibusque, supra inconspicuis subtus cum rete venularum prominulis; petiolus 0.6-1 cm. longus, praeditus. *Inflorescentia* axillaris, cymosa, e basi divaricata vel breviter pedunculata, ad 3 cm. longa et lata, omnino brunneo-puberula; bractae oblongae, circiter 2 mm. longae; pedicelli perbreves, ad 1.5 mm. longi. *Calyx* alte 5-partitus, extus appresse brunneo-puberulus, intus glandulis 5 minutis praeditus, lobis ovatis apice rotundatis 1.5 mm. longis. *Corolla* alba; tubus 2.5-3 mm. longus, intus glandulo-velutinus; lobi lineares, apice obtusi, circiter 5 mm. longi. *Gynostegium* 2-3 mm. longum; coronae segmenta externa late lanceolata, antheras paulo excedentia; segmenta interna tenuia, ligulata, antheris aequilonga; stigmatis caput subcylindricum vel basin versus parum incrassatum, apice integrum vel minute bilobum, circiter 1.3 mm. longum, stamina multum excedens. *Folliculi* ignoti.

Sukotai, Kao Luang, circiter 500 m., evergreen forest, Kerr 5914.

Toxocarpus ovatus Kerr [Asclepiadaceae-Secamoneae]; species *T. Griffithii* affinis, foliis ovatis, inflorescentia multiflora folia saepius excedente differt.

Suffrutex volubilis, ramulis gracilibus juventute brunneo-pubescentibus demum glabrescentibus, plus minusve striatis, cortice lenticellis ovalibus parum prominulis ornato vestitis. *Folia* ovata vel oblongo-ovata, basi rotundata, rarius obtuse cuneata, apice leviter acuminata, acuta, chartacea, 4.6-7 cm. longa, 1.8-3.2 cm. lata, supra nitida, glabra nisi secus costam puberula, subtus opaca, glabra vel secus costam puberula, costa supra impressa subtus prominente, nervis lateralibus 5-6-paribus supra inconspicuis subtus prominulis. *Inflorescentia* extra-axillaris, cymosa, valde ramosa lateque divaricata, saepius folia excedens, omnino brunneo-puberula; bractae ovatae, acutae, circiter 1.5 mm. longae; pedicelli 1-1.5 mm. longi. *Calyx* alte 5-partitus, extus appresse brunneo-pubescentibus, intus basi glandulis minutis praeditus; lobi ovati, obtusi, 1.5 mm. longi. *Corollae* tubus intus fauce pilis erectis rigidulis rubro-brunneis in fasciculis 5 Y-formibus dispositis etiam basin loborum attingentibus ornatus, circiter 1 mm. longus; lobi lineares, apice obtusi, 4 mm. longi, 0.75 mm. lati. *Gynostegium* 2-2.5 mm. altum; coronae segmenta late hastata,

antheras excedentia, intus ligulo membranaceo segmento longiore praedita; stigmatis caput fusiforme, apice integrum, circiter 1.25 mm. longum. *Folliculi* ignoti.

Nakawn Sritamarat, Kua Koi, 55 m., Vanpruk 707.

Gymnemopsis calcicola Kerr [Asclepiadaceae-Marsdenieae]; ab affini *G. Pierrei* Cost. foliis apice acutis pro rata angustioribus inter alia distinguenda.

Frutex volubilis, ramulis teretibus gracilibus crispatis pubescentibus demum glabrescentibus. *Folia* lanceolata, basi obtuse cuneata vel rotundata, apice acuta minuteque mucronata, rarius leviter acuminata, margine parum revoluta, 2.8-4.5 cm. longa, 0.9-1.3 cm. lata, chartacea, supra olivacea, opaca, subtus pallidiora, ad marginem et secus costam utrinque tenuiter pubescentia, costa supra impressa subtus prominente, nervis lateralibus 3-4-paribus, paribus imis saepius e basi ortis, acute ascendentibus supra parum impressis subtus prominulis; petiolus 2-4 mm. longus, pubescens. *Inflorescentia* axillaris, 2-4-flora, subsessilis vel breviter pedunculata; bractae saepius subfoliaceae, lanceolatae, pubescentes, ad 5 mm. longae; pedicelli 1.5-3 mm. longi, pubescentes. *Calyx* alte 5-partitus, extus pubescens, intus basi glandulis quinqueparibus praeditus, lobis ellipticis apice obtusis 2.25 mm. longis. *Corolla* late campanulata, 5-lobata, rosea, extus glabra; tubus circiter 2.5 mm. longus, fauce pilis demissis instructus; lobi obtusi, circiter 2.5 mm. longi et lati, basi pilis paucis inspersi. *Coronae squamae* 5, fauci tubi adnatae, apice liberae et ultra sinus exsertae, pilis longis demissis copiose indutae. *Gynostegium* circiter 2 mm. altum, basi parum contractum, apice leviter convexum; corpuscula ab externa parte conspicua, apice stigmatis caput paulo excedentia, basi subhastata; pollinia oblongo-ovata, corpusculis breviora, pediculis subaequilonga; stigmatis caput pentagonale, vertice parum convexum. *Folliculi* ignoti.

Ratburi, circiter 200 m., climbing over bushes on limestone hill, Kerr 9044.

Tylophora riparia Kerr [Asclepiadaceae-Marsdenieae]; *T. tenui* Blume affinis, floribus majoribus, corollae lobis pro rata longioribus differt.

Frutex volubilis; ramuli graciles, teretes, striati, juventute crispatis puberuli, demum glabrescentes. *Folia* oblongo-ovata vel ovata, basi leviter cordata interdum rotundata, apice rotundata et mucronata, papyracea, 1.6-3.6 cm. longa, 1-2.2 cm. lata, supra et secus costam nervosque laterales breviter crispatis pubescentia, ceterum parvisime puberula, costa supra subtusque prominula, nervis lateralibus 3-4-paribus supra subprominulis arcuato-ascendentibus, rete venularum obscuro; petiolus 5-10 mm. longus, supra anguste canaliculatus, canaliculi margine crispatis pubescente, apice glandulis paucis subulatis praeditus. *Inflorescentia* cymosa, flexuosa, saepius folia excedens, ad 4.5 cm. longa, pedunculis

ramulisque pubescentibus; bracteae subulatae, pubescentes, ad 1 mm. longae; pedicelli graciles, pubescentes, 5-9 mm. longi. *Calyx* alte 5-partitus, intus glandulis 5 minutis praeditus, lobis anguste triangularibus acutis extus leviter pubescentibus parceque ciliatis 1.5 mm. longis. *Corolla* viridula, glabra; lobi oblongo-ovati, obtusi, circiter 3 mm. longi, 1.5 mm. lati; tubus 1 mm. longus. *Coronae lobi* basi gynostegii affixi, leviter prominuli. *Gynostegium* circiter 1 mm. altum; antherarum appendices breves, caput stigmatis partim obtegentes; pollinia globosa; caput stigmatis pentagonale, apice leviter convexum. *Folliculi* ventricosi, apice acuminati, circiter 3 cm. longi.

Saraburi, Menam Sak, circiter 40 m., climbing on bushes at edge of river, *Kerr* 7025A (type); and climbing on *Homonoia riparia* at edge of river, *Kerr*, 7025; Nakawn Panom, Ban Han Pone, climber on roadside, flowers reddish, *Lakshnakara* 975.

Kerr 7025, from the same locality as the type, has, on the average, much larger leaves, reaching 8 cm. in length and 3.5 cm. in breadth. *Lakshnakara* 975 has leaves intermediate in size, but with pedicels and calyx glabrous.

Marsdenia (Eumarsdenia) calcicola *Kerr* [Asclepiadaceae-Marsdenieae]; *M. eriocauli* *Kerr* affinis, foliis ovatis, floribus minoribus inter alia differt.

Frutex volubilis, nisi corolla omnino dense crispatis pubescens, indumento cinereo vel brunneo-cinereo. *Folia* ovata, basi rotundata vel parum cordata, apice leviter acuminata, margine revoluta, ad 6-7 cm. longa, 3.5 cm. lata, chartacea, nervis lateralibus 5-6-paribus, cum costa supra inconspicuis subtus prominulis; petiolus 0.7-1.5 cm. longus. *Inflorescentia* axillaris, pedunculata, saepius subumbellata, rarius thyrsiformis, 1.5-2.6 cm. longa, pedunculo communi 0.6-1.2 cm. incluso; bracteae minutae; pedicelli circiter 2.5 mm. longi. *Calyx* alte 5-partitus, intus glandulifer; lobi late ovati vel suborbiculares, circiter 1.5 mm. longi, 1.25 mm. lati. *Corolla* suburceolata, in vivo alba, sicco nigrescens, extus glabra; tubus 2 mm. longus, intus fauce annulo piloso clausus, inferne pilis retrorsis in fasciculis 5 dispositis praeditus; lobi triangulares, subacuti, 1 mm. longi. *Coronae squamae* ligulatae, antheris breviores. *Gynostegium* circiter 2 mm. altum; stigmatis caput conicum, 5-lobatum, apice minute bifidum. *Folliculi* lanceolati, crispatis pubescentes, circiter 5-8 cm. longi.

Doi Chiangdao, circiter 2100 m., on limestone rocks, *Kerr* 6599.

In all the flowers examined the anthers appeared diseased, being thick and friable, the thickening often involving the whole of the membranous appendage. The pollinia could not be separated out from the cells.

Marsdenia (Eumarsdenia) eriocaulis *Kerr* [Asclepiadaceae-Marsdenieae]; *M. Balansae* Cost. affinis, foliis minoribus pro rata angustioribus distinguitur.

Frutex volubilis; ramuli teretes, graciles, pilis rufescentibus patentibus dense vestiti. *Folia* lanceolata, basi rotundata, apice longius acuminata, 5-8-9 cm. longa, 1.9-4 cm. lata, chartacea, supra pilis basi bulbosis praesertim ad costam nervosque cinereo-tomentosa, subtus similia sed praeterea secus costam nervosque pilis longis rufescentibus patentibus dense hirsuta, nervis lateralibus 5-6-paribus, subtus prominulis; petiolus 1.4-2.2 cm. longus, indumento ut caulis instructus. *Inflorescentia* axillaris, thyrsiformis, pedunculata, omnino pilosa, 2-6 cm. longa, pedunculo communi 1.3-3.4 cm. incluso; bracteae triangulares, circiter 0.5 mm. longae; pedicelli 2.5-3 mm. longi. *Calyx* alte 5-partitus, extus pilosus, intus glandulis minutis 5-paribus praeditus; lobi ovati, obtusi, circiter 1.75 mm. longi, 1 mm. lati. *Corolla* subcampanulata, breviter 5-lobata, in vivo alba (ex *Put*), sicco nigrescens; tubus subcylindricus, 3.25 mm. longus, extus glaber, intus fauce annulo piloso clausus, inferne pilis retrorsis in fasciculis 5 dispositis instructus; lobi subtriangulares, leviter inaequilaterales, subacuti, glabri, 1.25 mm. longi. *Coronae squamae* ligulatae, dorso antherarum affixae et eis breviores. *Gynostegium* 1.7 mm. longum; antherarum appendices membranaceae, stigmatis caput obtegentes; pollinia oblonga, caudiculis parum longiora; stigmatis caput pentagonale, vertice apiculatum, minute bilobum. *Folliculi* ignoti.

Chiangmai, Pang Tawn, *Put* 3872.

Stephanotis (Jasminanthes) pilosa *Kerr* [Asclepiadaceae-Marsdenieae]; ex affinitate *S. chinensis* Champ., a qua foliis majoribus, calycis lobis pro rata majoribus inter alia differt.

Frutex volubilis; rami robusti, siccitate fistulosi, longitudinaliter striati, pilis fulvis patentibus sat dense induti. *Folia* oblonga vel oblongo-obovata, basi cordata, apice subito breviterque acuminata, ad 19 cm. longa et 9.7 cm. lata, chartacea, siccitate supra cinereo-viridia, subnitida, sparse pilosa, subtus sat dense fulvo-pilosa praecipue ad costam nervosque, costa supra cum nervis lateralibus leviter impressa subtus prominente, nervis lateralibus utrinque 7-10 marginem versus arcuatis anastomosantibus, rete venularum subtus subconspicuo. *Inflorescentia* conferte cymosa, 2-6-flora, axillaris vel ramos contractos terminans, subsessilis vel pedunculata, foliis multo brevior; pedunculus robustus, striatus, dense pilosus, ad 25 mm. longus; bracteae lineares, vel lineari-lanceolatae, pilosae, ad 16 mm. longae, 2 mm. latae; pedicelli lanceolatae, pilosae, ad 16 mm. longae, 2 mm. latae; pedicelli 5-12 mm. longi, indumento pedunculi. *Calyx* ad basin 5-partitus, extus intusque pilosus, extus etiam minute verrucosus, intus ad basin glandulis minutis praeditus; lobi anguste oblanceolati, subacuti, 20-23 mm. longi, 4-8 mm. lati. *Corolla* alba, hypocrateromorpha; tubus cylindraceus, inferne sensim ampliatus, extus sulcatus et pilis brevibus patentibus indutus, intus superne sparse pilosus, basin versus pilis brunneis rigidis erectis in lineis bifariis 5 dispositis praeditus, 23-28 mm. longus; lobi falcato-oblongi, obtusi, extus pilosi, intus glabri, circiter 16 mm. longi;

10 mm. lati. *Coronae squamae* ut videtur nullae. *Gynostegium* circiter 7 mm. altum; stamina appendicibus oblongis submembranaceis stigmatibus caput obtegentibus terminata; antherae pars inferior e lamina cartilaginea quadrangulata composita; pollinia obovoidea, circiter 1 mm. longa, corpusculo duplo longiora; stigmatibus caput alte convexum. *Folliculi* desunt.

Loi, Dan Sai, Kao Keo Kang, circiter 1300 m., evergreen forest, Kerr 5769.

In the material of this collection all the flowers examined had been attacked by a grub, which paid its chief attention to the gynostegium, with the result that the structure was not easy to make out. As far as could be seen, however, there was no sign of a corona, or at least of any free portion of one.

LXI—BINGHAMIA, HAAGEOCEREUS AND PSEUDO-ESPOSTOA.—A. A. BULLOCK.

The desirability of full descriptions of new taxonomic groups, and of explicit designation of their types, is amply illustrated in the following discussion of the three generic names *Binghamia* Britt. et Rose, *Haageocereus* Backeb. and *Pseudoespostoa* Backeb.

Binghamia Britt. et Rose (Cactaceae, 2, 167: 1920) included two species, named *B. melanostele* and *B. acrantha*. The former species was ostensibly based on *Cephalocereus melanostele* Vaupel, but as shown below, this was due to a misidentification: the latter was based on *Cereus acranthus* Vaupel. Britton and Rose stated that the type species of *Binghamia* was *Cephalocereus melanostele* Vaupel, but there is no evidence that they ever saw Vaupel's plant, and their statement may be amended to "the type is the species which we have identified as *Cephalocereus melanostele* Vaupel," since this represents the actual facts.

Cephalocereus melanostele Vaupel, described very fully (in Engl. Bot. Jahrb. 50, Beibl. cxi. 12: 1913) from material collected by Weberbauer near Chosica, Peru, is characterized by bearing its flowers in lateral cephalia—"Cephalium laterale, crassissimum, lineari-oblongum, brunneum, aculeis egens, costas 8 obtegens." In Britton and Rose's key this plant runs down to *Espostoa* Britt. et Rose, and is excluded from *Binghamia*, which bears its flowers singly at unmodified areoles. The misidentification of *Cephalocereus melanostele* by Britton and Rose presumably arose from Rose having found what was actually a new species of similar habit at Chosica, Peru, the type-locality of *C. melanostele*. He found it also at Santa Clara, Peru, and Britton and Rose's description appears to have been drawn up from the Santa Clara material.

Werdermann and Backeberg (Neue Kakteen, 74-75, cum fig.: 1931) were the first to point out that Britton and Rose had wrongly identified *Cephalocereus melanostele* Vaupel. They described (*l.c.*) a new species, *Cereus* (Sect. *Binghamia*) *pseudomelanostele*, based on a plant collected by Backeberg near Cajamarquilla, Peru, and

went on to say that it was the same as the plant described by Britton and Rose as *Binghamia melanostele*, which the latter authors had later (Cactaceae, 4, 279: 1923) considered to be conspecific with *Cereus multangularis* (Willd.) Haw.

Cereus pseudomelanostele was later (Backeb. et F. M. Knuth, Kaktus-ABC, 209: 1935), transferred by Backeberg to *Haageocereus* Backeb., as *H. pseudomelanostele* (Werd. et Backeb.) Backeb., whilst *Cephalocereus melanostele* Vaupel was transferred by him (*op. cit.* 340) to a second new and monotypic genus *Pseudoespostoa* Backeb. The remaining element of *Binghamia* Britt. et Rose, *Cereus acranthus* Vaupel, was also transferred by him to *Haageocereus*. At the same time he transferred to *Binghamia* (*op. cit.* 195) two other species, referred to *Borzacactus* Riccobono by Britton and Rose. Thus instead of retaining the name *Binghamia* for the two species actually described under it by Britton and Rose, or even for the ostensible generic type, *Cephalocereus melanostele*, Backeberg applied it to an entirely different genus, completely disregarding the type-method of nomenclature.

The publication of *Haageocereus* is somewhat involved. The first appearance of the name in print was, as far as has been ascertained, in Cact. and Succ. Journ. Amer. 3, 130 (1932), where, describing some of his discoveries in Peru, Backeberg says that he found:—" *Haageocereus rigidissimus* and *auricolor* gen. n. et sp. n." The only description is as follows:—"These are up to 1.20 metres (four feet) high, densely spiny, highly coloured cerei of exceptional beauty which have neither the hair of *Binghamia* nor the flower forms of *Borzacactus*, and so form a separate sub-genus of *Cereus* (related to the old *Cereus multangularis* Haw. ??)." It is impossible to identify the genus from this information. For all practical purposes the generic name is a *nomen nudum*, and since there is no description whatever of the two species mentioned, their names also are *nomina nuda*.

The second appearance of the name *Haageocereus* is in Cact. Journ. 1, 52 (1933), where Backeberg makes the amazing statement: "... the *Binghamias* described by Dr. Rose are nothing of the kind, but have spread from Ecuador to Central Peru; (on account of their rotate flowers which do not arise from areoles furnished with a true cephalium, I have designated them *Haageocereus* g.n. or subg. n.)." Apart from other considerations the meaning of the term 'rotate' in this context is obscure, since all the plants concerned have comparatively long funnel-form flowers. Whether the vague and misleading diagnostic characters can be accepted as validating publication of the name or not is immaterial, since it is clearly a superfluous name for *Binghamia* Britt. et Rose, and must on that account be rejected.

The third appearance of the name *Haageocereus* is in Backeberg's Blätter Kakteenforsch. 1934, pt. 3 [p. 4], where it appears in the author's systematic list of genera as follows:—

"[Genus] 52. *Haageocereus* Bckb. (C. *pseudomelanostele* W. & B.)." It can only be assumed that in this case *Haageocereus* Backeb. is intended to be typified by *Cereus pseudomelanostele* Werderm. et Backeb. (in Backeb. *Neue Kakteen*, 74: 1931; Werderm. in Fedde, *Repert.* 30, 61: 1932). Werdermann had made a curious orthographic error under his citation of *Cereus pseudomelanostele* in Fedde, *Repert.* 30, 61 (1932). He cited as a synonym *Binghamia acrantha*, giving the reference to Britton and Rose as "S. 167," whereas that name actually occurs (apart from the key to species) only on page 168. It seems clear that Werdermann intended to cite *Binghamia melanostele* Britt. et Rose (excl. syn.), since otherwise he would have used the earlier epithet *acranthus* (Vaupel, 1913) in place of *pseudomelanostele*. The locality, Chosica, which he cites for *Cereus pseudomelanostele* indicates that he included under it the type-element of the generic name *Binghamia*, since the type-locality of *C. pseudomelanostele* was Cajamarquilla.

The fourth appearance of the name *Haageocereus* was again in Backeberg's *Blätter Kakteenforsch.* 1934, pt. 6 [p. 1], where a meagre description was given which may be accepted as validating publication of the name. Backeberg went on to say, "When drawing up the description of *Binghamia* Rose proposed [sic] *Cereus aurivillus*, for he did not find it in Peru and possibly thought it identical with *Haageoc. pseudomelanostele*." The French version is a little more explicit, "hors de la rédaction de la description générique pour *Binghamia* le Dr. Rose aura certainement eu devant lui un *Cereus aurivillus* qu'il n'a pas trouvé au Pérou et qu'il a probablement tenu pour identique à *Haageocereus pseudomelanostele*." Since Britton and Rose explicitly state that the plant which they described as *Binghamia melanostele* was collected and photographed respectively by Rose at Chosica and Santa Clara, Peru, Backeberg's statement and assumption cannot be accepted. Incidentally, Britton and Rose placed *Cereus aurivillus* K. Schum. in the genus *Borzicactus* Riccobono. *Haageocereus pseudomelanostele* (Werd. et Backeb.) Backeb. is the only species of *Haageocereus* mentioned here by Backeberg.

The fifth and, as far as has been found, last appearance of the name *Haageocereus* is in Backeb. et F. M. Knuth, *Kaktus-ABC*, 207 (1935), where nine species are listed in alphabetical order. The type-element of *Binghamia*, together with *Binghamia acrantha* (Vaupel) Britt. et Rose, is again included, and this gives final proof that *Haageocereus* is a superfluous name for *Binghamia*.

Backeberg (*Blätter Kakteenforsch.* 1934, pt. 10 [p. 7], et in Backeb. et F. M. Knuth, *Kaktus-ABC*, 195: 1935) misapplied the name *Binghamia* to a genus including two species, *Cactus Humboldtii* H.B.K. and *Cactus icosagona* H.B.K. (the latter including *Cereus aurivillus* K. Schum.), which were placed under *Borzicactus* Riccobono by Britton and Rose. In 1934 he stated, "... Dr. Rose has constituted a special genus for South American Cerei which 'develop

on the side of the head capable of bearing flowers, a cephalium-like tuft'." The source of Backeberg's quotation has not been found. What Britton and Rose stated was: "The top of the flowering plant is made up of a compact mass of long white or yellowish bristle-like spines from one side of which the flowers appear, and this F. Vaupel has termed a lateral cephalium."

The present writer is not prepared to say whether the two species placed under *Binghamia* by Backeberg really constitute a genus distinct from *Borzicactus* Riccobono, but if they do, the genus concerned requires a new name and a diagnosis. A new name, *Seticereus*, has been provided for this genus by Backeberg (in *Jahrb. Deutsch. Kakteenes.*: 1937, et *Blätter Kakteenforsch.* 1937, pt. 11 [p. 5]) on the ground that *Binghamia* was a *nomen confusum*. On the whole it seems preferable to retain the two species concerned under *Borzicactus*, in which case the name *Seticereus* Backeb. becomes a taxonomic synonym of *Borzicactus* Riccobono. In any case it is not synonymous with *Binghamia* Britt. et Rose. In this connexion, it may be added that the writer sees no reason for separating *Loxanthocereus* Backeb. (in *Jahrb. Deutsch. Kakteenes.*: 1937, et *Blätter Kakteenforsch.* 1937, pt. 11 [p. 3]) from *Borzicactus*. The distinctions given appear to be of a purely specific nature.

The genus *Pseudoespostoa* Backeb. is in the writer's opinion not sufficiently distinct from *Espostoa* Britt. et Rose to warrant generic segregation, and the reduction and new combination necessitated by this view are made below.

Following the classification outlined above, the correct names and synonymy of the genera and species directly involved in the above discussion are as follows:—

1. *Binghamia* Britt. et Rose, *Cactaceae* 2, 167 (1920); non Backeb. *Blätter Kakteenforsch.* 1934, pt. 10 [p. 7], et in Backeb. et F. M. Knuth, *Kaktus-ABC*, 195 (1935).—*Haageocereus* Backeb. in *Cact. et Succ. Journ. Amer.* 3, 130 (1932), nomen in obs., et in *Cact. Journ.* 1, 52 (1933), in obs., et *Blätter Kakteenforsch.* 1934, pt. 3 [p. 4], in sched., et *op. cit.* pt. 6 [p. 1], cum descr., et in Backeb. et F. M. Knuth, *Kaktus-ABC*, 207 (1935).

B. pseudomelanostele (Werderm. et Backeb.) Bullock, comb. nov.—*B. melanostele* Britt. et Rose, *Cactaceae*, 2, 167 (1920), excl. syn. [i.e. non *Cephalocereus melanostele* Vaupel (1913)].—*Cereus pseudomelanostele* Werderm. et Backeb. in Backeb. *Neue Kakteen*. 74 (1931); Werderm. in Fedde, *Repert.* 30, 61 (1932), excl. syn.—*Haageocereus pseudomelanostele* (Werderm. et Backeb.) Backeb. *Blätter Kakteenforsch.* 1934, pt. 6 [p. 1], et in Backeb. et F. M. Knuth, *Kaktus-ABC*, 209 (1935).

Eight other species, including *Binghamia acrantha* (Vaupel) Britt. et Rose, are listed by Backeberg under *Haageocereus*. If all these prove to be distinct, they must be transferred to *Binghamia*.

2. *Espostoa* Britt. et Rose, *Cactaceae*, 2, 60 (1920); Backeb. in Backeb. et F. M. Knuth, *Kaktus-ABC*, 340 (1935).—*Pseudoespostoa* Backeb. *Blätter Kakteenforsch.* 1934, pt. 10 [p. 1], et in Backeb. et F. M. Knuth, *Kaktus-ABC*, 340 (1935).

E. melanostele (Vaupel) Bullock, comb. nov.—*Cephalocereus melanostele* Vaupel in *Engl. Bot. Jahrb.* 50, Beibl. cxi 12 (1913).—*Binghamia melanostele* (Vaupel) Britt. et Rose, *Cactaceae*, 2, 167 (1920), quoad syn. tantum.—*Pseudoespostoa melanostele* (Vaupel) Backeb. *Blätter Kakteenforsch.* 1934, pt. 10 [p. 1], et in Backeb. et F. M. Knuth, *Kaktus-ABC*, 340 (1935).

LXII—THE TAXONOMIC POSITION OF TETRATHALAMUS. B. L. BURTT.

In 1905 Lauterbach (1) described a new genus and species from New Guinea under the name *Tetralthalamus montanus* and placed it in the family *Guttiferae*, next to *Garcinia*. Here, and again in his later treatment of the genus (2), Lauterbach apparently had no doubts about referring *Tetralthalamus* to *Guttiferae*, and even Engler (3) places it between *Garcinia* and *Tripetalum* without comment.

To neither of these genera does it show any real resemblance but when, quite by chance, it was examined shortly after working on the *Winteraceae* a possible affinity became evident, for it closely resembles certain New Guinea species of *Bubbia*.

It is necessarily a difficult matter to contrast a single species with a large and variable family like *Guttiferae*, but we can tabulate the following morphological characters, which, taken together, certainly justify the exclusion of *Tetralthalamus* from *Guttiferae*.

Tetralthalamus has:—

- (1) Branchlets terete—not angled as is frequent in *Guttiferae*.
- (2) Leaves alternate [as far as can be seen from the specimen at Kew and Lauterbach's figure (2)]—this is a very rare condition in the true *Guttiferae*.
- (3) Leaves pellucid-punctate—not showing resinous streaks as is usual in *Guttiferae*.
- (4) Leaves with a waxy deposit on the lower epidermis.
- (5) Carpels not united to the apex.
- (6) Carpels with 3 ovules—there is only 1 ovule in each cell in the subtribe *Garcinieae*.

On the other hand, if we compare *Tetralthalamus* with members of the *Winteraceae* we find a striking agreement on many points. The presence of oil-containing cells both in the cortex of the branchlets and in the leaf, giving the latter its characteristic pellucid-punctate appearance, is constant throughout the *Winteraceae*. The waxy deposit on the lower epidermis is also found in many species in that family. With regard to the carpels, the genera of *Winteraceae* show a transition from numerous free carpels to few

united carpels and in this character *Tetralthalamus* may be placed between *Bubbia* (which has free carpels) and *Zygogynum* and *Exospermum* in which they are united or at least coherent. The ovules are borne on the inner upper angle of the carpel as in other *Winteraceae*.

The perianth of *Tetralthalamus* is described as consisting of 4 sepals and 4 petals and there are three small bracteoles just below the calyx. A whorl of three bracteoles in such a position would be unusual and it seems better to follow the current interpretation of the flower of such genera as *Bubbia* and *Zygogynum* and to regard these three small structures as sepals and the corolla as consisting of two whorls of four members each.

The androecium of *Tetralthalamus* is also very like that of *Winteraceae* and consists of about 12 stamens with rather thick filaments and the anther cells placed transversely at the top. This seems to be unlike any of the varied forms of stamen found in *Guttiferae*, but closely resembles a species like *Bubbia Howeana*.

A morphological examination of the genus is to be found in the *Winteraceae* and not in the *Guttiferae*, where it has hitherto been placed.

This conclusion is given final confirmation by an anatomical characteristic, the possession of entirely tracheidal xylem, which is diagnostic of the *Winteraceae* and is also possessed by *Tetralthalamus*.

As to the position of the genus within the family, Hutchinson (4) has given a key to the genera in which the question of the union of the carpels is considered of primary importance and two tribes *Drimydeae*—"carpels free, especially in fruit"—and *Exospermeae*—"carpels more or less united, especially in fruit"—are recognized, in addition to *Illiceae* which is distinguished by its imbricate sepals. Unfortunately fruits of *Tetralthalamus* are as yet unknown but the carpels are certainly united for three-quarters of their length in the flowering stage. The tribe *Exospermeae* contains only two genera, both endemic to New Caledonia: *Exospermum* differs from *Tetralthalamus* in having 7–8 carpels and linear stigmata, as well as in its solitary flowers: *Zygogynum*, the other genus of this tribe, has the carpels more closely united than in *Tetralthalamus*, for they are separated from one another only by a thin wall; this genus, too, has large solitary flowers.

Superficially, as well as phytogeographically, *Tetralthalamus* is more closely allied to *Bubbia*, one of the *Drimydeae*, than to either of the *Exospermeae*. In *Bubbia* some species are found with small flowers and much branched inflorescences, but the carpels are always free to the base and the stigmata are of the linear type. Nevertheless the real affinity of *Tetralthalamus* seems to be with some of these small-flowered, New Guinea species and for the present it may be regarded as a distinct genus closely allied to *Bubbia*.

REFERENCES.

- (1) LAUTERBACH in Lauterbach, C., and Schumann, K., "Nachträge zur Flora der Deutschen Schutzgebiete in der Südsee," 319 (1905).
- (2) LAUTERBACH, C., "Die Guttiferen Papuasiens" in Engler, Bot. Jahrb. 58, 15 (1922).
- (3) ENGLER, A., in Engler u. Prantl, Natürl. Pflanzenfam. 2 Aufl., 21, 229 (1925).
- (4) HUTCHINSON, J., "The family Winteraceae," in Kew Bull. 1921, 185.

LXIII—ON THE FLORA OF THE NEARER EAST: XIX.* ADDITIONS, ETC., TO THE FLORA OF CYPRUS. A. K. JACKSON and W. B. TURRILL.

The material at Kew from the island of Cyprus has been much increased during the past few years by numerous collections made by residents or visitors. Several of these collections are of considerable size and have added greatly to our knowledge of the flora. Not only have numerous gaps in the Herbarium been filled in, but the known distribution of many species has been extended, and species hitherto unrecorded for the flora of Cyprus, including several new to science, have been discovered. It is particularly gratifying that most of the collectors have provided abundant and beautifully dried material of the plants collected, frequently at different stages of their life-history. Some of the new records have already been published (K.B. 1933, 407; 1934, 271; 1936, 16; 1937, 341). New and extended collections are, however, still being received and it is evident from these that much detailed work remains to be done before sufficient precisely determined material is available for the preparation of an adequate Flora of the island.

Special reference should be made to the magnificent collection of Mrs. E. W. Kennedy, mainly from the mountainous areas of the centre and north of Cyprus. Specimens collected under more than 1200 numbers have now been received from her. Most of these numbers are represented by at least several sheets, which between them often illustrate various stages in the life-history, habitat modifications, and general range of variation. Valuable field notes accompany the specimens.

From Lady Loch we have received interesting collections made in different parts of Cyprus and including a number of new records.

Mr. A. Syngressides, of the Department of Agriculture, continues to send material which not only enriches the Kew collections but is making it possible to build up a local herbarium at Nicosia. His collection, as received at Kew, now exceeds 1900 numbers.

The present paper contains records of species whose occurrence in Cyprus was unknown, unpublished, or in some respect uncertain or incompletely known. These records are arranged systematically

* Continued from K.B. 1937, 86.

according to the Bentham and Hooker classification. It is hoped that their publication will encourage collectors to continue their researches and, perhaps, entice other residents and visitors to help in making it possible to prepare a Flora of the island.

Ranunculus bullatus L. Sp. Pl. 550 (1753).

Kyrenia, coast, in pockets of soil on dry rocks at sea-level, 31.10.37, Lady Loch 7.

This species was recorded from several localities by Kotschy, Cypern 315 (1865) but was not seen by Holmboe. Kotschy records it from "bei Papho an den Felsen von Ktima blühend im November 1840. In der Gegend von Kalochoorko unweit Larnaca 1862. Bei Ormidia unweit Famagosta in der Tracheotis häufig."

The occurrence of this species in Cyprus, substantiated by Lady Loch's specimen, is of considerable interest. Its distribution is mainly western in the Mediterranean Basin: Portugal, Spain, Corsica, Sardinia, Italy, Sicily, Malta, Crete, Cephalonia, Morocco, and Algeria.

Ranunculus Ficaria L. Sp. Pl. 550 (1753).

In Cyprus, *R. Ficaria grandiflora* Schultz (see Bot. Mag. t. 9199: 1927) appears to be widely distributed, especially in the lower regions. Specimens from Platres, 1400 m., 20.3.37, wet flat ground by a winter-time rivulet, E. W. Kennedy 425, show leaf-blades of an unusual shape. They are broadly elliptic or elliptic-ovate, rounded at the apex, and more or less truncate at the base, up to 5.8 cm. long and 4.3 cm. broad. One specimen under this number has normally shaped leaf-blades with more or less cordate bases. The truncate leaf-bases of the other specimens are usually very striking, but occasionally they are very slightly cuneate. There is no trace of divergent or over-lapping lobes. The peculiar blade shape appears also in leaves from tuber plantlets. The flowers measure up to 4 cm. in diameter.

Viola Kitaibeliana R. et S. Syst. 5, 383 (1819).

Holmboe (Stud. Veg. Cyp. 132: 1914) records *V. occulta* Lehm., as collected in Cyprus by Unger and Kotschy, on the authority of Boissier, Flor. Or. 1, 467 (1867). The specimen at Kew of Kotschy 710, "In hortis ad Prodromo et in faucibus umbrosis pagi Fini Majo," is *V. Kitaibeliana* R. et S. The same species has also been collected by Mrs. Kennedy.

Kryos Potamos, 16.3.38, 890 m., flat grassy slope at the river's edge, petals white, lower one yellow, deeper shade at base, with purple lines, E. W. Kennedy 636; Platres, 22.3.38, 920 m., bank between a stream and a vineyard, E. W. Kennedy 637; Platres, 28.3.38, 1100 m., on a bank above a terrace of cultivated land on the dry mountain-side, the bed of a gully, E. W. Kennedy 637A.

Lobularia maritima (L.) Desv. Journ. Bot. 3, 162 (1814).

Platres, 11.6.37, 1153 m., dry mountain-side, among garigue bushes, E. W. Kennedy 486.

This is new to Cyprus. The species is widely spread in the Mediterranean Basin and the Canary Islands.

Dianthus cyprius A. K. Jackson et Turrill, a *D. pendulo* Boiss. et Bl. planta in parte inferiore valde fruticosa, foliis latioribus, floribus subcorymboso-aggregatis, et squamis calycinis latioribus differt.

Suffrutex, caulibus saepe pendulis in parte inferiore lignosis usque ad 5 mm. diametro. *Caules* usque ad 3.7 dm. alti, glabri, inferne plerumque ramosi. *Folia* caulina, linearia vel angustissime lanceolato-linearia, apice acuta, vel subacuminata, basi leviter latiora, sessilia, in vaginam 0.5–3.5 mm. longam connata, inferiora 5–9 cm. longa et 2.5–3 mm. lata, superiora gradatim breviora sed vix angustiora, margine inferne minute hispidula superne fere glabra, nervis in pagina superiore inconspicuis, infra subprominentibus. *Inflorescentia* subcorymboso-aggregata, 3–8-flora, floribus fere sessilibus; squamae calycinae 10–16, adpresse imbricatae, ovato-oblongae, acutae vel subacutae, superiores 1.2 cm. longae et 3 mm. latae, margine saepe minutissime ciliatae, inferiores multo minores. *Calyx* cylindricus, 2.5 cm. longus, 4–5 mm. diametro, glaber, dentibus lanceolatis acutis 5–6 mm. longis 1.5 mm. latis margine anguste membranaceis subciliatis. *Petala* rosea, saepe purpureo-maculata, 3.5 cm. longa, lamina obovata 1–1.4 cm. longa breviter digitato-incisa basi barbulata. *Stamina* leviter exserta, filamentis 2.4 cm. longis, antheris 2.5 mm. longis. *Ovarium* ovato-cylindricum, 4.5 mm. altum, 1.5 mm. diametro; styli 0.7–1.1 mm. longi; gynophorium 2.5 mm. longum. *Capsula* cylindrica vel anguste ellipsoideo-cylindrica, 2.3 cm. longa, 5 mm. diametro, dentibus anguste triangularibus 4.5 mm. longis obtusis; carpophorium 4 mm. longum. *Semina* oblongo-elliptica, 1.5 mm. longa (margine membranacea inclusa), laevia.

St. Hilarion castle, 20.10.29, C. B. Ussher 68; Kyrenia, 14.11.36, 338 m., limestone. In cracks of precipitous rock, facing north. Often big bushes, hanging down, branches 3 feet long, E. W. Kennedy 408 (type).

Dianthus cyprius is to be placed in the section *Dentati* Boiss. (Flor. Or. 1, 480, 498: 1867). Within this section it is most clearly related in morphological structure to *D. pendulus* Boiss. et Bl. and *D. actinopetalus* Fenzl. The former is a Syrian species and the characters distinguishing it from *D. cyprius* are given in the differential diagnosis. *D. actinopetalus* is a native of western and southern Asia Minor and, according to Boissier, N. Syria. It has fewer (4–8) calycine scales than either *D. cyprius* or *D. pendulus*. This occurrence of a number of morphologically closely related species in the Nearer East geographically more or less vicarious one with another suggests the break-up of a common ancestral species.

Tunica Kennedyae A. K. Jackson et Turrill, a *T. pachygona* Fisch. et Mey. inflorescentia valde glandulosa, foliis caulinis erectis, floribus seminisque minoribus, calycis costis uninerviis, petalis

bifidis facile distinguitur; a *T. illyrica* (L.) Fisch. et Mey. radice annua et petalis minoribus differt.

Herba annua, 0.6–2.8 dm. alta. *Caulis* erectus, subrigidus, saepe basi plus minusve ramosus, superne (inflorescentiae ramis praecipue) glanduloso-viscidus, inferne breviter glanduloso-hispidus, in parte media glaber vel glabrescens. *Folia* basalia oblongo-elliptica, apice rotundata vel obtusa, usque ad 1.2 cm. longa et 4 mm. lata, glabra vel sparse hispidula, basi leviter ciliolata, caulina anguste linearia, subacuta 0.5–1.5 cm. longa et 0.5–2 mm. lata, trinervia, ad caulem plus minusve adpressa, glabra. *Inflorescentia* laxa, floribus solitariis ebracteolatis, pedicellis usque ad 2.5 cm. longis saepe dense glanduloso-viscidis. *Calyx* turbinatus, subpentagonus, 5–6 mm. longus, 1.5 mm. diametro, plerumque glanduloso-viscidus, perraro fere glaber, costis uninerviis saepissime rubris vel purpureis, inter angulos membranaceo-albidus, dentibus triangularibus acutis circiter 0.5 mm. longis. *Petala* in pagina superiore alba, inferiore rubra, lineari-spathulata, 7–8 mm. longa, lamina circiter 1 mm. lata bifida, 1–2 mm. exserta. *Stamina* inclusa, 2–4 mm. longa, glabra. *Ovarium* oblongo-ellipsoideum, 1.5 mm. longum et circiter 1 mm. diametro, glabrum; styli 0.5 mm. longi. *Capsula* anguste ellipsoidea, 7–8 mm. longa, apice 1–2 mm. exserta, dentibus ovato-oblongis 2 mm. longis obtusis vel subacutis recurvis. *Semina* oblonga, irregulariter compresso-concava, basi abrupte angustata, 1.5 mm. longa, 0.75 mm. lata (ala inclusa), laevia, minutissime punctata, nigra.

Prope Prodromo in monte Troodos, 17.6.1880, Sintenis et Rigo 764; Platres, 6.5.37, among garigue, dry mountainside, 1050 m., E. W. Kennedy 360; Platres, 19.6.37, garigue on dry mountainside, 800 m., E. W. Kennedy 361; Platres, 21.7.37, steep mountainside among *Quercus alnifolia* and Pine trees, 1350 m., E. W. Kennedy 362; Platres, 19.5.38, dry mountainside where rain has run. In the open sun in bare patches among the garigue, below a bush or a rock that held the rain, 990 m. Petals red outside, pale inside, notched, E. W. Kennedy 1036; Platres, 18.6.38, 900–1000 m., plentiful, E. W. Kennedy 1037 (type); Kryos Potamos, 20.6.38, 890–1550 m., E. W. Kennedy 1038.

This species seems to be very different in a number of obvious and important characters from *T. pachygona*, which is the only other species of *Tunica* (excluding *Kohlrauschia*) recorded from Cyprus. So far as one can judge from the abundant dried material it is an "annual," but may be an overwintering annual with autumn germination of the seeds. It certainly appears to be monocarpic.

No material has been seen of *T. Davaeana* Coss. in Bull. Soc. Bot. Fr. 36, 103 (1889). This was described from material collected in Cyrenaica and the somewhat incomplete description suggests an affinity with *T. pachygona* and *T. Kennedyae*. It is, however, said to have a rather thick fusiform root, leaves subulate at the apex, green calyx nerves, narrowly oblong petals with the claw passing

gradually into a dilated limb, and seeds broadly winged with a retuse base.

Alyssum fulvescens S. et S. Prodr. Fl. Graec, 2, 13 (1813).

This species was originally described, without an exact locality being given, from Cyprus. It has now been received from Platres, 960 m., 27.2.37, dry mountainside, in the shade of *Cistus*, E. W. Kennedy 512.

Silene Behen L. Sp. Pl. 418 (1753).

This species is recorded by Boissier (Flor. Or. 1, 584: 1867) from Cyprus, as collected by Kotschy, but no more precise locality is given. We now have in the Herbarium at Kew the following specimens from Cyprus: in campis prope Kythraea, 11.4.1880, *Sintenis et Rigo* 249; in agris pr. Hagios Andronicus, 22.4.1880, *Sintenis et Rigo* 249; in agris pr. Yalussa, 22.4.1880, *Sintenis et Rigo* 249; Houstons, Kyrenia, 3.1902, A. G. and M. E. Lascelles; Government House, Nicosia, 200 m., 23.3.1927, A. Huddle 21; Kormathitis, 60 m., on field terraces, 31.3.1936, A. *Syngrossides* 1221; near Phassouri (Limassol), 45 m., on red soil, in broad bean cultivation, 12.4.1938, A. *Syngrossides* 1802.

Portulaca oleracea L. Sp. Pl. 445 (1753).

Platres, 1200 m., 28.6.37, in fallow land terraced on the side of a gully, E. W. Kennedy 1034. Flowers yellow, fruit purple.

This species, now known from nearly all the warmer parts of the world, has, apparently, been recorded previously from Cyprus only by Kotschy.

Geranium columbinum L. Sp. Pl. 682.

Cape Andreas, on red rocky soil, 100 m., 29.3.1938, A. *Syngrossides* 1767. Petals violet-rose.

This species, widely spread in Europe, the Nearer East, and Central Asia, has, apparently, not been previously recorded from Cyprus.

Ornithopus compressus L. Sp. Pl. 744 (1753).

Kryos Valley, Platres, 900 m., 24.3.37, E. W. Kennedy 571A; Platres, 1100 m., 28.3.38, E. W. Kennedy 571B.

This species, widely spread in the Mediterranean Region, has apparently not previously been found in Cyprus.

Trifolium pratense L. Sp. Pl. 768 (1753).

Kryos Potamos, 1700 m., 20.6.37, edge of stream, at the foot of a wet, very shady, high bank on the steep mountainside, E. W. Kennedy 558.

This species, widely spread in Europe, the Orient, and N. Asia, has not apparently hitherto been recorded from Cyprus.

Trifolium subterraneum L. Sp. Pl. 767 (1753).

Kryos Potamos, 1000 m., 24.3.37, under *Cistus* on dry mountainside above the stream, E. W. Kennedy 564.

A new record for Cyprus. The species is widely spread throughout the Mediterranean Region and western Europe.

Vicia lathyroides L. Sp. Pl. 736 (1753).

Platres, 1000 m., 20.3.37, under *Cistus* on dry mountainside above a winter-time rivulet, flowers blue, E. W. Kennedy 585; Platres, 22.3.38, 1030 m., on a bank under a hedge by a path through vineyards on a gentle slope of the mountain, E. W. Kennedy 586; Kryos Potamos, 24.3.37, 900 m., under *Cistus* on the dry mountainside above the stream, flowers blue, E. W. Kennedy 587.

This species, widely spread in Central Europe and the Mediterranean Basin, was recorded from Cyprus by Sibthorp et Smith (Prodr. 2, 71: 1813) but without exact locality. The record in the *Prodromus* says "In Cypri arvis; etiam in agro Cariensi, et Eliensi," and adds "*Flores* in exemplaribus Sibthorpiensis albidis, vexillo striato."

Geum heterocarpum Boiss. Voy. Bot. Espagne, 201. t. 63 (1839).

Chionistra, 2000 m., 13.7.37, under a Juniper tree, on the steep rocky northern slope, growing thickly together, E. W. Kennedy 595; also 16.6.38, E. W. Kennedy 1044; also 23.6.38, E. W. Kennedy 1045; also 6.7.38, E. W. Kennedy 1046.

This species is widely spread in the mountain altitudinal zones in the Mediterranean Region. It appears to be frequently associated with junipers.

? **Siler cordifolium** Boiss. in Flor. Or. Suppl. 263 (1888).

Aphamis, 30.7.37, limestone mountain, 1150 m., some among garigue and others in a vineyard with *Sideritis* and *Stachys*, E. W. Kennedy 674; Aphamis, 21.8.37, 10.9.37, 2.10.37, limestone mountain, 1000 m., on limestone and on an outcrop of igneous rock. Among garigue of *Genista fasselata* (*sphacelata*) and in vineyards. Flower-stalk has a bitter smell. Mericarps purple with white wings. More numerous than at 1150 m., E. W. Kennedy 675; Platres, 29.9.37, igneous rock, 1600 m., few plants on a shady slope towards a rain gully under pine trees and among bracken, E. W. Kennedy 676.

As pointed out by Holmboe (Stud. Veg. Cyp. 141: 1914) the position of this plant is uncertain as ripe fruits have not been described. Ripe or nearly ripe fruits are included in Mrs. Kennedy's collection. These show that the species is not to be included in the genus *Siler* as usually understood. The fruit structure is very close to that of certain species of *Ferula* (in the sense of Bentham and Hooker), and ? *S. cordifolium* may eventually have to be removed either to *Ferula* or made the type of a new genus.

Lactuca triquetra (Labill.) Boiss. Flor. Or. 3, 819 (1875).

Above Yerasa from Agros to Limassol, 480 m., 8.10.37, on chalky cliffs, forming a large group of perennial rootstocks, many growing together; flowers violet bluish, A. *Syngrossides* 1698.

The species has hitherto been recorded from Syria only, so far as is known.

Pyrethrum Balsamita (L.) var. *tanacetoides* Boiss. Flor. Or. 3, 346 (1875).

Kryos Potamos, 1700 m., 7.9.37, on a wet slope in the shade of pine trees near the stream, *E. W. Kennedy* 945.

Troodos, Government Cottage, 1500 m., cultivated, 6.10.37, *A. Syngressides* 1685.

The species is Oriental, ranging from E. Asia Minor to Persia.

Ipomoea stolonifera (Cyr.) J. F. Gmel. Syst. 345 (1791). *Convolvulus stoloniferus* Cyr. Pl. rar. Neap. fasc. 1, t. 5 (1788). *Ipomoea littoralis* (L.) Boiss. Fl. Or. 4, 112 (1879).

Famagusta, sand by sea-shore, 9.11.1937, *Lady Loch* 12. Creeping with long branches; flowers greenish white; leaves varying in shape.

This is a species not previously recorded from Cyprus. The nomenclature presents some difficulty and we have adopted the name *I. stolonifera* since it seems the least ambiguous of those so far proposed and is founded on a good description and figure. The distribution of the species is interesting. It occurs on coastal sands in Italy, Palestine, Syria, Egypt, Morocco, and the Azores. In Eastern Tropical and Subtropical America (from Florida to Brazil), again near the shore, there occur plants which have, under one or another synonym, been considered to be the same species as *I. stolonifera*. Some of the specimens thus identified appear to us to be specifically distinct, but material from Florida is probably best regarded as conspecific.

Sideritis perfoliata L. Sp. Pl. 575 (1753).

Aphamis, limestone mountain rising south of Chionistra, 1200 m., 4.7.37, among garigue, with *Silene*, etc., *E. W. Kennedy* 794, the root smells of poppies and the leaves of lemon-scented verberna; the flowers are cream-coloured; Aphamis, district of Limassol, on limestone mountainside, facing north, in garigue, 1200 m., 6.8.38, *E. W. Kennedy* 1076, corolla palest yellow inside and out.

The distribution of *S. perfoliata* is uncertain. The group to which it belongs requires revision. We are, for example, unable to separate *S. glandulifera* Post from *S. perfoliata* as this latter is usually accepted. Post's description does not agree in important particulars with authenticated material in the Herbarium at Kew. *S. perfoliata* has probably a wide distribution in Asia Minor, Syria, and Palestine.

Euphorbia aleppica L. Sp. Pl. 458 (1753).

Kyrenia, 30.10.36, 62 m., on limestone, among garigue between cultivated land and a gully, on the slope between the precipice and the sea, *E. W. Kennedy* 612.

New to the flora of Cyprus. The species is widely spread from southern Italy, the southern and western Balkan Peninsula, east to Asia Minor, Palestine, Syria, and Iraq.

Euphorbia Aplos L. Sp. Pl. 457 (1753).

Kyrenia, 29.10.36, on limestone near the edge of the sea on flat rocky ground, *E. W. Kennedy* 610; Xerovounos (Pyrgos), 19.10.37, 310 m., on dry mountains and hills, *A. Syngressides* 1721. Root-stock tuberous, leaves with shaggy hairs, fruit trilobed, with red spots.

This appears to be a new record for the island. The species is widely spread in the hill and montane zones in Greece, Macedonia, Thrace, S. Bulgaria, Asia Minor, and Syria. It is also recorded from southern Italy.

Euphorbia biglandulosa Desf. in Ann. Mus. Par. 12, 114 (1808).

This species was recorded from Cyprus in *K.B.* 1934, 273. The following additional specimens have now to be included: Troodos, June 1880, *Sintenis et Rigo*, 695; Cyprus, April 1901, *Lascelles*; Troodos, July 1914, *Feilden* 4; Troodos, July 1929, *Ussher* 70; Kryos Potamos, 1200 m., 18.2.37, in rock hanging over the bank of the river, *E. W. Kennedy* 604; Platres, in rock among garigue on the mountainside, sloping down to a wintertime rivulet, branches spreading down the rock, 21.2.37, 990 m., *E. W. Kennedy* 605; Kryos Potamos, 25.2.37, 920 m., in rock on flat ground at the edge of the stream, the branches falling and spreading on the ground, none upright, *E. W. Kennedy* 606; Kryos Potamos, 10.3.37, 890 m., in rock near the stream, a flat damp shady place, *E. W. Kennedy* 607; Kryos Potamos, 28.4.37, 1300 m., in rock in the bed of the shrunken river, *E. W. Kennedy* 608; Kryos Potamos, 17.5.37, 1170 m., hanging down on rock high above the stream, *E. W. Kennedy* 609; Troodos mnts., on rocky land near the road, 1700 m., July 1937, *Wyatt* 22.

This species is closely related to *E. Myrsinites* L., which is recorded by Holmboe from localities in the Troodos range, but no authentic specimens of the latter species from Cyprus have been seen.

Fritillaria acmopetala Boiss, Diagn. Ser. 1, 7, 104 (1846); Stapf in Bot. Mag. t. 9148 (1928).

Karmi, 270 m., fields, 29.3.37, *Lady Loch* 17; Templos, 100 m., cultivated fields under olives, 30.3.38, *Lady Loch* 55; Karmi and Trimithi (Kyrenia district), 60-250 m., in cereal crops, 4.4.38, *A. Syngressides* 1784.

This is a new record for Cyprus. Hitherto *F. acmopetala* has been known from Syria (Amanus and Lebanon), and southern Asia Minor (from Cilicia to Lycia).

Colchicum Steveni Kunth Enum. Pl. 4, 144 (1843); Stefanoff Monogr. Colch. 57 (1926).

Below Vasilia, 17 m., 31.10.37, dry banks of soil between cultivation, *Lady Loch* 9. Growing in clumps with six leaves fully developed; perianth segments 8-10-nerved.

This is a new record for Cyprus. The species is known from Syria, Palestine, and Cilicia.

C. hiemale Freyn in Bull. Herb. Boiss. 5, 802 (1897); Stefanoff Monogr. Colch. 56 (1926).

The following specimens from localities additional to those quoted by Stefanoff have recently been received: Ag. Parasthenis, Government House, Nicosia, 175 m., 13.11.35, on rocky fields, *A. Syngrossides* 858; Ag. Chrysostomos, 330 m., 25.11.36, stony soil among olives, *Lady Loch* 14; Haleyya, 660 m., 24.11.36, stony maquis below rocky cliffs—thinly distributed in only one patch, *Lady Loch* 8; Athalassa, 175 m., 3.12.36, stony arid soil, on hillocks above Messaria plain—growing in profusion, *Lady Loch* 15; three miles W. of Nicosia, 200 m., 8.12.36, peppered over many acres of flat cultivated land, *E. W. Kennedy* 156; Korno, 330 m., 15.11.37, dry hillsides, *Lady Loch* 14; Cape Elea, 17 m., 21.11.37, growing in profusion on rich red soil, *Lady Loch* 16; Ag. Chrysostomos, 330 m., 1.12.37, dry hillsides, *Lady Loch* 18.

Carex illegitima Cesati in Friedrichsth. Reise, 271 (1838) sec. Kükenthal in Pflanzenr. IV. 20, 459 (1909).

Kyrenia, 360 m., ground below precipice facing north, on limestone, 14.11.1936, *E. W. Kennedy* 120.

This material, determined by E. Nemes, represents a species new to the flora of Cyprus. The distribution of the species is peculiar. It occurs particularly in islands or on peninsulas and is recorded from the following areas: Lesina, Lissa, Cephalonia, Poros, Attica, Eleusis, Peloponnese, and Makronisi (in the Gulf of Smyrna). Mrs. Kennedy's specimens considerably extend the known eastern range.

LXIV—PEDILANTHUS VERSUS TITHYMALUS.

A. A. BULLOCK.

In the American Journal of Botany, 24, 702-704 (1937), Dr. L. Croizat has pointed out that the valid name for the well-known Euphorbiaceous genus *Pedilanthus* Neck. (1790) is *Tithymalus* Mill. (1754). He mentions the fact that Small (Man. S. E. Fl. 804: 1933) has used the name *Tithymalus* Mill., making one new combination, and that Hara (in Journ. Jap. Bot. 11, 381: 1935) has pointed out that if *Euphorbia* sect. *Tithymalus* is raised to generic rank, the name *Galarhoeus* Haw. (1812) must be adopted for it, on account of the pre-occupation of the name *Tithymalus*. Haworth (Syn. Pl. Succ. 136: 1812) used the new name *Crepidaria* for *Pedilanthus* Neck., but this is merely a later synonym, and need not be considered here.

The data given by Dr. Croizat in his careful study of the question appear to be strictly accurate, but his conclusion that *Pedilanthus* should be replaced by *Tithymalus* is based on failure to appreciate the most important principle underlying the International Rules of Botanical Nomenclature: the first essential in nomenclature is to aim at fixity of names (Art. 4). The importance of this principle is emphasized by the acceptance of the further principle of *nomina*

conservanda (Art. 21), which in exceptional cases overrides the principle of priority of publication. The position regarding future *nomina conservanda* was made clear by the Congress of 1935, which adopted the following proposal by Prof. R. Maire:—"As soon as any well-known generic name is found to be endangered, the case should be at once communicated to the Special Committee concerned" (Proc. Zesde Internat. Bot. Congr. 1, 361: 1936).

The case of *Pedilanthus* versus *Tithymalus* should accordingly have been submitted to the Special Committee for Phanerogamae and Pteridophyta appointed at Amsterdam (Secretary: M. L. Green, Kew). To make new combinations under *Tithymalus* Mill. for species of *Pedilanthus*, before the question of conservation has been considered, is to prejudice the issue.

Conservation of *Pedilanthus* Neck. is warranted, in the writer's opinion, by the facts stated below for the information of the Special Committee, to which the case will be submitted on the appearance of this article:—

(1) The genus *Pedilanthus* includes about 30 species, natives of Tropical America, with the greatest concentration in Mexico. A few are in cultivation in collections of succulent plants.

(2) The name *Pedilanthus* has been in continuous use from 1790 to 1935; *Tithymalus* Mill., on the other hand, was not adopted by any author* between 1754 and 1933, and Haworth's Syn. Pl. Succ. 136 (1812) is the only publication that has been found between these dates in which it is even cited as a synonym. Small adopted it for a single species in 1933, and its general adoption was advocated by Croizat, as indicated above, in 1937.

(3) The *Index Londinensis* records 19 figures, dealing with 11 species under the name *Pedilanthus* Neck., and none under *Tithymalus* Mill.

(4) The name *Pedilanthus* Neck. is adopted in the following important works (the list is not exhaustive):—Neck. Elem. Bot. 2, 354 (1790); Poiteau in Ann. Mus. Hist. Nat. Par. 19, 388 (1812); Spreng. Syst. 3, 802 (1826); H.B.K. Nov. Gen. et Sp. 2, 63 (1817); Baill. Euphorb. 287 (1858); Griseb. Fl. Brit. W. Ind. 51 (1859); Boiss. in DC. Prodr. 15, pars 2, 4 (1862); Baill. Hist. Pl. 5, 178 (1874); Müll.-Arg. in Mart. Fl. Bras. 11, pars 2, 707 (1874); Benth. et Hook. f. Gen. Pl. 3, 257 (1880); Hemsl. Biol. Centr.-Amer. Bot. 3, 88 (1882); Pax in Engl. et Prantl. Nat. Pflanzenfam. 3, 5, 112 (1896), et op. cit. Nachtr. 195 (1907); Urbina, Cat. Pl. Mex. 312 (1897); Dalla Torre et Harms, Gen. Siphonog. 282 (1901); Pulle, Enum. Vasc. Pl. Surin. 264 (1906); Urb. Symb. Antill. 4, 357 (1910), et op. cit. 8, 375 (1920); Goyena, Fl. Nicarag. 291 (1911); Millsp. in Publ. Field Mus. Nat. Hist. Chicago, Bot. Ser. 2, 353 (1913); Small, Fl. S.E. United States, 1350 (1913); Boldingh, Fl. Nederl. W. Ind. 256 (1913); Britton, Fl. Bermuda, 218 (1918); Britton et Millsp. Bahama Fl. 233 (1920); Fawc. et Rendle, Fl. Jamaica, 4, 346 (1920); Standl. in Contrib. U.S. Nat. Herb. 23, 604 (1923); Britton et Wils. Fl.

* Except Miller himself, in the various editions of his Dictionary.

Porto Rico and Virgin Is. 496 (1924); Standl. et Calderon, Fl. Salvador, 135 (1925); Pax et Hoffm. in Engl. et Prantl, Nat. Pflanzenfam. 2 Aufl. 19c, 223 (1931).

PLATE IV.

Kew Bulletin, 1938

LXV—MISCELLANEOUS NOTES.

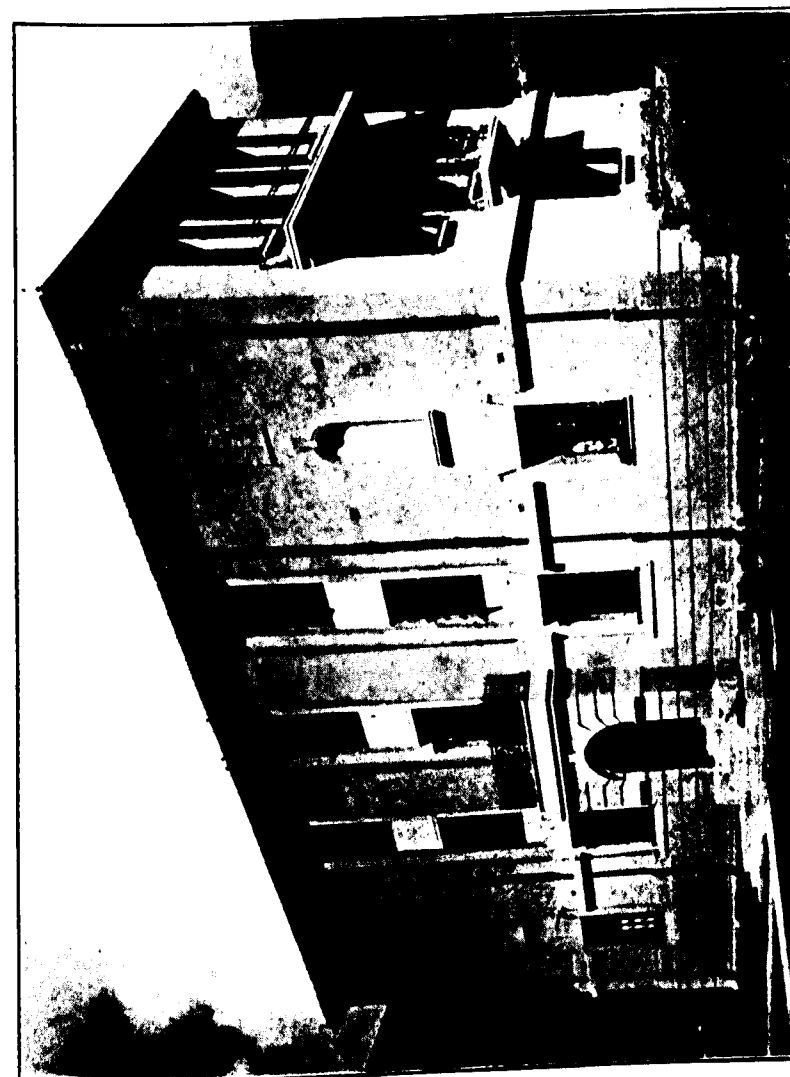
New Building at the University of Cape Town for the Bolus Herbarium.—The Bolus Herbarium was left by the late Dr. Harry Bolus to the University of Cape Town, together with sufficient funds for its continuation as an active force in the botanical life of South Africa. At first it was housed at the Old University buildings in Cape Town, but on the establishment of the National Botanic Garden at Kirstenbosch a special building was erected to house the collection near the garden, with which it has worked in close co-operation.

The unsuitability of the climate at the Kirstenbosch site, however, was unfortunately not realised. In winter the very damp atmospheric conditions at the particular spot occupied by the building proved to be detrimental to the preservation of herbarium specimens, and damp and mould would soon have completely destroyed many of them, particularly succulents. The installation of additional heating apparatus some ten years or so ago has had little effect, and it became imperative that a new site should be found for this valuable collection.

However one may regret the separation of the herbarium from the Botanic Garden, it is a great relief to learn that the herbarium has now been moved to a new building at the University, near Rondebosch, where much drier conditions prevail during the winter, and where it will be available for the use of the University staff.

We are indebted to Dr. L. Bolus, Curator of the Herbarium, for the following details of the fine new building, which have been drawn up by the architect, and for the photograph which is here reproduced.

This building was commenced in November 1937 and completed in six months at a cost of nine thousand pounds. It occupies a sunny and open site at the North West corner of a group of 14 buildings in a formal lay-out on the eastern slope of Devil's Peak. The building is planned long and narrow so as to preserve good natural lighting throughout, and has large steel windows on the East and West sides, but teak windows with louvred shutters on the hot North end. At this end there are balconies for growing plants or drying specimens. The accommodation is arranged on three floors, the lower floor being the Entrance Hall, Workshop and Curator's and Staff Rooms. The two upper floors house the collection of dried specimens and the library, the cases and bookshelves being arranged to form separate spacious and well-lit bays for study and work. The length inside the walls is 77 feet and the breadth 24 feet 6 inches.



The new building of the Bolus Herbarium.

Every care has been taken to keep the building dry. The roof is of heavy Roman pattern tiles laid on boarding and asphalt sheeting; the walls are built with cavities and plastered with water-repellent cement. Fire-resisting materials were used in the construction, and carbon dioxide fire extinguishers are installed.

The architects were Messrs. Walgate & Elsworth, of Cape Town.

Botanical Gardens of the University of British Columbia.—

Professor John Davidson, Associate Professor of Botany in the University, has written an interesting and well-illustrated account of the Gardens which have been developed on ground adjacent to the University buildings.

An area of some five acres on the University site was set aside in 1916 for a Botanic Garden and this has now reached an advanced and very satisfactory stage of development.

The aims of the Gardens at their inception were (1) to assemble a representative collection of plants from all parts of the Province of British Columbia; (2) to grow sets of species belonging to critical genera for study and research, to determine accurately their species and apply their valid names; (3) to create an outdoor museum, to provide living material for teaching purposes as well as for post-graduate research. The latter aim is, of course, a most necessary one seeing that the Gardens are so closely associated with the University.

The Gardens as now organised consist of a Native Garden exclusively devoted to British Columbian plants, which from the wide range of the Province from the coast to high mountains represents a very interesting flora which it is most valuable to have collected together. This portion of the Gardens consists of herbaceous plants, arranged systematically in a series of parallel beds, with the native trees and shrubs planted out on the adjacent lawns. An Exotic Garden has been established mainly for supplying material for teaching purposes and there is also a Medicinal Garden, and a Rock Garden where a number of interesting native plants are being grown.

In the Aquatic Garden a large collection of native water plants is being cultivated, so that in the small space devoted to the Gardens all the essential parts of a Botanic Garden are represented, while the Herbarium is close at hand.

A Botanic Garden in British Columbia dates from the year 1912, when two acres of land were set aside for the purpose on the Provincial Colony Farm, Essondale, but thanks to the establishment of the Botanical Survey of the Province of British Columbia great quantities of material were received at the Provincial Botanical Office and it became necessary, with the inauguration of the University, to transfer the botanical work to the University. In the year 1916, therefore, the collections at Essondale which then numbered 20,000 to 30,000 herbaceous plants, shrubs and trees were transported to the present University site.

The Gardens, situated in so rich a botanical district, are deserving of every encouragement and we offer our best wishes for their success. Five acres is a somewhat small area for so large a collection and it is to be hoped that before long some more ground may be made available for garden purposes and especially for the more extensive display of the native British Columbian flora.

Lithocarpus lappaceus and **L. Falconeri**.—In the Kew Bulletin, No. 3, 1938, pp. 100, 102, these two names appeared as "new combinations," the fact that they had been published previously having been overlooked. The correct citations of these names are :—

Lithocarpus lappaceus (Roxb.) Rehder in Journ. Arn. Arb. 1, 128 (1919) ; based on *Quercus lappacea* Roxb.

L. Falconeri (Kurz) Rehder, l.c. 10, 133 (1929) : based on *Quercus Falconeri* Kurz.

The Centenary of the Cell Theory.—We have been asked by the President of the "Sociedad Mexicana de Historia Natural," Apartado Postal 1079, Mexico, D.F., to publish the following announcement :—

"The scientific world celebrates this year the centenary of the cellular theory which was founded by the German botanist Mathias Jacob Schleiden, and by the zoologist Theodor Schwann, a hundred years ago. To commemorate this event, which according to E. B. Wilson, the famous cytologist, has had the same far reaching consequences as the theory of evolution, the Mexican Society of Natural History (Sociedad Mexicana de Historia Natural) resolved at their meeting, May 6th, to publish a special volume which would contain papers relating to problems of the cellular theory and kindred subjects.

"The committee respectfully submits the resolution to the learned sister societies of the world and begs to invite all biologists interested in the cellular theory to collaborate in the preparation of the volume. The paper which, according to the jury, is the outstanding contribution, will be awarded the Schleiden-Schwann medal of the Mexican Society of Natural History. Every cytological paper is welcome, but only those which have a direct bearing on the theory will be judged.

"The committee hopes that the publication of a commemorative volume with contributions by scientists of many countries will not only serve science, but establish also friendly relations with Mexico, where research in biology has found in the last years an enthusiastic support by Government authorities."

Printed under the authority of His MAJESTY'S STATIONERY OFFICE
By the South Essex Recorders, Ltd., Ilford.

(2208) Wt. 17/82 800 12/38 S E R. Ltd. Gp. 381

BULLETIN OF MISCELLANEOUS INFORMATION Appendix 1938 ROYAL BOTANIC GARDENS, KEW

REVIEW OF THE WORK OF THE ROYAL BOTANIC GARDENS, KEW, DURING 1938

General

STAFF.—Mr. H. C. SAMPSON, C.I.E., retired from the post of Economic Botanist on September 30th, 1938. Sir GEOFFREY EVANS, C.I.E., Principal of the Imperial College of Tropical Agriculture, Trinidad, was appointed to succeed him (K.B. 1938, 250).

Dr. H. G. SCHWEICKERDT, who has held the post of Botanist for South Africa since 1934, returned to South Africa as Professional Officer (Botany), Division of Plant Industry, Department of Agriculture, Pretoria. He has been succeeded by Mr. D. G. COLLETT, B.Sc., Assistant Professional Officer (Botany) in the same Department, who commenced his duties on September 24th 1938.

ERRATUM

In K.B. 1938, No. 2, p. 86, line 9, "3.1 cm. alta" should read "3.1 dm. alta."

and was fully engaged during the week attending the various meetings connected with the Congress.

The meeting was opened by His Excellency the Viceroy, the Most Hon. the Marquess of Linlithgow, P.C., in a large marquee erected in the grounds of the University College of Science, the members of the British Association Delegation and the Indian scientists wearing their academic robes.

During the week the Director read a paper on "The Seedling Structure of the Gesneriaceae" before the botanical section of the Congress and took part in discussions on papers presented to the section. He also broadcast an address on the Royal Botanic Gardens, Kew, and its connexion with India, and addressed the annual meeting of the Indian Botanical Society.

The Director attended the 150th Anniversary Meeting of the Royal Botanic Gardens, Sibpur, presided over by the Nawab Bahadur of Dacca, Minister for Industries and Agriculture, Bengal, and made the following speech :—

“ Honourable Nawab Bahadur, Ladies and Gentlemen.

“ It is singularly appropriate that the 150th Anniversary of the Foundation of the Royal Botanic Gardens, Sibpur, should coincide with the Jubilee Meeting of the Indian Science Congress at Calcutta, which is being attended by so many distinguished delegates from Great Britain, many of whom, including the President, we are honoured in having with us this afternoon. We all join in offering our good wishes for the continued prosperity of the Garden and look back with respectful admiration to its record of valuable work under its distinguished Superintendents during the past 150 years.

“ I feel particularly fortunate in being present here with you to-day, as it is the first time a Director of the Royal Botanic Gardens, Kew, has been in India in his official capacity. It is also of special interest to me personally, since my predecessor in office at Kew, Sir David Prain, held with distinction for many years the post of Superintendent of these Gardens and the Directorship of the Botanical Survey of India.

“ Your Gardens here offer an interesting and remarkable parallel to those other Royal Gardens under my charge at Kew, since Kew, on the banks of the River Thames, is only a few miles from London, while your Sibpur Gardens are within easy distance of the second city of the Empire and are situated on the banks of the Hooghly, which washes the shores of Calcutta. Both our Gardens suffer somewhat from being on the flat alluvial soil of the riverside ; the skill of the gardener, however, has transformed both sites into Gardens of high scientific interest as well as of great aesthetic beauty, so that they serve as a source of inspiration, education and research for their many visitors. May they find in them both spiritual rest and refreshment and also that tree whose leaves were ‘ for the healing of the Nations.’ Then again you justly treasure in this garden your renowned Herbarium, which is in fact the National Herbarium of India and is the Mecca for the study of Indian systematic botany by botanists, not only in India but from overseas, affording yet another point of similarity with Kew ; for our great National Herbarium at Kew is the centre for the study of systematic botany both for India and for the Empire.

“ I earnestly hope that the Government of Bengal will continue to realise the importance of these famous Sibpur Gardens and that the necessary funds will be forthcoming both for the maintenance of the scientific staff and for the proper upkeep of the living collections.

“ These Gardens, I would suggest, should, as one of their functions, serve, like Kew, as a training ground for student

gardeners, in order that the many good gardens and parks in India may be maintained at a high standard of excellence in the future by Indian gardeners trained at Sibpur. As you know, Sibpur, almost since its inception, has been tended and improved by student gardeners sent out from the Royal Botanic Gardens, Kew, many of whose names are remembered with honour in the roll of Indian Horticulture and whose fine work remains as their permanent memorial. This custom, which has resulted in so much benefit to Indian horticulture, I hope may be continued in the future. With one or two men sent out from Kew to Calcutta as Instructors or Curators, there should be no difficulty in establishing at the Royal Botanic Gardens, Sibpur, a ‘ school ’ for the training of Indian student gardeners for service in various parts of India, so that the great traditions of the past may be adequately continued.

“ Honourable Nawab Bahadur, Ladies and Gentlemen, on behalf of the more youthful Royal Botanic Gardens, Kew, which have not yet reached the 100th year of their existence as a public institution, I beg leave to offer our cordial good wishes for the continued prosperity and enhanced usefulness of the Royal Botanic Gardens, Calcutta.”

A discussion was arranged on “ A National Herbarium for India ” in the Botanical Section of the Association in co-operation with the Botanical Society, in which the Director took part, the outcome of which was the appointment of a committee of which he was elected a member. This committee has since submitted a report, which has been presented to the Government of India, recommending the recognition of the Herbarium at Sibpur as the National Herbarium and other important matters relating to the encouragement of research in systematic botany.

As the Director had been appointed the Ripon Professor in the Indian Association for the Cultivation of Science it was his duty to deliver three lectures before the members of the Association in Calcutta during the week of the Congress. The first of these lectures related to the history and functions of botanic gardens and to Kew’s connexion with India in particular, while the other two dealt with matters connected with seedling structure and the germination of certain abnormal types of seed. The lectures* have now been published with illustrations.

During the week in Calcutta the Director visited on more than one occasion the Royal Botanic Garden and the Herbarium under the guidance of Dr. K. Biswas ; the Indian Science Museum with its fine economic collections which were ably demonstrated by Dr. S. N. Bal, and other scientific institutions in Calcutta. A visit was paid to the Gardens at Government House, Barrackpore, now in charge of Mr. A. P. Lancaster who was a student gardener

*The Indian Association for the Cultivation of Science, Special Publication No. 8. Calcutta, 1939. Price 2s.

at Kew. He also saw Mr. A. S. Wilson, formerly Assistant Curator at Kew, who is now head gardener to the Maharajah of Cooch Behar.

At the close of the Congress the Director bade farewell to the other members of the British Association Delegation and proceeded to Puri, where he was the guest of His Excellency the Governor of Orissa, Sir John Hubback, K.C.S.I. North of Puri the extensive, sandy tracts have been thickly planted with *Casuarinas*, which provide an abundance of firewood. Full advantage was taken of the opportunities afforded for studying the vegetation and the various cultivated crops in the country around Puri and between Puri and Madras, including rice, millet, tobacco, cotton, jute and bright-vermillion fields of chilies drying in the sun.

During the stay in Madras the Director discussed the wheat-rust problem and Dr. Mehta's proposals for suppressing wheat cultivation in the Nilghiris with Dr. Rama Reddi, the Director of Agriculture, and later with the Hon. the Minister of Agriculture and the Secretary.

The Madras Museum was visited under the guidance of Dr. Gravely. The botanical side is very well arranged, the botanical specimens being displayed in admirable cases with narrow drawers which can be pulled right out only by releasing an invisible fastening.

At the invitation of Prof. Iyengar, the Director was entertained to tea in the botanical department of Presidency College, and there met the botanical staff of the College and several botanists from other institutions in and near Madras. The fine collection of living green marine algae made by Prof. Iyengar was of very great interest.

A visit was also paid to the Madras Christian College at Tambaram, where Prof. E. Barnes, who has done so much to increase our knowledge of the local flora, is a member of the staff. This visit was paid during the Director's second stay with H.E. the Governor of Madras at Guindy. Here the gardens and those at Government House, Madras, are in the charge of Mr. George Farley, formerly a student gardener at Kew, and their beauty is largely due to the keen interest in horticulture of Lady Beatrix Stanley when the Right Hon. Sir George Stanley was Governor of Madras. A visit was also paid to the Agri-Horticultural Society's Gardens, Madras, where several interesting plants were seen. As a result of this visit plants of the trailing *Torenia travancorica* and of a fine orange-yellow form of *Crossandra undulifolia* were sent over to Kew by air mail and are now successfully in cultivation. The *Torenia* has already been figured for the Botanical Magazine.

Between the two visits to Madras the Director went to Coimbatore, Ootacamund, Mysore and Bangalore. At Coimbatore he was the guest of Mr. R. C. Broadfoot, Principal of the Agricultural College and Research Institute, and was able to make a thorough inspection of the Cotton Station with the Cotton Specialist, Sri. V. Ramanatha Ayyar, who had arranged a remarkably fine demonstration of the work in progress, methods of pollination and of

ensuring self-fertilization by smearing the unopened petals of a flower with clay to prevent the opening of the flowers. Specimens of the local races of cotton and the pests were also exhibited. Slides were also examined showing the different types of the vascular bundle arrangement at the base of young cotton flowers, which may be of considerable value in classification, since scattered or grouped bundles in different patterns appear to be constant for the species and varieties.

The millet and sorghum research work under Mr. G. N. Rangaswami Ayangar was also studied, thanks to the fine set of specimens set out for examination. These included an exhibit of *Phaseolus* varieties and all the various grain crops. At the Sugar Cane Station, Rao Bahadur T. S. Venkataraman very ably demonstrated his work on crossing *Saccharum* with *Sorghum* and with bamboo. The latter cross with a bamboo some 40 ft. high is a very remarkable one, since the hybrid is a typical cane but with a hollow stem and a good sugar-content.

The various cultivated plots of species and varieties of *Saccharum*, *Sorghum*, *Eleusine*, etc., were studied, as well as the numerous seedlings raised at the Station. The very interesting cytological work being carried out by Dr. E. K. Janaki Ammal on the sugar cane hybrids was also seen under her guidance.

The Herbarium at the College in charge of Dr. K. Cherion Jacob and the oil seed work being conducted by Dr. G. B. Patel were also examined in detail and the Director gave a lecture to the students and staff of the College. A visit was also paid to the Forestry Institute and Museum at Coimbatore.

The journey to Ootacamund was made partly by car, visits being paid to the Lower Fruit Station and to Burliar on the ascent. At Burliar, *Amherstia* was in flower and Mangosteens were in fruit, while many other interesting tropical fruits were displayed and enjoyed. The drive up was through coffee and tea gardens to Conoor with wonderful views in all directions. Sims Park and the Pomological Station—where strawberries were ripe—were also visited. Plums, pears, peaches, oranges, apples and other fruit trees were being well cultivated at the Station, which was terraced and excellently maintained.

At Sims Park the trees and shrubs were mainly exotic and included a fine collection of conifers, oaks, beeches, camellias, hydrangeas, etc. Here, as in the gardens at Ootacamund, there was a sad absence of trees and shrubs native to the country—moreover the gardens showed lack of proper attention from skilled horticulturists.

From Ootacamund the *Cinchona* plantations, and the factory at Naduvatam, were visited with Mr. Wheatley. The factory is excellent and very well arranged, but the plantations compared unfavourably with those at Mungpoo, owing partly to the lack of fully qualified men to superintend the cultivation of the plants and

to less suitable conditions. In some places the *Cinchona* appeared to be suffering from unduly heavy shade of the *Alnus* and *Grevilleas*, and consequent loss of water, taken from the soil by the thickly planted shade trees. It was noticed that some of the young *Cinchona* plants at the higher elevations had been cut by frost in mid-January.

On the invitation of H.H. the Maharajah, the Director proceeded to Mysore by car from Ootacamund, passing through tea and coffee estates and Teak and native forests on the beautiful drive down to Mysore State. A visit was arranged at dusk to the great Dam at Brindavan and the magnificent gardens with their fountains below the Dam were illuminated in his honour; the display was one of remarkable beauty. Mysore City is a veritable garden city and the gardens here and at Bangalore owe very much to the skill and knowledge of Mr. Gustav H. Krumbiegel, formerly at Kew, who has devoted so many years of his life to the encouragement of horticulture in the State.

The Director then went to Bangalore *via* Seringapatam, Somnathpur and the hydro-electric works at Sivasamudram, reaching Bangalore in time for the opening of the Lal Bagh Flower Show at which he made a speech and distributed the prizes in the presence of the Dewan, Sir Mirza Ismail, Dr. Hans Luther, formerly German Ambassador at Washington, and other distinguished visitors. The Show was a remarkably fine display of flowers, vegetables and fruit, which compared very favourably with a good exhibition at the Royal Horticultural Society at home. After dining with the Dewan, the Director left for Madras and thence *via* Madura, Chanushkodi and Talaimannan to Colombo, which was reached at 7 a.m. on January 26th.

Here the Director was met by Professor Nigel Ball and visited the public gardens with the new orchid house, *Vanda spathulata* being in full flower. A long morning was then spent at University College, Colombo, and something was seen of Professor Ball's work on *Turnera*, etc. Later a visit was paid to Dr. de Sousa, Secretary of the Orchid Society of Ceylon, and his interesting collection of orchids was examined; specimens from some of his plants he is kindly presenting to Kew.

The Director left Colombo at 5 p.m. on January 26th in the s.s. "Mooltan," and reached Kew on February 13th, having spent 20 nights in trains during the Indian tour.

Mr. E. MILNE-REDHEAD returned to Kew in the middle of March, having spent about 4½ months collecting around Matonchi Farm in the Mwinilunga District of Northern Rhodesia (see Annual Review, 1937, 531). In addition he made a fortnight's tour into the adjacent Moxico District of Angola during January, visiting the Lusavo Falls and the Ikulu Hot Springs by the Zambezi. His collection of some 2150 numbers contains several little-known species, many of which were not previously represented in the Kew Herbarium, whilst the number of species new to Northern Rhodesia

is considerable. The collection is supplemented by material in spirit and by over 80 timber specimens.

Mr. H. S. MARSHALL, Assistant Librarian, attended the 61st Annual Conference of the Library Association held at Portsmouth and Southsea in June, as a delegate from Kew.

THE DIRECTOR and two members of the staff, Miss M. L. GREEN and Dr. C. R. METCALFE, attended the Twelfth International Horticultural Congress in Berlin from August 12th to 17th, 1938. After the Plenary Meeting, which took place at 11 a.m. on August 12th, members attended the meetings of those Sections in which their interests chiefly lay. The Director addressed the Section of Education on the international exchange of student gardeners. Miss Green contributed to the discussions on nomenclature and Dr. Metcalfe was chiefly interested in Section 8 (Plant Protection), Section 10 (Storage of Fruit and Vegetables) and in Section 17 (Special Questions in Plant Physiology). Dr. T. A. SPRAGUE also attended the Congress as a private member, and took part in the nomenclature discussions.

At the meeting of the British Association for the Advancement of Science held at Cambridge in August 1938, Dr. W. B. TURRILL gave a paper on "Ecological Isolation" in the Joint Discussion (sections D and K) on "Mechanism of Evolution." This paper has since been published in the Kew Bulletin, 1938, 384.

Mr. E. NELMES, Acting Librarian, represented the Royal Botanic Gardens, Kew, at the Fifteenth Annual Conference of the Association of Special Libraries and Information Bureau at Oxford in September.

THE ASSISTANT DIRECTOR, together with Mr. A. H. G. Alston of the British Museum (Natural History), attended, as Delegates of the British Government, the "Primeira Reunião Sul-Americana de Botanica" held at Rio de Janeiro from October 12th to 19th. The delegates were guests of the Brazilian Government during their stay at Rio and were given every facility by the Brazilian botanists to see as much as possible in the short time available. Besides attending meetings in connexion with the Congress, Mr. Gilmour paid several visits to the Instituto de Biologia Vegetal and the famous Botanic Garden attached to it, and to the botanical department of the Museum Nacional. Official excursions took place to the beautiful mountain town of Petropolis and to the interesting "restinga" formation near Cabo Frio. Every opportunity was taken for personal contact with the many Botanists assembled from all parts of South America and elsewhere, and a number of arrangements were made for exchange of material and publications. Our grateful thanks are offered to Dr. Campos Porto and his colleagues at the Instituto, and to the staff of the Museum Nacional, for all their kindness.

After the Congress Mr. Gilmour spent a week in the State of São Paulo with Prof. G. Stahel of Paramaribo and Dr. C. van de Koppel of the Koloniaal Instituut, Amsterdam. Every facility

was accorded them for seeing the botanical and agricultural work being carried out in the State and the following institutes were visited under the guidance of their respective Directors and staff: Instituto Biologico, São Paulo; Instituto Agronomico do Estado de São Paulo, Campinas; Escola Superior de Agricultura da Universidade de São Paulo, Piracicaba; and the Eucalyptus Museum of the Serviço Florestal da Companhia Paulista, Rio Claro.

Mr. Gilmour returned to Rio on October 24th and the following day commenced the three-day flight to Trinidad, arriving at Port-of-Spain on the evening of October 27th. Nights were spent at Pernambuco and at Para, where the Museum Goeldi was visited.

Mr. Gilmour spent a fortnight in Trinidad, staying at the Imperial College of Tropical Agriculture as the guest of Professor Cheesman and of Mr. R. E. D. Baker. Through the kindness of the heads of the various departments of the College and of the Director of Agriculture, Mr. E. J. Wortley, and his staff, he was enabled to see much that was of botanical and agricultural interest in the Island.

On his voyage home, Mr. Gilmour called at Georgetown, British Guiana, where a brief visit was paid to the Botanic Garden with Mr. E. B. Martyn, the Superintendent, and at Paramaribo, Dutch Guiana, where Prof. Stahel showed him the work being carried out by his department. Mr. Gilmour returned to Kew on December 2nd.

PUBLICATIONS.—Ten numbers of the "Kew Bulletin" were published during the year, and the Review of the work during 1937 was issued as an Appendix. The "List of Seeds" was published as a separate pamphlet.

A new edition (the fourth) of the "Hand-List of Coniferae, Cycadaceae and Gnetaceae grown in the Royal Botanic Gardens, Kew, and at the National Pinetum, Bedgebury" was published in April. The nomenclature has been brought up to date and a section has been added on cultivation.

A fifth edition of the "Popular Guide" was published in September.

Economic Work in Tropical Agriculture

This work consists mainly in arranging for the collecting and despatch of economic plant material to scientific workers of Colonial Agricultural Departments or Research Institutions in the Tropical countries. Many of these plants are required by plant breeders or geneticists who are attempting to raise improved varieties of economic crops, others are needed to meet the demands of those who are dealing with disease-resistance problems, whilst some may be new crop introductions or plants of use as insecticides.

Bananas.—The collection and despatch of banana types to the plant breeders in Trinidad and Jamaica have proceeded. A collection of East African suckers received from Amani has, after a period of quarantine at Kew, been despatched to these two Colonies. More lately, however, particular attention has been paid to wild types, and seeds of wild bananas from Assam, North Borneo, Nigeria, New

Guinea and its neighbouring islands, and Burma have been dealt with. The usual practice is to retain a portion of the seed at Kew, where it is grown up to a certain stage, and to send the rest to the West Indies. This precaution is considered necessary in case of accident or failure to germinate after arrival in the West Indies, due to loss of viability or damage in transit.

Two suspicious cases of virus disease were noticed at Kew and the plants were destroyed and precautionary measures taken.

Cassava.—At the request of the East African Agricultural Research Station at Amani a collection of Cassava cuttings that had been sent by Dr. S. C. Harland from Brazil was received at Kew. Half the consignment was grown on at Kew and the remainder despatched to Amani where a collection is being made with the object of overcoming the mosaic disease by breeding disease-resistant types. Efforts to obtain other species of *Manihot* from Brazil, apart from *M. utilissima* and *M. dichotoma*, are now being made. Similarly cuttings of good varieties of Cassava from Malaya were sent to British Honduras at the request of that Government.

Cacao.—There is a desire on the part of the Nigerian agricultural authorities to improve the quality of Nigerian cacao by the introduction of better types from the West Indies. At the Imperial College of Tropical Agriculture in Trinidad selection work on Foresteria cacao has been in progress for some years and high-yielding, good quality clones are now available. The difficulty is to effect the introduction without at the same time bringing in disease, especially the witchbroom disease (*Marasmius perniciosus*), which is causing serious damage in Trinidad. It was decided to call for the co-operation of Kew and accordingly cacao seeds from Nigeria have been planted and a number of seedlings has been raised in the Gardens. These will be used as root stocks, and bud wood from a number of rooted cuttings of selected types which have been received from Trinidad and grown under quarantine here will be worked on to these stocks. Eventually it is intended to transfer the plants so raised to the Nigeria Agricultural Department where it is hoped that they will prove a valuable nucleus in improving the quality.

Cowpeas.—Further collections of seeds have been received and despatched to Trinidad and to Delhi where the collections made by Kew are being grown and studied.

Insecticides.—Cuttings of *Derris* species received from the Malayan Agricultural Department, taken from clones selected for high rotenone content, are destined for the W. Indies and the U.S.A. A plant of *Lonchocarpus nicou* with a high rotenone content has been raised from some cuttings sent to Kew by the Bureau of Plant Industry of the U.S. Department of Agriculture, to whom special thanks are due. Seeds of *Tephrosia vogelii* were sent to Madras, Trinidad, Amani and to the United States.

Soy bean varieties have been sent to Nigeria and South Africa.

Among other plants of economic importance that have concerned Kew are sweet potatoes, tubers of which have been transferred from India to Barbados, and *Erythrina lithosperma*, seeds of which have been sent from Ceylon to Trinidad where the plant is being tested as a possible shade tree for cacao.

The services of Kew are likely to be continued in work of this kind and may indeed be extended. Arrangements are already being made for a collection of *Passiflora* species which are wanted by Amani for breeding resistant varieties to meet the menace of virus diseases which are threatening the Passion-fruit industry in Kenya. It is possible, also, that Kew's services may be sought in connexion with *Carica* species required for breeding varieties of Papaya resistant to the yellow leaf virus disease, and in connexion with the introduction of high altitude plants from the Andes, particularly *Rubus* species, strawberries and potatoes.

The Gardens

GENERAL.—The year will be memorable for the long continued dry periods, and for the abnormally low rainfall, the total being 20 inches, as compared with the unusual amount of 29.68 inches which fell in 1937. Constant watering was necessary to prevent losses among the collections, and 36,941,000 gallons of water were used, nearly 13,000,000 gallons more than in the previous year. Additional overtime payments for watering alone entailed an expenditure of over £200. During December there were two heavy falls of snow, the one at Christmas being about 9 inches to 1 foot in depth. The snow plough was kept hard at work clearing the main walks so that visitors suffered very little inconvenience. The branches of conifers and other evergreens were cleared of snow and fortunately no damage to the trees resulted.

VISITORS.—The number of visitors to the Gardens in 1938 was 1,221,480; weekdays (other than students' days) 624,587; Sundays 523,802; students' days 73,091—an increase of 57,231 over the figure for 1937. The greatest monthly attendance was in April, with 211,452; the lowest in December with 9012. The highest daily attendance was 44,253 on Whit-Monday, and the lowest 10 on December 16th.

ARBORETUM.—Many of the trees were badly damaged by gales, particularly in the autumn, and several large limbs were broken off, as well as quantities of small branches and twigs. Two Lombardy poplars were blown down, and specimens of *Populus monilifera* and *Betula alba* were so badly damaged that they had to be removed. As a result of the breaking away of branches, decayed areas were revealed in several of the old beech trees and owing to their dangerous condition they have been felled. The fine specimen of $\times$ *Ulmus hollandica* ($\times$ *U. major*) growing near Museum No. III, which for some years has been under observation, proved to be diseased. In view of its position at the side of a

main path and consequent danger to the public, it had to be removed. When felled it was found to be far more decayed than had been expected. Bad atmospheric conditions continue to take toll of the conifers, and several large pine trees at the south end of the Lake, and also the specimen of *Cupressus macrocarpa*, 58 ft. high, near the Lily Pond, which is mentioned in the preface to the Conifer List, have been felled.

Dry weather and freedom from frost resulted in an exceptionally good display of flowers of *Magnolia*, *Prunus* and *Malus*. *Magnolia Sprengeri* flowered well for the first time; its deep-pink flowers were very fine and it should become a notable object in course of time.

TEMPERATE HOUSE.—Re-roofing of the various parts of this house still proceeds and the south-eastern section of the lower roof of the main building has been completed.

An outstanding operation has been the transplanting of the large Chilean wine palm, *Jubaea spectabilis*. This palm had reached to the roof of the house, and it had either to be cut down or moved to the centre of the house so that it would have sufficient space for its continued growth for some years to come; it was therefore decided to attempt the moving of the palm some 15 to 20 feet nearer the centre of the house. The work was carried out in August and the preliminary preparations, which occupied a month, entailed the removal of several yards of hot water pipes, portions of two side paths and large portions of the main paths of the Temperate House to give working space, and the excavation of the soil from the bed to a depth of eight feet over the whole area between the old and new positions for the palm. As the beds of the Temperate House are enclosed by walls four feet deep, the walls surrounding the bed in which the palm was planted had to be destroyed and also the walls of the adjoining bed to which it was to be moved, as can be seen in the photograph (Plate V, fig. 2).

It may be mentioned that owing to the palm having been planted near the end of a bed the root-spread was bounded by three of these walls, so that there was a perfect unbroken square mass of earth surrounding the roots; this remained unbroken throughout the moving operations. When the square "ball" of earth was isolated, it was first enclosed in a box of stout boards clamped together by iron bands and then eleven 10-inch square baulks of timber were placed below for the ball to rest upon. A platform of running boards of 11 by 4-inch planks, faced with sheet iron strips, was then prepared and by the aid of powerful lifting jacks a series of rollers were placed beneath the palm. With the preparation so far advanced, the actual movement of the plant, which took place in a few hours, was carried out without a hitch and the whole work reflects great credit on Mr. Raffill, Assistant Curator in charge, and the members of his staff. The magnitude of the task can be realised from the following

PLATE V

particulars: height of palm, 45 feet; circumference of stem at base, 11 feet 2 inches; circumference at top, 6 feet 1 inch; size of ball, 15 feet 3 inches by 12 feet 4 inches by 5 feet 6 inches; approximate weight of ball, 44 tons; approximate weight of stem of palm, 7 tons; approximate weight of timbers supporting ball of soil, 3 tons; total weight, 54 tons. Figure 1 shows the method of boxing, and figure 2 the plant ready for moving with rollers and baulks of timber in position.

After the palm had been successfully moved to its new position it was found that the old, much-pruned and rather unsightly specimen of *Araucaria Bidwillii* (Queensland) spoilt the effect of the palm and also interfered with the full spread of its leaves. Since there was another, younger specimen in the house the old one was cut down and a specimen of *Howea Belmoreana* planted in its place. The removal of the *Araucaria* has greatly increased the light and also much improved the general appearance of this side of the house.

Alterations were made to improve the collection of tree ferns at the north end of the central portion of the house; this necessitated the removal of an old *Camellia* tree and the moving of many specimens.

Among the plants which flowered remarkably well during the year may be mentioned *Luculia gratissima*, *L. Pinceana*, *Prunus campanulata*, *Kigelia Moosa* and *Acacia Hanburyana* (*A. podalyrifolia* × *A. Baileyana*).

TROPICAL DEPARTMENT.—Palm House. The whole of the discoloured glass in the roof of the central section has been replaced and the section painted internally. Thanks to the use of the tubular type of scaffolding very little damage was done to the collections.

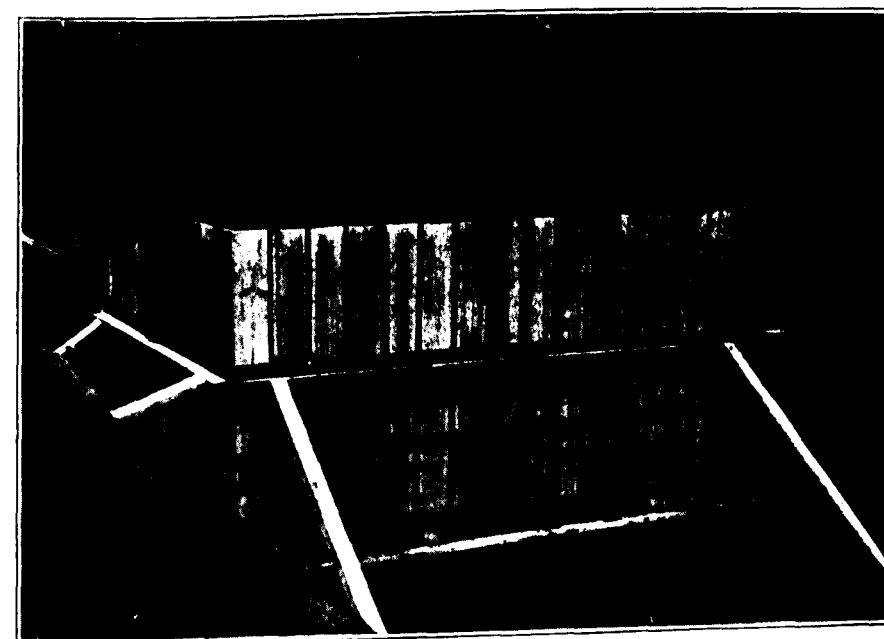
The shed which formerly housed the staff has been replaced by a larger permanent building provided with electric light, wash-basin, cupboards, etc.

New soil was introduced into four of the permanent beds and the opportunity taken to rearrange some of the plants.

Melon Yard.—A new sectional boiler was installed in place of the old saddle boiler in the large stokehole, whilst two new electric circulating pumps were added to increase the efficiency of the hot-water circulation. A fire-proof oil store has been erected in order to keep this inflammable material apart from the general store.

Ferries.—In Pit no. 6 concrete staging similar to that being installed generally has been erected and the propagating frames have been remade. Top ventilation was reconstructed and the house painted internally and externally.

Orchids and T Range.—An important addition to the accommodation here has been the provision of a new orchid drying house for ripening off the bulbs after flowering. A new portable electric pump for use between storage tanks out of doors and in the houses proved invaluable during the dry summer. The following



1. Method of boxing.

Photo. S. Rawlings



2. Palm ready for moving, showing rollers and baulks of timber in position.

Photo. S. Rawlings

Moving the specimen of *Jubaea spectabilis* in the Temperate House.

houses were repainted: nos. 8, 9, 11, 12, 13A, 14A and 14B. In the case of nos. 11 and 12, which are constructed of teak, it was necessary to have the teak painted in order to arrest the superficial decay which had set in owing to the damp, tropical conditions. Owing to the long time taken over the work at an unsuitable time of year (November and December), much damage was done to the plants by the erection of tarpaulin, etc., which cut off much of the daylight. The *Cacao* tree, for instance, which was bearing an exceptionally heavy crop of young pods, has now shed nearly all of them in consequence of the protracted painting operations.

Noteworthy plants which flowered during the year are *Coleus Autrani* from Abyssinia, *Catasetum viridiflavum*, *Crassula portulacea* and *Nymphaea colorata*; thanks to the absence of fog the orchids generally were very good. Fine cones were produced by the following Cycads: *Ceratozamia mexicana*, *Encephalartos Hildebrandtii* and *E. villosus*. The dry season no doubt helped fruiting under glass, as fine crops were borne on our plants of *Carica Papaya*, *Coffea arabica*, *Citrus paradisi*, Metford Lemon, *Theobroma Cacao* and *Vitis vinifera*.

HERBACEOUS DEPARTMENT.—Considerable activity has been displayed in this department during the year and many minor alterations have been carried out. Several of the Iris beds were re-soiled and replanted, and some of the beds were removed and some new ones added to complete as far as possible the general plan of the Iris Garden.

The Alpine House (no. 24) has been entirely rebuilt and somewhat enlarged, so that there is now more room for the plants and a wider central pathway which adds considerably to the convenience of visitors.

Several alterations have been made in the Rock Garden, particularly on the west side facing the island where the limestone has been replaced by Sussex sandstone. At the southern end of the garden better accommodation has been made for growing the collections of *Primula* and *Meconopsis*.

A few of the systematic beds have been extended and those that had become overcrowded have been replanted.

Amongst the more interesting plants which flowered during 1938 were *Leucanthemum Catananche* and *Narcissus Watieri*, collected by Mr. E. K. Balls in the Atlas Mountains of Morocco; *Calceolaria Darwinii*, a native of Magellanes in the Straits of Magellan; *Phlox mesoleuca*, an uncommon plant from North America; *Tulipa violacea* and the variety *pallida*, collected and presented by Mr. A. C. Trott, late of Tehran, Persia; *Primula Caudoriana*, raised from seed collected by Captain Sherriff and Mr. Ludlow on their expedition in S.E. Tibet during 1936; *Rheum inopinatum*, from seed sent in by Mr. B. J. Gould, Gangtok, Sikkim; *Codonopsis Forrestii* and *Weldenia candida*.

DECORATIVE DEPARTMENT.—A considerable improvement has been effected by the removal of the two stone-edged beds and some of the superfluous pathways between House no. 4 and the Ferneries; the areas have been turfed over and a circular bed has been made in the centre of each of the new lawns to harmonise with those on the adjacent lawns.

The grass slopes of the Palm House Terrace on the west side have received attention, the angle of the bank being made less acute and then returfed. The slope now conforms to that of the main steps approaching the Palm House. Tulip disease (*Sclerotium Tuliparum*) having been prevalent in the early spring in the beds on the Palm House lawn, several of the beds have been re-soiled to a depth of 18 inches.

Some of the older varieties of hybrid tea roses, which have failed to do well during recent years, have been lifted and some of the more modern varieties introduced. Particular attention has been paid to the selection of varieties of strong constitution.

In the Conservatory (House no. 4) *Jasminum rex* flowered profusely and has been the outstanding plant of the year, flowering continuously from autumn to December.

The standard of display of popular greenhouse plants, such as winter-flowering Begonias, Gloxinias, *Streptocarpus*, Cinerarias, Calceolarias, Primulas, *Cyclamen* and Chrysanthemums has been good and has been assisted in late autumn by the absence of fogs.

As in past years the fine bulbs of *Lilium longiflorum* sent over by the Government of St. Helena made a most attractive display in the autumn.

STUDENT GARDENERS.—Seventeen students secured appointments on completion of their training. This number is three less than in 1937 but, in view of the disturbed international situation, the position may be regarded as very satisfactory.

At home, Parks Departments, in which eight men obtained posts, proved to be the most attractive. One man was engaged by the Cambridgeshire County Council as Horticultural Assistant, one secured an appointment with the Air Ministry, and one entered private service.

The six overseas appointments secured were twice the number obtained during 1937, one man proceeding to the Botanic Gardens, Singapore; two to Canada (Ontario Agricultural College, Guelph; and Dominion Arboretum, Ottawa), and two to South Africa (National Botanic Garden, Kirstenbosch; Port Elizabeth Municipality), whilst one on exchange in the United States of America who returned to Kew, was subsequently appointed Director of Horticulture at Dillard University, New Orleans.

One student on exchange in the Luxembourg Gardens, Paris, was successful in obtaining a grant from the French Government, enabling him to remain in France for further study, and one proceeded

to the West of Scotland Agricultural College, to receive additional training in Agriculture.

Of the seventeen men accepted for full course vacancies, five were recruited from Parks Departments and twelve from nurseries and private gardens.

World affairs were also no doubt largely responsible for the inability to arrange for more than five students (as against nine in 1937) to visit other countries to gain experience under the existing scheme for exchange of students. It was, however, possible to send one man to Italy (whence he had to return at the time of the crisis), and one each to the Berlin Botanic Gardens; Ecole d'Horticulture, Vilvorde, Brussels; Messrs. Duncan and Davies's Nurseries, New Plymouth, New Zealand, and the New York Botanical Garden.

Three students, one from Belgium, one from Holland and one from Switzerland were admitted to work in the Gardens on a voluntary basis for varying periods during the year.

RAINFALL RECORD.—Rainfall recorded at the Royal Botanic Gardens, Kew, during 1938:—

Inches.			Inches.		
January	...	2.44	July	...	.89
February	...	.35	August	...	3.40
March	...	.26	September	...	2.38
April	...	.05	October	...	2.37
May	...	1.35	November	...	2.75
June	...	.34	December	...	3.42
Total 20.00 inches.					

The total for 1937 was 29.68 inches.

ORNAMENTAL WATERFOWL.—During the past year six Carolina ducks were reared, three of each sex, and four Canadian geese. Misfortune overtook the young Bar-headed and Magellan geese which were hatched. The stock was augmented by the following presentations in exchange from Dr. J. M. Derscheid, Armendy, Sterrebeek, Belgium:—

One Barrow's Golden-eye drake.
Two Common Pintail drakes.
One pair of Bahama Pintails.
Three Common Pintail ducks.
One Cinnamon Teal drake.
One pair of Versicolor Teal.
One Blue-winged Teal drake.
One Cinnamon Teal drake.
One pair of Common Teal; and
Two Bahama Pintail ducks.

A pair of Chilean Pintail was also received in exchange from Messrs. McLean and Wormald.

The Stanley Crane, which was presented to Kew in 1936 by Mr. A. Ezra of Foxwarren to take the place of the bird sent from

Pretoria in 1935, has died from tuberculosis and has not been replaced.

WILD FOWL, etc.—During the heavy snow at Christmas time two woodcock were noticed in the Gardens and numerous larks—one being seen on the snow outside the Director's Office on December 27th.

Grey squirrels continue to come into the Gardens, probably from Richmond Park, and during the year 307 have been shot. Rabbits unfortunately have tended to establish themselves and 43 have been killed during the year. They apparently have come from the Old Deer Park, where they are reported to be numerous.

Rats also find the holes under old stumps good breeding places, and are attracted, no doubt, by the food given to the birds, and some 250 have been destroyed in the course of the year.

MATERIAL CONTRIBUTED TO AND DISTRIBUTED FROM THE GARDENS, 1938

During the year, 966 separate consignments of plants, bulbs, seeds, etc., were received and 683 consignments despatched. The annual distribution of seeds amounted to 198 separate consignments comprising 6691 packets of seeds of herbaceous plants and 4207 of trees and shrubs. The aggregate shows an increase of 1073 packets as compared with 1937. Eight Wardian cases containing economic, ornamental and other plants were despatched during the year.

ECONOMIC PLANTS.—The following is a list of material of the more important economic plants received and distributed during the year:—

Agropyron spp.—Seeds received from the Institute of Agronomy, Belorussia, U.S.S.R., sent to the Plant Research Bureau, Wellington, New Zealand.

Citrus spp. and varieties.—Seeds from La Mortola, Italy, sent to Mr. H. Guthrie Smith, New Zealand.

Derris spp. for use as insecticides.—Cuttings from the Department of Agriculture, Federated Malay States, sent to Bureau of Plant Industry, Department of Agriculture, Washington, U.S.A.

Ephedra sinica.—Seeds from Prof. B. E. Read, Henry Lester Institute of Medical Research, Shanghai, China, were sent to the Division of Plant Industry, Australia; the Agricultural Research Service, Anglo-Egyptian Sudan; Department of Agriculture, Cyprus; Mr. C. C. Henriques; Imperial Institute, South Kensington; Forest Research Institute, Dehra Dun, India; Department of Agriculture, Kenya; Department of Agriculture, Malta; Department of Agriculture, Mauritius; Department of Scientific and Industrial Research, New Zealand; Department of Agriculture, Palestine; Agricultural and Forestry Officer, St. Helena; Division of Plant Industry, Pretoria, South Africa; Department of

Agriculture, Southern Rhodesia; Mr. Gilbert Walker, Kenya; and to Mr. I. B. White, New South Wales.

Erythrina lithosperma.—Seeds from the Department of Agriculture, Ceylon, sent to the Imperial College of Tropical Agriculture, Trinidad.

Gossypium sp. Bourbon var.—Seeds from the Department of Agriculture, Madras, sent to M. Guy Roberty, French West Africa.

Ilex paraguayensis.—Seeds from Liebig's Plantations, Argentine, sent to Mr. A. B. Wegodapola, Ceylon.

Ipomoea purga.—Cuttings from Department of Agriculture, Federated Malay States, and Mr. S. C. Harland, Instituto Agronomico, Campinas, Brazil, sent to Agricultural Department, British Honduras, and East African Agricultural Research Station, Amani.

Musa sp. var. agaba.—Seeds collected by the late B. D. Burt in Northern Nigeria, sent to Trinidad.

Musa errans.—Seeds from Division of Plant Industry, Manila, sent to Department of Science and Agriculture, Jamaica, and Trinidad.

Musa sp. var. Ngapyaw-nwe.—Seeds from Division of Plant Industry, Manila, sent to Department of Science and Agriculture, Jamaica, and Trinidad.

Musa spp.—Seeds from Botanic Garden, Buitenzorg, sent to Trinidad.

Musa spp.—Seeds from Silviculturist, Maymo, Burma, sent to Trinidad.

Musa sp. var. Pisang Awak Legor.—Seeds from Department of Agriculture, Federated Malay States, sent to Trinidad.

Musa spp.—Seeds from Department of Agriculture, New Guinea, sent to Trinidad.

Musa sp.—Seeds from Botanic Garden, Singapore, sent to Trinidad.

Musa Homblei.—Seeds from Capt. K. R. Paterson, Northern Rhodesia, distributed to East African Agricultural Research Station, Amani; Agricultural College, Coimbatore; Department of Science and Agriculture, Jamaica; Trinidad.

Pineapple.—Suckers of the Montserrat var. from Department of Agriculture, British Guiana, and suckers of the Black Antigua and Sugar Loaf vars. from the Royal Botanic Gardens, Trinidad, were sent to Captain K. R. Paterson, Northern Rhodesia.

Salix spp.—Cuttings from Mr. J. M. Lee, Madeira, sent to Department of Agriculture, Mauritius, and Long Ashton Experiment Station. Cuttings from Long Ashton Experiment Station were also sent to Department of Agriculture, Mauritius.

Soya Beans, Kabott and Mandarin vars.—Seeds from Dominion Experimental Farm, Ottawa, Canada, distributed to Fordson Estates; Department of Agriculture, Nigeria; J. L. North, 60, Grove Park Terrace, London, W.4; Prof. J. Reilly, University College, Cork, Eire; Rothamsted Experiment Station; Plant Breeding Station, Barberton, South Africa.

Tephrosia Vogelii.—Seeds from Department of Agriculture, Nyasaland, distributed to East African Agricultural Research Station, Amani; Department of Agriculture, Madras; Department of Agriculture, Trinidad; Bureau of Plant Industry, Washington, U.S.A.

In addition, the following material of economic plants has been either received or distributed :—

Material received :—

Bambusa spp.—Plants, Bureau of Plant Industry, Washington, U.S.A.

Cocos nucifera.—Nuts, West Indian Committee.

Coriandrum sativum.—Seeds of 1936 and 1937 crops, Messrs. Stafford Allen and Sons.

Grape Fruit × Tangerine.—Seeds, Mr. J. Dinswood, 94, Waverley Road, Ewell, Surrey.

Musa sp.—Suckers, East African Agricultural Research Station, Amani.

Musa sp.—Suckers, Imperial College of Tropical Agriculture, Trinidad.

Musa sp.—Seeds, Mr. P. H. Carpenter, Indian Tea Association.

Oryza spp.—Seeds, Jardin botanique, Brussels.

Phyllostachys spp.—Rhizomes, Bureau of Plant Industry, Washington, U.S.A.

Thea sp.—Seeds, Mr. H. C. Laws.

Theobroma Cacao.—Seeds, Cadbury Bros., and Department of Agriculture, Nigeria.

Theobroma Cacao.—Rooted cuttings of selected forms, Imperial College of Tropical Agriculture, Trinidad.

Material distributed :—

Arundinaria spp.—Plants, Mr. Howard Fyfe, U.S.A.

Bambusa spp.—Plants, Mr. R. J. Gardner, Natal.

Bromelia Magdalenae.—Plants and suckers, Department of Agriculture, Kenya.

Ceiba pentandra.—Seeds, Agricultural experiment Station, Buitenzorg, Java; Forests Department, Gold Coast.

Colocasia spp.—Tubers, Department of Agriculture, Barbados; Department of Agriculture, Gold Coast.

Cowpeas.—Seed, Imperial College of Tropical Agriculture, Trinidad.

Derris elliptica.—Cuttings, Government Botanic Garden, Crimea, U.S.S.R.

Ephedra spp.—Cuttings, Department of Agriculture, Kenya.

Manihot utilissima.—Cuttings, East African Agricultural Experiment Station, Amani.

Mentha sp.—Plants, Agricultural Experiment Station, Buitenzorg, Java.

Mimosa bracingana.—Seed, East African Agricultural Research Station, Amani.

Mundulea sericea.—Seed, East African Agricultural Research Station, Amani.

Musa spp.—Suckers, Imperial College of Tropical Agriculture, Trinidad.

Passiflora edulis.—Seed, East African Agricultural Research Station, Amani.

Phyllostachys bambusoides.—Plants, Mr. Howard Fyfe, U.S.A.

Rhamnus Purshiana.—Cuttings, Imperial Chemical Industries, Ltd., London.

Xanthosoma sp.—Tubers, Department of Agriculture, Barbados; Department of Agriculture, Gold Coast.

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 :—

Albany Museum, Grahamstown.—Seeds of *Pelargonium reniforme*.
Bolus Herbarium.—Plants collected by Mr. E. Esterhuysen, including *Anacampseros* spp., *Conophytum* sp., *Stomatium* sp., *Cheiridopsis* spp., *Nananthus* sp., *Vanheerdia* sp.

Cambridge Botanic Garden.—A collection of plants of *Iris* and *Alstroemeria* spp.

Dartington Hall.—Plants of *Primula* spp., *Meconopsis* spp., and *Mimulus* sp.

Edinburgh, Royal Botanic Garden.—A large collection of seeds from Western China (Yu collection), and seeds collected by Ludlow and Sherriff in Bhutan and Tibet.

John Innes Horticultural Institution.—A collection of Calceolarias and tubers of tree *Dahlia*.

Lloyd Botanic Garden, Darjeeling.—Seed of *Chirita* spp., and *Didymocarpus* spp.

Madras Agri-Horticultural Society.—Seeds and plants, including *Torenia travancorica* and *Crossandra undulifolia*.

Pretoria, Division of Plant Industry.—Seed of *Pelargonium* spp.
St. Helena, Agriculture and Forestry Department.—A consignment of bulbs of *Lilium longiflorum*.

Trinidad, Royal Botanic Gardens.—Plants of *Amherstia nobilis*, *Camoensia maxima*, *Bougainvillea* "Mrs. McLean," *Hibiscus* "Miss Betty," *Napoleona imperialis* and a collection of seeds.

Private Donors :—

Messrs. Armstrong & Brown.—Fine specimen plants of *Vanda Batemannii* and *Coelogyne pandurata*.

Lt.-Colonel F. M. Bailey.—A collection of plants from Nepal.

Major H. Beddington.—A collection of orchids from British Guiana and Brazil.

Mr. C. M. Dammers.—Seeds of *Dendromecon rigidum*.

Mr. S. G. A. Doorenbos.—A collection of trees and shrubs.

Mr. J. W. Drabble.—A number of fine specimen plants of rare orchids.

Dr. P. Gosse.—Seeds of *Trochetia erythroxylon* from St. Helena.
 Mr. B. J. Gould.—Seeds from Tibet.
 Mrs. F. J. Hanbury.—A collection of British plants.
 Mr. H. Q. Levy.—A collection of Jamaican orchids.
 Mr. P. Lloyd.—Seeds from Mount Everest expedition.
 Mr. F. R. Long.—A collection of Haworthias and seeds of *Pelargonium* spp. from South Africa.
 Mr. C. M. Maggs.—Seeds collected during the "Cap Pilar" expedition.
 Dr. F. A. Rodway.—A collection of Australian plants.
 Mr. L. de Rothschild.—A collection of Rhododendrons.
 Dr. Soysa, Ceylon.—Cuttings of *Vanda spathulata*.
 Dr. R. Seligman.—Plants collected during the Jan Meyen expedition.
 Miss D. Shand.—Tubers of *Chloraea* sp., and bulbs of *Zephyranthes* sp. from Chile.
 Rev. C. Smith.—A collection of orchids.
 Prof. N. J. G. Smith.—Plant of *Euphorbia* sp., infected by *Viscum minimum*, from Grahamstown, S. Africa.
 Mrs. M. Thompson.—A collection of ferns comprising 330 species.
 Capt. F. Kingdon Ward.—Seeds from 1937/38 expedition.
 Lord Wigram.—Seeds from Nepal.

The following is a list of material of the more important ornamental and other plants distributed during the year :—

Public Institutions :—

Amani, East African Agricultural Research Station.—Tubers of *Calanthe* sp.
 Bedgebury Pinetum.—460 trees and shrubs, and seeds of *Viscum album* growing on spruce from Mr. A. Beer, Innsbruck, for sowing on spruce.
 Blaksley Botanic Garden, California.—Plants of *Ceanothus* spp.
 British Guiana, Department of Agriculture.—Seeds of *Hyphaene thebaica* received from Kenya Forest Department.
 Madras Agri-Horticultural Society.—Plants, *Punica Granatum*.
 Ministry of Labour Social Service Centre, Durham.—A collection of trees and shrubs.
 Southampton, Redbridge Government Training Centre.—A collection of trees and shrubs.

Private Recipients :—

Dr. J. M. Derscheid.—A collection of bamboos and Rhododendrons.
 Mr. H. Q. Levy.—A collection of orchids.
 Dr. E. Rama.—A collection of orchids.
 Special distributions of seed of *Juglans nigra* and *Fritillaria Roylei* were made.

Wardian cases of plants were sent to Department of Agriculture, Bermuda; Department of Agriculture, Ceylon; Government House, Gibraltar; Government Gardens, Khartoum; Agri-Horticultural Society, Madras; Botanic Gardens, Singapore;

Department of Agriculture, Tanganyika; Royal Botanic Gardens, Trinidad.

Bedgebury Pinetum

About 3½ acres of the new ground taken over and fenced during the winter of 1937–38 were planted in February with a miscellaneous collection of deciduous trees and shrubs and a few groups of conifers, the object being to provide shelter for the Pinetum and to produce a display of autumn colour. Two avenues were formed through the area, one being outlined with *Liquidambar styraciflua* and the other with *Nothofagus obliqua* and *N. procera*. Most of the plants used were sent from Kew. The remainder of the ground transferred by the Commissioners of Crown Lands in 1937 is being cleared of chestnut coppice and it is hoped to begin planting it next autumn.

Warm weather in March excited many trees into premature growth and the young shoots were badly crippled by very cold winds and severe frosts during April and May. However, the growing season was a good one for trees that began to grow in late spring, and even some of the frosted ones made a good recovery. Although there was a considerable shortage of rain during the early part of the year, the only trees to suffer from drought were some of those planted in late February. There were several violent wind storms during summer and autumn but they caused little trouble, and various trees that required stakes a few years ago were not disturbed.

By arrangement with the Forestry Commission, about 100 trees and shrubs were moved from Gravetye Manor to Bedgebury in November. Owing to close original planting at Gravetye, many trees were preventing one another from growing as they should; some thinning out was therefore necessary, and, to prevent waste, the opportunity was taken of transferring a selection to the Pinetum.

About 300 of the naturally regenerated Scots pines that had been allowed to grow amongst the collection trees for furnishing and shelter have been removed during the last few months to give room to permanent trees. These pines had grown remarkably fast, and although only 11 and 12 years old, many of them exceeded 20 feet in height with trunks 6 inches in diameter at the base.

As usual, a few insect pests have given trouble, but the most serious losses have again been caused by late spring frosts, cold winds, and honey fungus. In some instances trees that were frost-tender in spring a few years ago are withstanding the cold better. With regard to the fungus it can only be hoped that it will gradually disappear from the ground as the old tree butts are grubbed up or decay.

The rainfall for the year amounted to 30.75 inches. The heaviest fall on a single day was 1.04 inch on October 3rd. In March the maximum temperature in the screen rose to 60 or more degrees Fah. on 19 days, the warmest day being March 30th with 66°. November was also abnormally warm and on several days the temperature

rose to 60° or more. On November 5th 67° were recorded. As in other years, ground temperature readings taken in five places over 50 acres of ground varied a good deal between low places and higher ground a few hundred yards away. Thus, on May 9th the temperature fell to 16° in low places, was 5° higher on higher ground, and 27° in the screen, and on March 18th there was a difference of 7° between low and high ground. However, during the heavy snow at the end of December, the thermometers in low places sometimes registered a little higher temperature than those in higher positions. The coldest morning was April 18th, when the temperature fell to 14°.

The Museums

The number of enquiries by correspondence and personal visits was well up to the average. Interest in *Ephedra* for medicinal purposes, referred to in last year's report, has continued. During the year small consignments of seed of *Ephedra sinica* Stapf were fortunately obtained from a correspondent in China from wild plants. This seed has been sent to East Africa and various other Empire countries for trial. As this is the most important medicinal species of *Ephedra* in China, it is hoped cultivation will be successful in at least some of the areas to which seed has been despatched.

As a result of the increasing use of a new type of detergent (sodium lauryl sulphate), which is superior to ordinary soap in many respects and is the basis of the present day soaps that may be used with sea-water or very hard water, enquiries have been received from trade sources for likely supplies of lauric acid. A superficial survey of the family *Lauraceae*, from the point of view of oil-yielding species, was carried out and suggestions made to those interested.

The extended use of "vegetable ivory nuts" (seeds of *Phytelephas macrocarpa* Ruiz et Pav. and *Hyphaene thebaica* Mart.) for ornamental articles of all kinds has led to several specimens of these seeds, either in the original or made up forms, being submitted for identification with requests for information.

In the early part of the year a large and interesting collection of native drugs and medicinal plant-products from various parts of northern Africa was received from the Department of Geography and Anthropology of the University of Aberystwyth. The naming of this collection was no light task, especially as there was much fragmentary material which required a good deal of time. An interesting point in connexion with these native medicines was the very large number of ingredients that may be used for a single mixture. As many as twenty different plant-products were encountered in one sample.

In connexion with illicit drug traffic and the use of "Indian hemp" (*Cannabis sativa* L.) for this purpose, a collection of "hemp" samples from various parts of the world has been supplied to the police authorities for use in their own laboratory investigations.

Apparently this drug not infrequently makes its appearance in cigarettes under the Mexican or Central American names of "marijunga" or "marihuana."

The mysterious American insecticidal plant "yerba de la pulga," for which such extravagant claims were made in some quarters, is now believed to be *Helenium quadridentatum* Labill., for plants raised from "yerba de la pulga" seed in the United States turned out to be this species. Accounts of the supposed valuable properties of "yerba de la pulga" appeared in various popular journals and numerous enquiries about it have been received at Kew. It would appear now that most of these claims are quite ill-founded, for *H. quadridentatum* is a comparatively well known species and has no outstanding insecticidal properties.

The reeds of *Arundo Donax* L. have been imported for many years for the manufacture of musical instruments. Four years ago root-stocks of this species were sent by request to a correspondent in Kenya. They were planted near a stream and grew well, appearing to be perfectly at home and reaching a height of about 15 feet. They remained entirely free of disease although it was found some of the canes were prone to outgrow their strength and fall over. Selected canes, when tested by instrument makers in London, were found to be well suited for certain instruments, notably the double reed of the oboe. Such instruments made with them were found to have good resistance without being metallic in tone. Considering the price of French and Spanish canes, however, and the distance of Kenya, it is doubtful whether cultivation in that country is likely to have commercial possibilities.

The work of checking and adding to the Arboretum Herbarium, and to the Herbarium of Economic Plants, has been continued.

The extraction of the smaller bottles of seeds and fruits, and small timber specimens from the show cases in No. 1 Museum has been completed. The former are classified on the book-shelves of the office in Museum No. 1, and the latter are now systematically arranged on shelves in the hall of Museum No. 4.

The provision of additional shelves has allowed a re-arrangement of the books in the library.

At the Royal Society's Conversazione in May an exhibit of portraits of some botanists after whom genera have been named was shown, together with a small exhibit tracing the evolution of the South African "grapple fruit," *Harpagophytum procumbens* Burch. These have since been displayed in Museum No. 3. Visitors to this Museum have shown great interest in the special exhibit of walking sticks mentioned in last year's report.

An exhibit showing the relationship between the elm bark-beetles (*Scolytus* spp.) and the Dutch elm disease caused by the fungus *Ceratostomella Ulmi* Buisman has been arranged in Museum No. 4. The beetles have a wide distribution in the British Isles and are the principal cause of the spread of this destructive disease.

The relabelling of the Gymnosperms in Museum No. 3 has been completed, and further progress has been made in Museum No. 1.

A good deal of time has been given by one member of the staff to the preparation of an English edition of the recently published work on the Opium poppy by Dr. Tj. J. Addens entitled—"De Verspreiding van de Opiumcultuur en de Handel in Opium" (Joh. Enschedé en Zonen, Harleem, 1938). Dr. Addens commenced this work two or three years ago when he spent several weeks working on opium in the Museums.

Members of the Museum staff have continued to serve on the Consultative Committees of the Imperial Institute and the Crude Drugs Sub-Committee of the British Pharmacopoeia Commission for which draft monographs of the microscopy of a number of vegetable drugs have been prepared.

PRESENTATIONS TO MUSEUMS:—

Mr. T. Hedley Barry, London: specimens of natural resins.

Mr. V. A. Beckley, Nairobi, Kenya: fibre from butts of sisal leaves, *Agave sisalana* Per., considered for upholstery and brushmaking.

The Government Botanist, Brisbane, Queensland, Australia: several varieties of the Macadamia nut as grown in Queensland.

Agricultural Department, British Honduras: seed of *Ceiba pentandra* Gaertn.

The British Legion Poppy Factory, Ltd., Richmond, Surrey: dyed leaves of *Phoenix dactylifera* L., used for decorative purposes.

Mr. L. Chalk, Imperial Forestry Institute, Oxford (through Dr. H. L. Shatz of the U.S. Department of Agriculture Forestry Service): various wood specimens.

Mr. W. S. Dahl, London: samples of soy bean powder and soy bean protein, *Glycine Max* (L.) Merr.

Mr. C. A. Gardner, Royal Botanic Gardens, Kew: inkstand of Australian crown mulga wood.

Mr. J. S. L. Gilmour, Royal Botanic Gardens, Kew: sample of "resina de jatoba" (resin of *Hymenaea Courbaril* L.?) from N. Bahia, Brazil.

Conservator of Forests, Nairobi, Kenya: five sections of *Senecio* stems collected by E. J. Honoré, Esq., on Mount Elgon.

The Director, Royal Botanic Gardens, Kew: booklet of sample sheets of vegetable pulps from India.

Dr. H. King, National Institute of Medical Research, Hampstead: five wood specimens of *Strychnos* spp. with corresponding herbarium material.

Comm. A. Lucas, Department of Antiquities, Cairo, Egypt: samples of timber found while repairing the Nilometer Well, Roda (erected A.D. 716).

Messrs. Maxwell Plaistow and Co., Ltd., London: samples of Plaimar sandalwood oil.

Dr. R. Melville, Royal Botanic Gardens, Kew: elm twigs showing feeding damage of the elm bark-beetle.

Mr. E. W. B. H. Milne-Redhead, Royal Botanic Gardens, Kew: timber specimens from north-western Rhodesia.

Nipah Distilleries of Malaya, Ltd., Kuala-Selangor, Malaya: sample of nipah sugar (*Nipa fruticans*).

Mr. J. Parkin, Blaithwaite, Wigton, Cumberland: log of *Eucommia ulmoides*.

Mr. G. A. Peacock, Deansgate, Manchester: five wood samples.

Mrs. M. G. Phillips, Kew, Surrey: walking-stick made from a Jersey-cabbage stem.

Major General S. H. Powell, Walmer, Kent: photographs of Indian trees.

Prof. S. J. Record, Yale University School of Forestry, U.S.A.: four specimens of timbers.

Prof. A. Rehder, Arnold Arboretum, Massachusetts, U.S.A.: 526 specimens of woody plants for the Arboretum Herbarium in exchange.

Mr. Athelstan Riley, Jersey, C.I.: photograph of citron growing in the open-air in Jersey.

Mr. H. Ritchings, Wimbledon: models of Chinese agricultural implements.

Mr. E. Rutenberg, London: Russian cigarettes.

Dr. J. M. Walter (U.S. Department of Agriculture), University Museum, Oxford: elm Bark-Beetles and examples of their breeding galleries in elm wood.

The Marianne North Gallery

The improvements in the Gallery which were carried out in 1936 (see Annual Report for 1936, 554), have now been completed by the provision of a Ruboleum covering for the floor, both in the main gallery and in the studio devoted to the collection of water-colour drawings. When Miss North built the Gallery the floor was tiled with small, square, red, black and buff tiles. As these were unduly conspicuous and detracted attention considerably from the pictures, H.M. Office of Works agreed to have the tiled floor covered with a soft brown Ruboleum and the new flooring greatly enhances the effect of the pictures and gives spaciousness to the Gallery.

The curved-out supports of the protective railing which projected into the Gallery and curtailed the floor space have been cut down to a height of about 2 feet and are much less obtrusive than before. This alteration also gives more space in the Gallery for visitors and has much improved the general effect.

Four new wooden seats have also been provided in place of the somewhat unsightly iron-framed seats which were formerly in the Gallery, and the pictures which were between the seats have been re-hung on stands which are placed between the two pairs of wooden seats.

Jodrell Laboratory

As usual, many specimens of timbers, fibres, roots and other miscellaneous material have been examined microscopically in order to determine their botanical identity. Although the number of specimens examined has been about the same as in recent years there have been fewer unusual items. The type of material has, however, ranged from dart boards made of *Juncus* sp., to a collection of bazaar medicines from Morocco, and pieces of wood from the Nilometer well.

Following a meeting held at Kew in November 1937 to discuss the use of hormone-like chemicals to stimulate the formation of roots on cuttings, a "Plant Hormone Committee," of which the Assistant Keeper is convener and secretary, has been formed to consider the applications of phytohormones in horticultural and agricultural practice. The Committee has so far held four meetings at the Laboratory, at one of which Dr. P. W. Zimmerman of the Boyce Thompson Institute for Plant Research, Yonkers, U.S.A., was present by invitation. A list of species which practical nurserymen find to be moderately or very difficult to propagate by means of cuttings has been prepared and published (Gard. Chron. **103**, 433; 1938), in the hope that anyone interested may be induced to experiment with these difficult plants and report results to the committee. The committee has received reports of experiments in progress on rooting cuttings of a wide range of species at various research centres in Great Britain, New Zealand, the Straits Settlements and elsewhere. A scheme is under consideration for compiling a propagation index to include particulars of the localities, time of year, and other conditions under which each species or variety has been successfully propagated.

A considerable number of experiments on rooting cuttings with the aid of "hormones" have also been made at Kew in collaboration with Mr. W. G. Templeman of the Imperial Chemical Industries Research Station, Jealott's Hill, and members of the gardens staff. It is hoped that an account of the more important results that have been obtained so far will shortly be prepared for publication in the Kew Bulletin.

Work on the preparation of a new book on the vegetative anatomy of the Dicotyledons has been started in collaboration with Dr. L. Chalk and Dr. M. M. Chattaway of the Imperial Forestry Institute, Oxford. The book, the original suggestion for which was put forward by the Research Committee of the Association for the Study of Systematics in Relation to General Biology, and which is to be published by the Clarendon Press, Oxford, will contain an account of the anatomy of the vegetative organs of the Dicotyledons by families, based on published literature supplemented by original observations. It is estimated that it will take about five years to complete this work.

In connexion with the compilation of this work it has been found necessary to extend the scope of the collection of microscopical slides which has hitherto been devoted mainly to sections of wood. Slides of representative herbaceous stems and leaves from the various families are therefore now being prepared, nearly 700 having been completed.

An article on the axillary tubercles and root tubers of *Ranunculus Ficaria*, based on work which has been recorded in recent annual reports, was published in the Annals of Botany (Ann. Bot. n.s. **2**, 145, 1938), and a further article on the sexual reproduction of this species will appear shortly in the same journal.

The following visitors have worked at the laboratory during the year: Mr. L. A. Boodle (identification of material excavated from Egyptian tombs); Mr. J. E. Senaratna (anatomy of *Leptaspis*); Mr. J. Pryde (identification of chemical substances present in certain S. African woods); Mr. Enver Duzel (elementary microtechnique); Mr. Doxey (fixing cytological material); Mr. Collett (anatomy of *Senecio*); Miss W. M. Curtis (anatomy and influence of phytohormones on *Taraxacum*); Miss E. L. Perry (anatomy of *Acanthaceae*); Miss K. Sealy (mycology and seed cleaning); Miss E. Wilton (anatomy of grasses).

DRAWING AND PHOTOGRAPHY.—A rather larger number than usual of borrowed specimens has been photographed for our own collection and photographs of many Kew type specimens have been made for other institutions.

Living plants have been drawn or photographed for our records, including some interesting illustrations of the twisting of orchid flowers and photographs of mosaic diseases in certain species of bananas.

Photographs and drawings have been prepared for various Colonial publications and work done for Hooker's "Icones Plantarum." Plates were drawn for Dr. Turrill's description of a new Crucifer.

Considerable time was spent in preparing for the press the illustrations of Atchley's "Flora of Attica," and in correcting the colour proofs.

An improved system of lighting for the photography of dried specimen sheets has been devised and is at present being constructed by H.M. Office of Works.

The Herbarium

EUROPE, NORTH AFRICA, AND ORIENT.

About 11,000 numbers were received for incorporation in this department of the Herbarium. This figure includes 6312 numbers received for identification or verification. About 11,400 sheets were mounted, and approximately the same number was laid in.

Additions to the collections from the British Isles have been made by members of the Kew staff, especially from Gloucestershire,

Suffolk, Wiltshire, the Channel Islands, Wales, and Ireland. Miscellaneous British collections were received from Mr. J. P. M. Brenan, Mr. I. H. Burkill, Mr. F. M. Day, Mr. J. D. Grose, Mr. P. M. Hall, Prof. J. W. Heslop Harrison, the executors of the late Mr. - Harvey (Shuttleworth Herbarium)*, Col. H. H. Johnston, Mr. J. E. Lousley, Mr. F. K. Makins, Rev. H. J. Riddelsdell, Captain R. S. Vine, and Mr. C. H. Wright. In addition, Miss C. Welfitt-Nicholls presented a collection of 1869 sheets of well-prepared specimens of British plants. These were selected with great care in order to show different stages in the life-history, and will prove particularly useful.

The following important collections of plants (totalling over 1320 numbers) from the Balkan Peninsula have been presented during 1938:—Crete, Greece, and Cyclades (Mr. P. Davis and Mr. M. Ogilvie Grant); Albania (Mr. Ian Hepburn); Pyrgos district, Athos Peninsula (Mrs. F. S. Loch); Thrace (Mr. H. G. Tedd); Dalmatia (Mr. G. E. Martindale); and various countries of the Balkan Peninsula (Museum and Botanic Garden, Geneva). The collections of Mr. Davis were particularly interesting since they contained a number of species not previously represented at Kew, and also several new to science. Mr. Martindale's material from Dalmatia was noteworthy for the beautiful preservation of the abundant material and for the fact that it was made in the winter and early spring, thus supplementing other recent collections made at later seasons. Mrs. Loch's collection (45 sheets) was made to illustrate the plants, native to the Pyrgos district, used in dyeing wool for rug making. The collection includes plant-material and samples of the dyed wool. As Mr. H. G. Tedd has now left Thrace, the 1938 material may be his final addition to the valuable collections he has sent to Kew over a period of nine years from Thrace and neighbouring districts. A full account of the Thracian material is being prepared for publication. Mr. I. Hepburn's collection from Albania contained some very useful additions to the Kew Herbarium and also a number of new records. The collection of 499 numbers from the Museum and Botanic Garden, Geneva, was very valuable, as it consisted largely of duplicates of well-known collections either not represented or incompletely represented at Kew. In addition to the above presentations, material from the Dobruja was purchased from Progressul Stiintific, Bucharest, and Albanian and Macedonian specimens from Dr. F. Lemperg.

Specimens from Estonia were presented by the Tartu University; from Roumania by the University of Cluj; from Italy and Switzerland by Mrs. Eastes; from northern Yugoslavia by Mr. G. E. Martindale; and from various European countries by Mr. H. S. Redgrove. Useful sets of plants collected in Czechoslovakia and in Denmark were presented by members of the staff.

Mr. W. T. Stearn presented a small collection made in Corsica by Mrs. F. Noel, and Miss J. Russell a collection from Portugal.

* Thanks are due to the donors of this collection, who gave no address.

A miscellaneous collection of 90 specimens from various European countries was received from the Naturhistorisches Museum, Vienna.

Special attention is now being paid to the flora of Cyprus, and several valuable additions have been received during the year under review. Mrs. C. M. Kennedy has presented a rich and excellently prepared collection of 1320 numbers, made by her largely in the mountains of the centre and north of the island. Features of the collection are the abundance of well dried specimens, the full field notes, and the frequent representation of different phases of the life-histories of the species. As Mrs. Kennedy is for the present resident in Cyprus it is hoped that she will continue her activities on our behalf. Already she has not only greatly increased the value of the Kew collections, but has discovered several species new to science and a considerable number of species not previously known from Cyprus. Mr. A. Syngressides, of the Department of Agriculture, Nicosia, has continued to send contributions through his Department. As his collections have mainly been in districts other than those being investigated by Mrs. Kennedy they largely supplement her activities. Smaller collections from Cyprus have been received from Mrs. Chapman (through the Department of Agriculture, Cyprus), Lady Loch, and Mr. C. H. Wyatt.

Other Oriental collections presented during 1938 include the following: Asia Minor (presented by the Arnold Arboretum, collected by Gorz); Transcaucasia (Baku Academy of Sciences); Palestine (Mr. A. C. Trott); Sinai (Ministry of Agriculture, Egypt); Iran (Rev. R. Iliff); and Arabia (Miss Freya Stark and Miss E. W. Gardner, of the Wakefield Expedition, and Mrs. V. Dickson). In addition a collection of Palestinian plants was purchased from Messrs. Vester & Co.

From Morocco useful additions were presented by Mr. A. W. Trethewy and Mr. A. A. Cruickshank. Prof. P. E. Newberry presented a fine set of specimens of wild and cultivated olives collected by him in Morocco. These were accompanied by an excellent series of photographs, which illustrate the habit and habitats of the trees, and by valuable field notes. Combined with Prof. Newberry's previous gifts there is now at Kew an important series of specimens illustrating the distribution and polymorphism of the olive, wild, feral, and cultivated. A set of 72 specimens of rare and endemic Moroccan plants was purchased from M. Jean Gattefossé. Specimens from Tunisia and Algeria were presented by Mr. N. D. Simpson.

The Leningrad Academy of Sciences presented various sets of specimens collected in the U.S.S.R. In the Kew arrangement of the Herbarium these come partly from Europe, partly from the Orient, and partly from North Asia. Mention should especially be made of 36 sheets of European species of *Tamarix*, which will prove very useful in further research on the taxonomy of this difficult genus.

Major F. C. Stern presented 41 specimens of *Paeonia* from various countries prepared from plants in cultivation at Highdown. Mr. W. T. Stearn presented a set of cultivated plants of *Epimedium*. In continuation of the collection of important agricultural plants made by the Hamburgisches Staatsinstitut für angewandte Botanik, 89 herbarium specimens and 93 bottles of seeds were purchased. The collection at Kew has thus been made complete up to date.

All available, named, and written up duplicates have been distributed to various botanical institutions, mainly in exchange for some of the collections referred to above.

Miss June Burroughes and Mr. M. Ogilvie-Grant have kindly given assistance during the past year in the naming of collections and in re-classifying material in the Herbarium.

Mr. A. Chevalier, of Liège, was given a five months' course of training in herbarium methods. He has now returned to Belgium, and one of his duties will be to take charge of a herbarium connected with the Botanic Garden at Liège.

Publications.—On the occurrence of *Fagus orientalis* in Greece (K.B. 1938, 38).

A new species of *Delphinium* from Afghanistan (K.B. 1938, 86).

On the flora of the Nearer East; XIX (K.B. 1938, 460).

Biarum Davisii Turrill, sp. nov. (Gard. Chron. 104 (3rd series), 437: 1938).

Statistical studies on two populations of *Fraxinus* (New Phyt. 37, 160: 1938).

ASIA.

INDO-MALAYA.—About 5700 sheets were laid in during the year. This hardly keeps pace with the incoming specimens, and no impression on arrears has been made. It is estimated that about 10,000 specimens in the Stores from India, Burma, Ceylon and Siam await mounting.

About 1300 specimens from Bhutan were received from Mr. B. J. Gould, I.C.S., Resident in Sikkim. Over 1100 numbers have, with the exception of the ferns, already been named. This collection included a new species of *Sedum*, and a new variety of *Primula*, and several Chinese species not previously recorded from India.

Professor E. Barnes has again contributed excellent specimens from Southern India, two or three of which are probably new. Nearly 500 sheets were presented by the Forest Botanical Garden at Maymyo, Burma; many of them were of considerable interest, particularly those collected in the little-known Wa States.

A member of the 1938 Mt. Everest Expedition, Mr. Peter Lloyd, presented over 100 specimens collected during the expedition. Col. F. H. Lister sent 85 specimens collected in Sikkim and Nepal. Mr. F. W. Andrews presented about 100 specimens from the Bombay Presidency, and Capt. R. S. Vine, R.A.M.C., about 300 from the Madras Presidency, mainly collected in the Nilgiris. Lesser contributions from India were received from Mr. R. N. Parker (Punjab),

Mr. P. V. Mayuranathan (S. India), the Imperial Forest Botanist, Dehra Dun, the Agricultural Department, Ceylon and the Forest Botanist, Assam; many specimens from the last two were, however, for identification and return.

Over 500 specimens were received from the Forest Department, British North Borneo; the Singapore Botanic Gardens presented nearly 700 named duplicates; a set of duplicates of the collection made by Dr. W. J. Lütjeharms in South Sumatra was presented by the State Herbarium, Leiden, and a small collection of about 150 Bornean duplicates was received from the Imperial Institute, South Kensington.

The determination of the British North Borneo Forest Department's material has, as last year, been held up in favour of the collection made by the Oxford University Expedition to Sarawak, 1932. It is now evident that, owing to the necessity of borrowing much type material from foreign herbaria, undue delay would result if publication were postponed till the completion of the whole work. The Enumeration referred to in last year's Report will therefore be published by families or groups of families, as identification proceeds.

Publications.—Rain forest in Ceylon, by J. R. Baker (K.B. 1938, 9).

Contributions to the Flora of Siam: Additamenta XLVI to L (K.B. 1938, 24, 98, 127, 199 and 445).

A Note on certain Malayan Species of *Sindora*, by C. F. Symington (Kepong, F.M.S.) (K.B. 1938, 73).

New or little-known plants from S. India: VIII and IX (K.B. 1938, 82 and 123).

Additions to the Flora of Borneo and other Malay Islands: VI, VII, IX and X, by H. N. Ridley (K.B. 1938, 110, 173, 221, 275).

Additions to the Flora of Borneo and other Malay Islands: VIII. *Convolvulaceae* collected by the Oxford University Expedition to Sarawak, 1932, by S. J. van Oostroom (K.B. 1938, 175).

Plants new to Assam: X (K.B. 1938, 210).

Two New Names in *Aglaia*, by H. N. Ridley (K.B. 1938, 215).

A new *Eugenia* from Assam, by K. P. Biswas (K.B. 1938, 262).

Three new species from Tibet (K.B. 1938, 285).

Notes on *Xylocarpus*, by H. N. Ridley (K.B. 1938, 288).

Contributions to the Flora of Burma: XIV (K.B. 1938, 294).

The Flora of the Lushai Hills, by Cecil E. C. Fischer, published as Vol. XII, No. 2 of the Records of the Botanical Survey of India, in Delhi, but prepared at Kew.

CHINA, JAPAN, FORMOSA AND NORTH ASIA.—Collecting in China has been much restricted owing to war conditions, but in spite of this several important collections have been received during the year. Among these may be mentioned more than three thousand specimens from the Lingnan University, including 2933 specimens from the 8th Hainan Expedition and subsequent collections: a collection made by Miss L. Trotter in Korea in 1937 and received

for identification, as well as 292 specimens collected by Prof. Nilsson-Ehle and Mr. E. Hulten in Siberia and Kamtchatka respectively, received from Stockholm. The Herbarium has further been enriched by the presentation of type material of species of *Gentiana* from Uppsala and the Tokyo Imperial University; the former institution contributed Chinese species described by Dr. Harry Smith and the latter those worked out by various Japanese botanists from Japan, Korea and Formosa which were previously unrepresented at Kew. In a number of instances photographs of the type specimens preserved at Tokyo were also presented. Type specimens of Chinese species of *Aconitum*, *Clematis*, and other genera have been returned from loan by Dr. Handel-Mazzetti, who has also kindly authenticated previously undetermined material.

A large number of new species and varieties of *Gentiana* have been described from Southern Tibet, Bhutan and adjacent regions, and a further paper on the Gentian flora of this region is approaching completion.

Publications.—The *Lilium Davidi-sutchuenense-Willmottiae* series. By A. Grove and A. D. Cotton. (Lily Year-Book, 1938, p. 26.)

Lilium Davidi var. *unicolor*. By A. D. Cotton (loc. cit. p. 35).

AFRICA.

Whilst the determination of recently gathered material has continued steadily, the absence in Rhodesia of the botanist in charge during the later part of 1937 and the first three months of this year has unfortunately caused some delay in supplying collectors with lists of names. More time than usual has been devoted to the answering of queries, both nomenclatural and taxonomic, and in consequence there has been little rearranging of the African material in the Herbarium, and very little time has been available for research. Several thousand duplicates have been sorted into sets and distributed during the year, large sets going to the herbaria at Berlin, Brussels and Paris. Mounting and incorporation of recently acquired material has proceeded satisfactorily.

Work on the taxonomy of Tropical African plants has now reached the stage when a more complete knowledge of individual species is required. Characters of great taxonomic importance, which are admirably suited for use in floras, cannot be made use of because the necessary information is very seldom supplied on the field labels. For example, herbaceous material is often collected without the rootstock and without information as to the probable duration of the plant. It is most important to know whether a certain herb is an annual or perennial and if a perennial, whether it possesses tubers or thick fleshy roots. In the case of trees and shrubs the taxonomist should know the habit and whether it is evergreen or

deciduous. Many savannah plants flower before the development of leaves, so that, in the herbarium, it is often difficult to correlate material collected at different seasons. By carrying out intensive work in a relatively small area, bearing in mind such points as those mentioned above, the field worker can do much to increase our knowledge, always provided that his material is carefully selected and prepared.

Many collections have been received from the British territories in Tropical Africa during the year but unfortunately much of the material is of comparatively little use on account of poor selection and preservation, and scanty accompanying data. If there is not much time available for collecting it is preferable to concentrate on obtaining a few good specimens rather than a larger number of poorly prepared ones.

WEST TROPICAL AFRICA.—Comparatively little material has been received from the area covered by the "Flora of West Tropical Africa" during the year, yet a few records of species not included in the Flora have been obtained. Much of the material received from this area suffers from improper drying and is of little value. The use of artificial heat in places where the rainfall is heavy and the humidity is high is strongly recommended.

About 80 specimens collected by Mr. F. C. Deighton, with useful notes, have been received from the Department of Agriculture, Sierra Leone. The Gold Coast Forestry Department sent about 75 specimens for naming, and a quantity of specimens from Nigeria, collected mainly by Mr. W. R. Elliott towards the beginning of the century, were presented by the Imperial Institute. About 50 named duplicates of Liberian plants were presented by the Arnold Arboretum.

The most interesting acquisition was a duplicate sheet of the type gathering of *Pitcairnia Feliciana* (Chev.) Harms & Mildbr., presented by the National Natural History Museum, Paris, being the first record for a species of *Bromeliaceae* from the African continent.

Work on the Additions to the "Flora of West Tropical Africa" has been continued by Dr. Hutchinson.

CAMEROONS AND CONGO.—In continuation of exchange, about 500 named specimens from the Belgian Congo were received from the State Botanic Garden, Brussels. These are a very valuable addition to our collections from the Congo, as the consignment contains many species not previously represented at Kew.

NORTH-EAST TROPICAL AFRICA.—A fine collection from the southern Anglo-Egyptian Sudan, consisting of about 500 numbers, was received for naming from Mr. J. G. Myers. Some further gatherings of water plants, several preserved in liquid, were received through Mr. F. W. Andrews of the Sudan Agricultural Research Service, who is making a study of the water-weeds of canals in the Sudan. Apart from grasses and a few specimens from western Abyssinia, collected by Capt. E. Erskine, nothing else was received from this area during the year.

EAST TROPICAL AFRICA.—The Officers of the Uganda Department of Agriculture collected several hundred specimens, the collections, as usual, resulting in many new records for the Protectorate and additional material of some poorly represented or little known species. Many gatherings were supplemented by material in liquid preservative, a form of collecting which is of very great help to the taxonomist and which is at present but rarely adopted. The largest of these collections was made by Mr. P. Chandler, whilst others who contributed were Mrs. Tothill, Mr. C. Hazel, and Mr. J. W. Purseglove. Further useful collections came from Mr. W. J. Eggeling and other Officers of the Forestry Department. Much time has been spent during the year in verifying some of the earlier identifications of Uganda plants at the request of Mr. Eggeling, who is anxious to make as accurate as possible the "Descriptive List of Uganda Trees and Shrubs" which is under preparation by the Forestry Department.

Several hundred specimens, contributed by various collectors and received from the Coryndon Memorial Museum, Nairobi, Kenya Colony, were unfortunately considerably below the standard of previous consignments on account of the poor preservation of the material. Useful collections, mainly of woody plants and including several rare species, were received from the Kenya Forestry Department. Other collections came from Mrs. D. R. Tweedie, Miss D. C. Mainwaring, and the Kenya Veterinary Research Laboratory. Mrs. C. G. Rogers presented over a thousand named plants collected by the late Mr. C. Gilbert Rogers mainly in Kenya Colony.

The most interesting collection of Tanganyika plants received during the year consisted of over 300 plants from Mafia Island collected and named by Mr. P. J. Greenway and presented by the East African Agricultural Research Station, Amani. This institution presented for naming a further 450 specimens of Tanganyikan plants, whilst about 100 specimens were received from the Department of Agriculture. A small but interesting collection was received from Mrs. H. E. Hornby, and Mr. A. P. G. Michelmores presented a further collection of nearly one hundred gatherings from near Lake Rukwa. Some valuable duplicate type material was kindly presented by the Berlin Botanical Museum.

SOUTH TROPICAL AFRICA.—Further useful collections were received from Sr. A de F. Gomes e Sousa collected in Portuguese East Africa, and from Mr. J. Gossweiler, collected in Angola whilst he was accompanying the British Museum Expedition in 1937. Both Mr. C. G. Trapnell of the Department of Agriculture, Northern Rhodesia, and Mr. A. P. G. Michelmores presented collections from Northern Rhodesia for naming. Mr. Milne-Redhead's expedition to Northern Rhodesia, made possible by assistance from the Bentham Moxon Trustees and by the generosity of Capt. K. R. Paterson, resulted in the acquisition of over 2100 gatherings,

300 of which were obtained in the Moxico District of Angola. This collection is fairly rich in duplicate material. Additional material of several rare or little-known plants found by Mr. Milne-Redhead has since been collected by Capt. Paterson. Over 300 specimens have been received from the Department of Agriculture, Nyasaland, collected by Mr. E. Lawrence and Mr. J. E. L. Fenner. About 50 specimens from Southern Rhodesia were presented for naming by the Transvaal Museum, whilst the National Herbarium, Pretoria, forwarded for verification nearly 200 plants collected by Mr. J. Erens on Dr. Pole Evans's recent trip to Ngamiland. About 100 miscellaneous duplicates were presented by the Imperial Forestry Institute, Oxford.

MASCARENE ISLANDS.—A collection of over 100 specimens, many of them representing rare endemic species, were collected by Mr. D. V. Fitzgerald in Seychelles and presented by the Department of Agriculture.

SOUTH AFRICA.—The most outstanding acquisition of recent years was the South African herbarium of Mr. S. Garside, which was purchased by the Bentham-Moxon Trustees during the year. The specimens number over 2500 and represent some of the best preserved South African plants ever received at Kew. Mr. Garside's careful notes and accurate drawings add greatly to the value of the herbarium, which is very rich in *Proteaceae*, and was formed from collections made mainly in the Cape region. In addition, Mr. Garside deposited at Kew, on loan, his spirit collection which supplements his herbarium.

Several hundred specimens were received from the National Herbarium, Pretoria, for naming or verification, and contained many useful additions to the Herbarium. Over 50 specimens were presented for naming or verification by the McGregor Museum, Kimberley, over 100 each by the Bolus Herbarium, Natal Herbarium and Captain T. M. Salter.

Dr. H. G. Schweickerdt was visiting botanical institutions on the Continent from April to September, and returned to Pretoria in October. Mr. D. G. Collett, who is succeeding Dr. Schweickerdt as Botanist for South Africa at Kew, arrived in September and has been occupied with routine naming of recent South African specimens, received chiefly from the Division of Plant Industry, Pretoria. The paper on "A new Conception of the genus *Ammocharis* Herb." by Mr. Milne-Redhead and Dr. Schweickerdt was finally completed and will be published in due course.

Publications.—On the Synonymy and Distribution of *Strychnos innocua* Del. (K.B. 1938, 45).

Euphorbia (*Diacanthium*) *Deightonii*, a new Succulent from West Africa, with brief notes on some Allied Species, by Leon Croizat (K.B. 1938, 53).

Notes on Mesembryanthemae: II. The Lectotypes of *Nananthus* and *Aloinopsis* (K.B. 1938, 153).

Meerburgh's *Impatiens capensis* (K.B. 1938, 161).

Notes on African Rubi in the Kew Herbarium, by C. E. Gustafsson (K.B. 1938, 177).

Notes on Carex: IV. The Section Elatae in Tropical Africa (K.B. 1938, 242).

AMERICA.

During the year 10,550 sheets were mounted, and about 4760 were laid in, as well as 250 photographs.

The Botanist in charge of the section spent much of his time on the identification of the collections made by him in British Guiana and Tobago, and the work, including the distribution of duplicates, was nearly completed. Small but valuable consignments of specimens collected by the Forest Department of British Guiana were also examined, while further time was spent in critically naming the Trinidad material of certain families with a view to the publication of another part of the Flora of Trinidad and Tobago. Other collections examined include those of the "Cap Pilar" Expedition (mainly in the Galapagos and Cayman Islands), a small consignment from Mrs. F. A. Sharpe from southern Peru, and the large and very valuable Peruvian collection of Miss Dora B. Stafford. A series of plants from Barbados was named for Dr. A. E. S. McIntosh, who is making a thorough investigation of the flora of this island. The Botanist also dealt with several interesting parcels of *Bignoniaceae* which were forwarded for identification from institutions in Brazil and Argentina.

The Assistant Botanist, who deals with all botanical questions relating to North and Central America, continued to be much occupied with the Mexican collections of Mr. G. B. Hinton, whose numbers now approach 13,500. Work has also begun on another large collection, comprising over 1600 specimens, made in Central Mexico last year by Mr. E. K. Balls and Dr. W. B. Gourlay. He also completed the identification of plants received during the year from Greenland collected by Lord Rossmore, of others from Newfoundland collected by Mr. T. R. G. Moir, and Mr. C. C. Cholmondeley's Labrador collection.

Apart from the important collections of Mr. Hinton, Mr. Balls and Dr. Gourlay, and Miss Stafford, special mention should be made of a duplicate set of the collection made by the Cambridge University Expedition to British Guiana in 1933 (coll. Mr. T. G. Tutin), presented by the British Museum (Natural History); of nearly 300 specimens collected by Mr. Christopher Sandeman on a recent expedition to little-explored areas of Amazonian Peru; of duplicates of plants from the Terry-Holden Expedition to the far interior of British Guiana in 1937-38 (coll. A. C. Smith), presented by the New York Botanical Garden; and of a valuable set of about 400 named duplicates of Amazonian plants collected by Dr. A. Ducke, received through the Ministry of Agriculture, Rio de Janeiro.

Other collections received during the year include:—

NORTH AMERICA.—*Presented*: By Arnold Arboretum (from California); University of California, Berkeley (California); California Academy of Sciences, San Francisco (California); Gray Herbarium (Cent. 8 of "Plantae Exsiccatae Grayanae," and plants from Nevada and Virginia); Mr. T. R. G. Moir (British Columbia and Alberta); Montana State University (Virginia); Dr. F. A. Rodway (California); Stanford University (California); Rev. and Mrs. H. A. Turner (Baffin Land). *Purchased*: From Dr. Aven Nelson, Wyoming University (Arizona).

CENTRAL AMERICA.—*Presented*: By Arnold Arboretum (Costa Rica); University of Colorado (Mexico and Lower California, coll. J. A. Ewan); Mr. H. H. Haines (Mexico and Lower California); Mr. C. H. Lankester (Costa Rica); Stanford University (Mexico and Lower California). *Purchased*: From Mr. F. Lyle Wynd (Mexico); Prof. E. Lyonnet (Mexico), Mr. C. L. Lundell (British Honduras and Mexico); Dr. A. F. Skutch (Costa Rica).

WEST INDIES.—*Presented*: By Director of Agriculture, Barbados (Barbados); Mr. C. Mathews (Bahamas); Mr. N. Y. Sandwith (Tobago); Department of Agriculture, Trinidad (Trinidad).

EAST TROPICAL S. AMERICA.—*Presented*: By Botanical Museum, Utrecht (Surinam); British Guiana Forestry Dept. (British Guiana, coll. Major A. Beddington, Br. Guiana Boundary Commission); Field Museum, Chicago (Trop. America); Gray Herbarium (Brazil); Museo Nacional, Rio de Janeiro (Brazil). *Purchased*: From Field Museum, Chicago (Brazil, coll. Mrs. Ducke).

WEST TROPICAL S. AMERICA.—*Presented*: By United States National Museum, Washington (Peru, Colombia, etc.).

TEMPERATE S. AMERICA.—*Presented*: By Buenos Aires Faculty of Agriculture (Argentina, coll. Dr. Arturo Burkart); Señor A. Cabrera (Argentina); Museo Argentino, Buenos Aires (Argentina, *Bignoniaceae*); University of Tucuman (Argentina).

Publications:—*Penstemon campanulatus* and *P. Kunthii* (K.B. 1938, 1).

Contributions to the Flora of Tropical America: XXXIV-XXXVII, comprising:—*Plantae Hintonianae*: VI. *Acanthaceae* (K.B. 1938, 59). *Plantae Hintonianae*: VII. Further notes on the Genus *Bursera* (K.B. 1938, 163). *Plantae Hintonianae*: VIII. New Mexican *Gesneriaceae* (K.B. 1938, 292). Notes on the Flora of Tobago (K.B. 1938, 353).

The Botanical Name of the Douglas Fir (K.B. 1938, 79).

Notes on a Botanical Journey in S.W. Greenland, 1937, by Dr. Nicholas Polunin (K.B. 1938, 89).

A Synopsis of the Labiatae of the Guianas, by Carl Epling (K.B. 1938, 187).

Neoporteria and *Chilenia* (K.B. 1938, 296).

Chileniopsis and *Bridgesia* (K.B. 1938, 300).

Binghamia, *Haageocereus* and *Pseudoespostoa* (K.B. 1938, 454).

Pedilanthus versus *Tithymalus* (K.B. 1938, 468).

Three new South American plants (Brittonia, 3, 91-94).

Account of Bignoniaceae of Surinam (Pulle, Fl. Suriname, 4, pt. 2, 1-86).

AUSTRALIA AND NEW GUINEA.

During the year it has been possible to keep up to date with the mounting and incorporating of material received and to deal with most of the outstanding accumulations.

Mr. C. A. Gardner continued his investigations of Western Australian plants, in the course of which he presented a further 1000 duplicates to the Kew Herbarium. These are a continuation of those mentioned in last year's report and include many rare or little-known species. Most of these have already been incorporated.

Collections were also received from Mr. C. T. White (Botanical Museum, Brisbane); Mr. S. T. Blake (Queensland *Cyperaceae*); the North Queensland Naturalists' Club; Mr. H. H. Haines (Queensland plants); the National Herbarium, Sydney; Dr. F. A. Rodway (New South Wales and Tasmania), and from Mr. B. T. Lowne.

In New Guinea work has been concentrated on *Ficus*, of which over 200 gatherings are being studied, including those collected on the two Archbold Expeditions and by the late Mr. C. E. Carr. There is much still to be discovered regarding the genus in this region and collections of these very characteristic and easily recognizable plants would be welcome. It should be emphasized that the specimens must bear figs, or identification is difficult or impossible. Details of the method of collection will be furnished to anyone interested.

NEW ZEALAND AND OCEANIA.

Little active work has been carried on in these regions. Dr. H. H. Allan continued to send material of rare or interesting New Zealand plants, while Mr. H. H. Haines presented a collection from the same country.

Further material of *Ficus* from Oceania was presented by the Bernice P. Bishop Museum, Honolulu, for critical study. A paper on the genus *Ficus* in Samoa has been prepared for publication, and will appear shortly in the "Occasional Papers" of the Bernice P. Bishop Museum. Work is being continued on the genus both in Fiji and in Tonga, as well as on several large collections from the Solomon Islands. The Musée d'histoire naturelle, Paris, presented some duplicates from New Caledonia.

ORCHIDACEAE.

As in previous years, a large proportion of the work has been the routine naming of small collections of orchids from all parts of the world. Many living plants from the Gardens have also been studied, while the receipt of spirit material from many collectors has permitted greater accuracy in determination, as well as providing valuable material for comparative study.

Valuable collections of orchid duplicates from Central America and the Philippine Islands were received in exchange from the Botanical Museum, Harvard University.

African collections still provide the greatest amount of work and research on these is being continued. The genus *Polystachya* in particular is being studied critically, since the only monograph available is already out of date. Other groups being specially studied are *Habenaria* and the *Angraecoids*, in both of which much work is still necessary before even a satisfactory general classification can be put forward.

Messrs. J. K. Cox and G. S. Cansdale of the Gold Coast Agricultural Department continued to send material of West African orchids, while contact has been made with several orchid-growers in Kenya Colony. It is hoped that close co-operation with these enthusiasts, who are growing the native species on a large scale, will be an important factor in writing up the *Orchidaceae* for the projected East African Flora.

Research has also been continued on the orchids of India, Burma and Indo-China.

Publications.—African Orchids: X (K.B. 1938, 141).

GRAMINEAE.

Numerous collections of grasses have been received for determination during the past year. They have included a greater proportion of British grasses than usual, due no doubt to the preparation of several local floras and the new British Flora. Over 2500 specimens from the British Empire and foreign countries have been named, comprising valuable collections from Cyprus, Asia Minor, Arabia, Tropical and South Africa, India, Mexico, West Indies and Australia. In addition to the work of naming, reports on economic grasses for various purposes, information on sources of seed-supply, notes on nomenclature, and other problems connected with grasses, have been prepared. The nomenclature of grasses has been checked for the new edition of the List of Herbaceous Plants cultivated at Kew. The preparation of the next part of the Flora of Tropical Africa has been continued, as well as the revision of several genera of Australian grasses, whilst an account of the grasses of Mauritius is almost completed. Thanks to additional assistance it has been possible to rearrange several genera according to recent monographs, to incorporate in the Herbarium about 3500 specimens, and to distribute 710 duplicates to other herbaria.

Miss J. W. Vickery and Mr. C. A. Gardner continued their studies of N.S. Wales and West Australian grasses respectively. Mr. J. E. Senaratna of Peradeniya, Ceylon, finished his revision of *Leptaspis*, but owing to illness he was unable to complete the remainder of his account of the *Phareae*. Mr. A. S. McKinnon spent a few weeks examining grasses from British Somaliland before proceeding to that country. Dr. H. G. Schweickerdt continued his investigations of the types of South African grasses preserved at Kew, fragments

of which have been presented to the National Herbarium, Pretoria. Amongst other visitors were Miss L. Chippindall (Pretoria) and Mr. Wm. G. Dore (Nova Scotia), who each spent a few days in the Herbarium studying grasses. Miss J. Wilton and Mr. W. Hartley gave valuable assistance in various ways connected with routine work on the *Gramineae*.

Most of the general collections contained a varying proportion of grasses, but a considerable number entirely or mainly composed of these plants have also been received. The more important of these are listed below:—

Europe:—British Isles (Mr. J. P. M. Brenan, Mr. F. Druce, Mr. H. B. Johnston, and members of the Kew Staff); France (Dr. M. Bouly de Lesdain); Sweden (Botanical Museum, Lund). *Asia*:—Arabia and Kurdistan (Mr. H. E. Bellringer); India, etc. (Wellcome Research Laboratories); Central Provinces, India (Dr. G. H. Bhatia). *Africa*:—Nigeria (Department of Agriculture); British Somaliland (Veterinary and Agricultural Department); Uganda (Agricultural, Forestry and Veterinary Departments); Tanganyika Territory (E. African Agricultural Research Station); Nyasaland (Agricultural and Veterinary Departments); Northern Rhodesia (Department of Agriculture); Mauritius and Rodriguez (Dr. R. E. Vaughan). *Australia*:—Queensland (Mr. S. T. Blake); N.S. Wales (National Herbarium, Sydney; Mr. R. A. Black); Western Australia (Department of Agriculture). *America*:—United States (Department of Agriculture); Argentina (Prof. L. R. Parodi) and Cuba and Hispaniola (coll. Ekman, purchased from Stockholm).

Publications:—Hook. Ic. Plant. tt. 3361–5.

PTERIDOPHYTA.

Work on the new edition of the "Handlist of Ferns in Cultivation at Kew" was continued, and it is hoped to publish it shortly. No special collections of ferns were received during the year, though a fair number of specimens were forthcoming from general collections, notably those of Mr. G. B. Hinton of Mexico and various collectors in tropical Africa.

Much time was spent in revising the herbarium material of the *Ophioglossaceae* and *Marsilia*, with special reference to the Indian species. The work was necessary in order to supply certain Indian correspondents with accurate distributional data. During the year 1400 sheets were incorporated, while many more have been sorted into genera and arranged in special cabinets.

Dr. T. M. C. Taylor, of the University of Toronto, spent several months working on the American species of the genus *Woodsia*.

BRYOPHYTA AND CHAROPHYTA.

Series 5 and 6 of Dr. Verdoorn's "*Musci selecti et critici*," and Series 6 of "*Hepaticae selectae et criticae*" have been purchased. An important set of 100 Mosses of Iowa has been presented by

Professor Conard of Grinnell College, Iowa, as well as Series A, "Bryophytes of the French Colonial Empire" by the Laboratoire de Cryptogamie, Paris and some 60 named *Musci* by the Natural History Museum, Vienna. A number of small consignments received during the year, particularly of *Hepaticae*, among general collections from Tropical Africa, have been identified. Mr. H. N. Dixon and Mr. G. O. Allen have kindly continued their co-operation in the naming of *Musci* and *Charophyta* respectively.

Ecological observations on the Bryophytes from the nivéal zone in the Alps of the Dauphiné, Bernese Oberland, and Matterhorn, have been continued, and a specially selected series of specimens has been placed in the Herbarium. A paper has been prepared on new records of Bryophytes from Harris, in the Outer Hebrides.

Among unusual specimens received during the year 1938 was a moss (*Nekera complanata*) stated to have been the material employed for caulking a prehistoric dug-out canoe discovered on the shore of the Humber.

The Card Index belonging to the British Bryological Society is now housed in the Herbarium under the charge of Mr. C. V. B. Marquand as Hon. Bibliographer of the British Bryological Society.

FUNGI.

Early in the year it became obvious that thorough and drastic treatment of the collections was necessary if irreparable damage by beetle attack was to be avoided. Accordingly it was decided to pass the whole of the *Basidiomycetes*, which is the group most affected, through the fumigation chamber. This has now been accomplished except for one block of cabinets, and the work involved considerable expenditure of time, as all packets and boxes had to be opened to allow of the penetration of the gas. At the same time the cupboards were brushed out with corrosive sublimate solution, particular attention being paid to crevices. It is hoped that in this way all beetles already existing in the cabinets will have been destroyed. Further introductions should be avoidable by the routine fumigation of all new material which now takes place.

Accessions to the mycological collections included a valuable set of 96 specimens of the genus *Septobasidium*, presented by Mr. T. Petch, and a first set of fungi of the French Colonial Empire, presented by the Laboratoire de Cryptogamie, Paris. Mr. C. G. Hansford has continued to send microfungi, both named and unnamed, from Uganda, and 66 specimens were received for naming from the South African Department of Agriculture, Pretoria.

A considerable amount of duplicate material, including co-types of many species of *Meliolineae* described by Mr. Hansford, was distributed from Kew to various herbaria, including those at Berlin, Paris, Stockholm, the Farlow Herbarium and the herbarium of the United States Department of Agriculture.

Miss Wakefield attended both the spring and autumn forays of the British Mycological Society, where besides the collection of

specimens of fungi for the Herbarium and for exchange, opportunity was taken to make coloured drawings likely to be useful for the Herbarium collection and for inclusion in the Ministry of Agriculture's Bulletin on edible and poisonous fungi.

Routine work has as usual included replies to many and varied questions about fungi, diseases caused by them, nomenclature, and books.

ALGAE AND LICHENS.

A further contribution of seaweeds from the New York Botanical Garden, including a quantity of specimens from the herbarium of F. S. Collins and miscellaneous algae from the general herbarium, has been received. Dr. F. Børgesen continues to supply material from his own collections, the last instalment being a number of marine algae from India, which have been described in three papers under the title "Contributions to a South Indian Marine Algal Flora."

About 2500 cards have been incorporated in Tilden's Index *Algarum Universalis*.

Loans to outside workers have included all the material available from particular geographical areas. In connexion with this type of work several bibliographical questions and enquiries have been received about little-known collectors whose names appear on Kew sheets.

Several collections were sent for naming, the largest being from Western Australia. Smaller sets included material from Queensland, New Zealand, South Africa and the British Isles.

Fascicles 4 to 7 of "*Lichenes Fenniae Exsiccati*" have been mounted and laid in to the Herbarium. Numerous small collections have been received for determination.

SPIRIT COLLECTION.

The number of bottles incorporated this year is 674, which maintains the high average of the last few years. With the collection becoming more fully representative of the various groups, its value is rapidly increasing. The most valuable collection received during the year was about 700 gatherings made by Mr. Milne-Redhead during his stay in Northern Rhodesia. This represents about one-third of his total gatherings, most of the spirit material being duplicated by dried specimens. The spirit material is particularly rich in Orchids and Monocotyledons generally but other families such as *Asclepiadaceae* are also well represented. Supplementary spirit collections of some of the orchids have since been received from Capt. K. R. Paterson, with whom Mr. Milne-Redhead stayed during his visit.

Another very important addition has been a series of *Stapelieae* grown by Mr. B. L. Sloane at Pasadena, California, and presented by him and Mr. Alain C. White. This includes flowering stems from type plants of species described by the above two specialists in *Stapelieae*, and also authentic material of many other species.

Several collections of water plants have been received from East Africa. Such material retains many valuable diagnostic characters which are lost during the preparation of dried specimens, and spirit or formalin material of water plants will be welcomed from any sources. It is important that the specimens should be in flower (and fruit if possible) when collected.

Recent work has shown the value of spirit preservation of flowers and fruits of *Annonaceae*, in which important diagnostic characters disappear during drying. Collectors are urged to preserve material from this family whenever possible.

Material of thirteen previously unrepresented orchid genera were added during the year, including the comparatively rare genera *Aphyllorchis*, *Cymbidiella*, *Cirrhaea*, *Diplocentrum*, *Josephia*, *Amparoa* and *Menadenium*.

Mr. S. Garside has recently placed his very valuable collection of spirit material of South African plants on permanent loan to Kew. This includes many rare *Proteaceae* and other plants, and comprises not only flowers, etc., but also stems and leaves suitable for anatomical investigation.

EXPERIMENTAL AND TRANSPLANT WORK.

Genetical research was continued at the Potterne Biological Station and at Kew on *Silene*, *Centaurea*, *Ranunculus*, and *Saxifraga*.

The experiments with *Silene* included numerous stocks from a wide range of localities and from diverse habitats. The investigation of the numerous genes involved in both interspecific differentiation and intraspecific variation is proving exceptionally interesting, though difficult. Many of the characters are due to the definite interaction of several genes, and a complicated system of crossing and back-crossing is sometimes essential for the elucidation of the problem of "variation" in the plants used. In *Centaurea* the whole of the F_2 and some of the F_3 families have now been scored. It is hoped to complete the scoring of the F_3 families in 1939. Mr. E. M. Marsden-Jones is continuing research at Potterne on *Anagallis* (with Prof. F. E. Weiss), on *Solanum Dulcamara*, and on interspecific crosses in *Epilobium*. Investigation of the apomicts and variations of *Taraxacum* was continued at Kew. A considerable amount of research, especially anatomical and physiological, on this genus was carried out by Miss W. Curtis, B.Sc. A large number of species of known wild origin, from the Balkan Peninsula, Cyprus, and elsewhere, was studied in the Herbarium Experimental Ground at Kew. Developmental stages, with abundant living material, were observed and recorded throughout the year. Valuable material was obtained for the Herbarium, especially of *Caryophyllaceae*, *Sempervivum*, and *Fritillaria*. Mr. J. R. Sealy is carrying out experiments on the germination and early stages of seedling growth of *Arbutus*.

The Transplant Experiments of the British Ecological Society at Potterne entered the second decade of their existence. Their

value both to ecologists and to taxonomists is indicated in the summary of ten years' results recently published.

Publications.—Taxonomy and Genetics (Journ. Bot. 76, 33: 1938).

Researches on *Silene maritima* and *S. vulgaris*: xxi (K.B. 1938, 248).

Ecological Isolation (K.B. 1938, 384).

Problems of British Taraxaca (Proc. Linn. Soc. 150th Session, 120: 1938).

Material for a study of Taxonomic Problems in Taraxacum (B.E.C. 1937 Report, 570: 1938).

The expansion of Taxonomy with special reference to Spermatophyta (Biological Reviews, 13, 342: 1938).

Further Interspecific *Saxifraga* hybrids (Journ. Genetics, 36, 431: 1938).

Fifth Report of the Transplant Experiments of the British Ecological Society at Potterne, Wiltshire (Journ. Ecol. 26, 359: 1938).

Transplant Experiments of the British Ecological Society at Potterne, Wiltshire, Summary of Results, 1928-37 (Journ. Ecol. 26, 380: 1938).

SEED COLLECTION.

The laying in has been kept up to date, though only about 30 additional boxes have been added to the general collection. Visitors and members of the staff have made considerable use of the collection for the determination or verification of samples of fruits and seeds. Tropical families are still very poorly represented, and sets of authentically named seeds from the tropics would be much welcomed.

SUMMARY.

The routine work, apart from naming, accomplished during 1938, is summarised as follows:—

Mounted	...	...	...	...	...	50,700*
Incorporated	...	...	...	...	...	47,000*
Duplicates distributed	...	...	...	...	...	16,450
Specimens received on loan	...	...	...	...	...	6590
Specimens sent on loan	...	...	...	...	...	7176
Specimens presented or purchased	...	...	...	...	...	52,885

* Not including lower cryptogams.

POISON CHAMBER.

The chamber was in continuous use during the year, and 29 fumigations were carried out. In addition to the treatment of all incoming collections, including borrowed specimens and material brought by visitors, many thousands of sheets showing traces of beetles were taken out and passed through the chamber. These included the genera *Meconopsis*, *Iberis* and *Iris*, besides material belonging to the families *Araliaceae*, *Capparidaceae* and *Compositae*.

A special collection of *Centaureas* was also treated, besides several thousand specimens of fungi (*Basidiomycetes*).

DRAWINGS, PHOTOGRAPHS AND PORTRAITS.

The large number of drawings and photographs which have been received during the year have been placed in the collection of drawings, or, if photographs of types, have been laid into the Herbarium. They include the following presentations: 62 water-colour drawings prepared for the Botanical Magazine, 9 photographs and one pen-and-ink drawing, from the Royal Horticultural Society; 40 plates of the "Flowering Plants of S. Africa" from Dr. Pole Evans; 120 photographs of Calcutta Botanic Gardens from Lt.-Col. A. T. Gage; 80 photographs of *Aloë* species from Mr. H. Basil Christian; 25 original pen-and-ink drawings of plates (3176-3200) for Hooker's *Icones Plantarum*, and 25 copies of plates (3351-75) from the Bentham Trustees; 10 water-colour paintings by Mrs. Crossman presented by Mr. R. N. Salaman; 1128 water-colour paintings of fungi, etc. by the late Dr. Henry Clarke, presented by Miss Gladys T. Clarke; 24 photographs of types of *Lomariopsis* from Mr. R. E. Holtum; 19 photographs of types of *Brachystegia* presented by the Imperial Forestry Institute, and 15 photographs of types of *Gentiana* from Tokyo Imperial University. About 400 photographs of types—largely of *Piperaceae*—were also received, in exchange, from the United States National Herbarium, and a portrait of Sir Joseph Banks and an old print of Chelsea Physic Garden from Dr. F. Dawtrey Drewitt. In addition a large number of drawings and photographs, including some portraits of eminent botanists, were received from various sources.

INDEX KEWENSIS.

The year 1938 records the publication of Supplement 9, in the preparation and proof-reading of which the Index staff has been mainly occupied. The Supplement appeared during the last week of December, an advance copy having been received at Kew on December 6th. Compared with Supplement 8 the recent Supplement shows an increase of 49 pages. This is probably due, partly to an increase in the number of new species and transferences made during the quinquennium, and partly to the inclusion within the Supplement of many works of earlier date which were omitted from the original Index and its Supplements. Attention may be drawn to the Preface where certain alterations in the form of entry are explained. Double citations are now supplied in accordance with Article 49 of the International Rules of Botanical Nomenclature: "When a genus or group of lower rank is altered in rank but retains its name or epithet, the original author must be cited in parenthesis, followed by the name of the author who effected the alteration. The same holds when a subdivision of a genus, a species, or a group of lower rank, is transferred to another genus or species with or without alteration of rank." This modification in the form of entry

in Supplement 9 of the Index Kewensis, although it has materially added to the work of compilation, will undoubtedly be greatly appreciated by all workers. All hybrids are so indicated by the sign $\times$ placed before the name. In former Supplements hybrids were indicated by the abbreviation "hybr." placed after the date following the citation. The new method, besides being in accordance with the International Rules, shows at a glance which names are those of hybrids as opposed to those of species. In the original Index and its Supplements up to Supplement 8 it was customary to place a comma between the botanical name and the name of the author. In Supplement 9 the comma has been omitted.

Great care has been taken during the preparation of Supplement 9 to distinguish generic homonyms so that all specific names are placed under the correct generic name and family. As in Supplements 7 and 8, a list of new generic names arranged under their families in alphabetical order is included at the end of the work (pp. 303-305). The Supplement is published by the Clarendon Press and as usual maintains the high standard of work of that Institution.

The compilation of Supplement 10 (1936-40) is well in hand with about 7000 entries in the Card Catalogue, which are available for consultation.

NOMENCLATURE, BIBLIOGRAPHY AND HISTORY OF BOTANY.

During the past year a large number of nomenclatural enquiries has again been received. In addition to this, several lists of names have been received with the request that they should be corrected according to International Rules; these have often involved both nomenclatural and taxonomic investigation. Arising from such routine work, papers dealing with particular nomenclatural investigations have been published. During the early part of the year some time was spent on proof-reading the late Sir Arthur Hort's translation of "The Critica Botanica" of Linnaeus, revised by Miss M. L. Green, which has been published by the Ray Society. The "Critica" is interesting in throwing light on the nomenclatural views of Linnaeus before he wrote his "Species Plantarum" in 1753, and may be considered as the first set of "rules" of botanical nomenclature. In June the "Handlist of Coniferae, Cycadaceae and Gnetaceae cultivated at the Royal Botanic Gardens, Kew, and at the National Pinetum, Bedgebury" appeared, and the nomenclature has been brought into line with the International Rules as amended at Cambridge and Amsterdam. During August Dr. T. A. Sprague and Miss M. L. Green attended the nomenclatural meetings of the Twelfth International Horticultural Congress held in Berlin. It was generally agreed that the list of the correct names of economic plants decided upon at the International Botanical Congress at Amsterdam, would be very valuable, and it is hoped that special attention will be paid to the preparation of this list during the coming year. As Secretary of the Special Committee

for Phanerogamae and Pteridophyta, Miss Green has prepared a list of nomina conservanda as voted upon by the members of the Committee. This list has been submitted to Professor Harms, Chairman of the Executive Committee, by whom it will be edited and inserted in the Supplement to the International Rules, Ed. 3, which it is hoped will be published shortly.

The correct authority and the effective date of publication of the name *Nicotiana Langsdorffii* were investigated on the suggestion of Dr. T. H. Goodspeed, and it was found that this name had been published independently by different authors, using different type material, in 1819, 1820 and 1821. The dates of publication of the first three volumes of Harvey and Sonder's "Flora Capensis" were also investigated.

An account of Hermann Boerhaave's botanical work and attainments was prepared in connexion with the commemoration at Leyden, on September 23rd, 1938, of the two-hundredth anniversary of his death. It was found that while there is little that was original in Boerhaave's system of botanical classification he possessed considerable morphological acumen and sound taxonomic judgment, and that his generic descriptions were excellent.

Publications.—*Nomenclature*: On the synonymy and distribution of *Strychnos innocua* Del. (K.B. 1938, 45).

On the validity of the name *Solidaster* (*Chronica Botanica*, 1938, 4, 36-39).

The botanical name of the Douglas Fir (K.B. 1938, 79).

New Conifer Names (K.B. 1938, 85).

The lectotypes of *Nananthus* and *Aloinopsis* (K.B. 1938, 153).

The correct name of the Common Parsley (K.B. 1938, 256).

The XIIth International Horticultural Congress (*Nature*, 1938, Sept. 17, 544-545).

Neoporteria and *Chilenia* (K.B. 1938, 296).

Chileniopsis and *Bridgesia* (K.B. 1938, 300).

Binghamia, *Haageocereus* and *Pseudoespostoa* (K.B. 1938, 454).

Pedilanthus versus *Tithymalus* (K.B. 1938, 468).

On the correct names of three European species of *Cirsium* (*Fedde, Repert.* 43, 302-315: 1938).

History of Botany.—Boerhaave as a Botanist (*Nederl. Tijdschr. voor Geneeskunde*, 82, no. 40, 4891-4: 1938; reprinted in "Memorialia Hermann Boerhaave optimi medici," Haarlem: 1939).

VISITORS.

The number of visitors in the Visitors' Book for the year 1938 was 4770. This shows a slight decrease compared with 1937.

The following kindly gave voluntary assistance in the Herbarium:—Mr. H. N. Ridley again helped in naming Malayan specimens, and Miss M. M. Whiting in arranging and classifying the Indo-Malayan material; Miss F. Hamilton has given very considerable assistance with genetical-statistical studies on *Saxifraga granulata* from wild material collected on the Hogs Back, Guildford

and from plants bred from this material. Miss June Burroughes has given assistance throughout most of the year in naming European collections and in re-classifying material from this area in the Herbarium, and latterly Mr. Ogilvie Grant has kindly assisted with similar work.

Amongst frequent or regular visitors were members of the staffs of the Department of Botany, British Museum (Natural History), the Imperial Mycological Institute, and the Imperial Forestry Institute, Oxford. The Staff employed by the Royal Horticultural Society in connexion with the preparation of the "Index Londinensis" and "The Botanical Magazine" have worked in the Herbarium and Library throughout the year.

The most noteworthy or frequent visitors to the Herbarium were the following:—

Prof. R. S. Adamson (Cape Town); Revd. L. W. A. Ahrendt; Mr. A. H. G. Alston; Mr. G. H. J. Amshoff (Utrecht); Dr. E. Asplund (Stockholm).

Mr. E. G. Baker; Miss Ella M. Barnes; Miss E. C. Barnett; Mr. W. J. Bean; Dr. G. R. Bisby; Mr. J. P. M. Brenan; Prof. A. H. R. Buller (late of Winnipeg); Mr. I. H. Burkill; Miss J. Burroughes.

Mr. K. St. G. Cartwright; Mr. D. Chatterjee; Prof. E. E. Cheesman (Trinidad); Mr. C. Chevalier (Liège); Miss L. Chippindall (Pretoria); Dr. C. Christensen (Copenhagen); Dr. Charles Chupp (Ithaca, New York); Miss L. v. W. Claterbos (Leiden); Dr. Leon M. Croizat (Harvard).

Dr. J. M. Dalziel; Mr. J. E. Dandy; Prof. B. H. Danser (Groningen); Mr. P. M. Dansereau (Montreal); Mr. F. C. Deighton (Sierra Leone); Mr. H. N. Dixon; Mr. Wm. G. Dore (Nova Scotia); Mr. H. L. Dunkley.

Mr. A. W. Exell.

Mr. G. St. C. Fielden; Mr. R. M. Fiennes (Entebbe, Uganda); Dr. L. Fraser (Sydney); Prof. R. E. Fries (Stockholm).

Prof. T. H. Goodspeed (Berkeley, California); Mr. P. J. Greenway (Amani, Tanganyika Territory); Mr. A. Grove.

Sir A. Daniel Hall; Miss F. Hamilton; Mr. C. G. Hansford (Kampala, Uganda); Mr. J. W. Hartley; Mr. Wm. Hartley (late of Melbourne); Mr. J. H. Holland; Dr. R. E. Holtum (Singapore); Dr. D. Hooper; Mr. A. C. Hoyle.

Mr. A. Bruce Jackson; Dr. Maria M. Job (La Plata); Dr. F. P. Jonker (Utrecht).

Dr. A. F. G. Kerr; Mr. B. C. Kundu (Bengal).

Dr. I. M. Lamb; Mr. J. E. Lousley.

Mr. E. M. Mason; Mrs. Dorothea W. McKay (Johannesburg); Mr. S. K. Mukerjee; Mr. R. S. McKinnon (Br. Somaliland); Miss E. M. Napier; Mr. C. Norman.

Mr. M. Ogilvie-Grant; Mr. W. R. B. Oliver (Wellington, New Zealand); Lt.-Col. C. L. Meyler-O'Malley; Prof. T. G. B. Osborn.

Mr. C. Parkinson (Forest Dept., Burma); Dr. Reuben T. Patton (Melbourne); Mr. C. Persson (Stockholm); Mr. T. Petch; Dr. W. R. Philipson; Dr. N. Polunin; Mr. W. R. Price; Mr. H. W. Pugsley.

Mr. H. N. Ridley.

Miss K. Sampson; Mr. J. R. Sealy; Miss K. M. Sealy; Mr. J. E. Senaratna (Peradeniya, Ceylon); Mr. N. Douglas Simpson; Dr. H. Sleumer (Berlin); Miss L. Snelling; Miss M. S. Sprague; Miss Dora B. Stafford; Mr. W. T. Stearn; Major F. C. Stern; Miss W. F. Steven; Mr. A. L. Still.

Mr. T. Tang (Peiping); Dr. Thos. M. C. Taylor (Toronto); Dr. Hamilton P. Traub (Washington); Mr. A. W. Trethewy; Mr. R. S. Trickett.

Miss I. C. Verdoorn (Pretoria); Miss J. W. Vickery (Sydney).

Mr. T. Wang (Peiping); Dr. E. F. Warburg; Mrs. M. L. Wedgwood; Miss Dora Weintraub (Johannesburg); Dr. Winona H. Welch (Greencastle, Indiana); Miss M. M. Whiting; Miss J. Wilton; Mr. S. P. Wiltshire; Mr. W. C. Worsdell.

DISTRIBUTION OF DUPLICATES.

The following were the principal institutions to which duplicates were distributed:—

Great Britain.—London, British Museum (Natural History); Manchester, Victoria University; Oxford, Fielding Herbarium and Imperial Forestry Institute.

Europe, North Africa and Orient.—Algiers, Botanical Laboratory of the University; Belgrade, Botanic Gardens; Berlin, Botanic Gardens and Museum; Bologna, Botanical Institute of the University; Brussels, Botanic Garden; Cluj, Botanical Museum; Coimbra, Botanical Institute of the University; Geneva, Museum and Botanic Garden; Helsingfors, Botanical Museum; Leiden, 's Rijks Herbarium; Leningrad, Botanical Institute of the Academy of Sciences; Lisbon, Colonial Garden; Lund, Botanical Museum; Paris, Natural History Museum; Prague, Karlovy University; Sarajevo, State Museum; Sofia, University; Stockholm, Natural History Museum; Uppsala, Botanical Institution; Utrecht, Botanical Museum and Herbarium; Vienna, Natural History Museum.

Asia.—Calcutta, Royal Botanic Gardens; Manila, Bureau of Science; Peradeniya, Department of Agriculture; Sapporo, Botanical Institute of the Faculty of Science; Hokkaido, Imperial University; Singapore, Botanic Gardens.

Tropical and South Africa.—Amani, East African Agricultural Research Station; Pretoria, National Herbarium; Zomba, Forest Department.

America.—Cambridge, Farlow Herbarium and Gray Herbarium; Iowa, State University; Jamaica Plain, Arnold Arboretum; Los Angeles, University of California; New York, Botanical Garden; Ottawa, Central Experimental Farm; San Francisco, California

Academy of Sciences; Toronto, The University; Washington, D.C., Bureau of Plant Industry and United States National Museum.
Australia.—Adelaide, The University; Brisbane, Botanic Museum and Herbarium; Melbourne, National Herbarium.
Oceania.—Honolulu, Bernice P. Bishop Museum.

The Library

Work on the special tasks mentioned in last year's Report has continued, and satisfactory progress can be recorded.

The first two or three letters of the alphabet of the new Supplement to the Library Catalogue are now ready for printing.

The work of binding arrears, thanks to the renewal of the special grant, was continued during 1938.

PRESENTATIONS TO THE LIBRARY.

Lt.-Colonel Sir David Prain has presented numerous publications and the continuation of various periodicals including: *Bulletin de la Société Botanique de France*, *Berichte der Deutschen Botanischen Gesellschaft*, *The Quarterly Journal of Pharmacy*, and the *Proceedings of the American Philosophical Society*.

Two copies of *Horticultural Colour Chart*, Vol. 1 (1938) have been received from the Royal Horticultural Society; the Society has also presented copies of *Some good garden plants* by F. J. Chittenden, the *Index to Journal and Proceedings 1838-1935* and *List of Awards, 1859-1935*, and, as in previous years, two copies of their *Lily Year-Book*.

Mr. Ridley has kindly presented to Kew a number of books and pamphlets including: T. Mawe (J. Abercrombie) and others, *Everyman his own gardener*, etc. ed. 4, 1769; J. Abercrombie, *The gardener's pocket journal and daily assistant*, etc. ed. 33, 1854; E. Beckett, *Vegetables for exhibition and home consumption*; R. P. Brotherston, *The book of cut flowers*; J. Fleming, *Spring and winter flower gardening*; A. Pratt, *Wild flowers*; T. Rivers, *Rose amateur's guide*.

Mrs. H. B. Morse has presented a number of botanical drawings and papers including *Notes on Formosan plants* by A. Henry and *Chinese Plants* by A. Henry and E. Faber, and also some botanical letters written by Dr. A. Henry to Dr. H. B. Morse, from 1893 to about 1907.

The following books have been kindly given to Kew by Miss R. Burford: Dr. Adam Littleton's *Latine dictionary*, ed. 4, 1703; F. Ratzel, *Die Erde und das Leben*, (2 vols.); *Sketches of Persia*, etc.; O. Stapf, *The flora of Mount Kinabalu in North Borneo*; Wellcome Historical Medical Museum, *Souvenir Cinchona Tercentenary Celebration and Exhibition*.

From the Carnegie Institution of Washington have come *Rainfall and tree growth in the Great Basin* by E. Antevs, *Principles and methods of tree-ring analysis* by S. Glock, A. E. Douglass and

G. A. Pearson, and *Eocene flora of western America* by E. I. Sanborn, S. S. Potbury, and H. D. Macginitie.

The Trustees of the British Museum have presented *The British Rhætic flora*, by T. M. Harris.

Among the publications received during 1938 from the New York Botanical Garden were the continuation of *Addisonia*, *Brittonia*, and the *North American Flora*.

The Crown Agents for the Colonies have sent a copy of E. A. T. Dutton's *The planting of trees and shrubs*.

Volume 7 of the *Flora URSS* has been received from the Botanical Institute of the Academy of Sciences, Leningrad.

The Rhododendron Association has presented its *Year Book* for 1938.

The Bentham-Moxon Trustees have presented a Latin edition (in 11 volumes) of Diodorus Siculus, *Bibliothecae historicae libri qui supersunt e recensione Petri Wesselingii*, etc., Biponti and Argentorati, 1793-1807. This is a valuable acquisition, containing an account of the Hanging Gardens of Babylon built for the royal harem by a Syrian king. *The travels of Ibn Batuta* are now represented by the English translation by the Rev. Samuel Lee, published in 1829, which contains notes on the botany. Another noteworthy addition to the Library is V. Cordus, *Dispensatorium*, etc. Lugduni Bataviae, 1618. Other works presented by the Trustees are:—T. Montsaint, *Le jardin senonois*, etc. Sens, 1604; P. J. B. Chomel, *Catalogue des plantes d'usage suivant l'ordre de leur vertus* [s.l. et a]; J. B. Triumfetti, *Syllabus plantarum horto medico Romanae sapientiae . . . anno 1688 additarum*, Romae, 1688; C. Donarelli, *Enumeratio seminum*, etc., Romae, [s.a.]; the Bentham-Moxon Trustees have also presented the continuation of several periodicals in exchange for Hooker's *Icones Plantarum*.

The Editor of "Nature" has presented the following:—R. S. Adamson, *Vegetation of South Africa*; A. H. G. Alston, *The Kandy flora*; F. J. Chittenden (Ed.), *Ornamental flowering trees and shrubs: report of the Conference held by the Royal Horticultural Society, 1938*; C. Flahault, *La distribution géographique des végétaux dans la région méditerranéenne française*; P. J. Greenway, *A Swahili dictionary of plant names*; Hsen-Hsu Hu and Woon-Young Chun, *Icones plantarum sinicarum*, fasc. 5; A. F. G. Kerr (Ed.), *Florae siamensis enumeratio*, vol. 2, part 4, *Vacciniaceae to Styraceae*; J. H. McFarland, R. M. Hatton and D. J. Foley, *Garden bulbs in color*; Oxford University Exploration Club, *British Guiana papers: scientific results of the Oxford University Expedition to British Guiana in 1929*; L. and M. Pardé, *Arbres et forêts*; J. O. Thomas and L. J. Davies, *Common British grasses and legumes*; J. E. Weaver and F. C. Clements, *Plant ecology*, ed. 2.

The following publishers have sent the books mentioned for review in the Bulletin:—Anglo-Scottish Press: W. F. Bewley and J. Harnett, *The cultivation of mushrooms*, ed. 2; Baillière, Tindall

and Cox; S. A. Waksman, *Humus: origin, chemical composition, and importance in nature*; British Empire Vegetation Committee: R. S. Adamson, *Vegetation of South Africa*; Cambridge University Press: A. Arber, *Herbals: their origin and evolution*; Chapman and Hall: L. Bonar, L. Roush and R. M. Holman, *A laboratory guide for a course in general botany*, ed. 4; R. M. Holman and W. W. Robbins, *Textbook of general botany*, ed. 4; W. Seifriz, *The physiology of plants*; Department of Agriculture and Stock, Brisbane, Queensland: C. T. White, *Principles of botany for Queensland farmers*; Imperial Forestry Institute, University of Oxford: G. S. Cansdale, *The black poplars and their hybrids cultivated in Britain*; Journal of Park Administration, Ltd.: W. W. Pettigrew, *Municipal parks: layout, management and administration*; Longmans, Green and Co.: J. H. Priestley and L. I. Scott, *An introduction to botany*; Macmillan and Co.: F. O. Bower, *Sixty years of botany in Britain (1875-1935)*; Marshall Press: E. Richardson, *The bog-garden: its construction and maintenance*; N. V. A. Oosthoek's Uitgevers Mij., Utrecht: A. A. Pulle, *Compendium van de terminologie, nomenclatuur en systematiek der zaadplanten*; Oxford University Press: S. C. Atchley, *Wild flowers of Attica*; Lord Hailey, *An African survey*; E. B. Worthington, *Science in Africa*; Putnam and Co.: T. Hay, *Plants for the connoisseur*; F. Stoker, *A gardener's progress*; Reinhold Publishing Corporation: C. Ellis and M. W. Swaney, *Soilless growth of plants*; C. Scribner's Sons: D. Fairchild, *The world was my garden*.

Among the more important works received, presented by the authors unless otherwise stated, are the following:—A. H. G. Alston, *The Kandy flora* (from Director of Agriculture, Peradeniya, Ceylon); Oakes Ames, *Resupination as a diagnostic character in the Orchidaceae, with special reference to Malaxis monophyllos*; M. Aubréville, *Report of the Niger Colony Forestry Expedition*, Sept.-Dec., 1935 (from the Imperial Forestry Institute, Oxford); Australian and New Zealand Association for the Advancement of Science, *Report of the 23rd Meeting*, 1937; C. Baehni, *Mémoires sur les Sapotacées*, 1: système de classification; F. M. Bain, *Bronze leaf wilt disease of the coconut palm*; R. C. Bakhuizen van den Brink, *Revisio Ebenacearum malayensium*, pp. 177-368 (from the Curator, Botanic Garden, Buitenzorg); M. Barros, *Ciperáceas Argentinas*, 2 and 3; A. W. Bayer, *An account of the plant ecology of the coastbelt and midlands of Zululand*; C. M. Beadnell, *Dictionary of scientific terms* (from Mr. C. E. C. Fischer); G. Beauverd and S. Topali, *Contribution à la connaissance de la flore hellénique*, 1 and 2 (from G. Beauverd); C. Beddington, *Shrubs and plants at the Villa Yolanda, Ospedaletti* (2 copies); G. Benl, *Die genetischen Grundlagen der Blütenfarben (Sammelreferat)*; F. Boergesen, *Contributions to a South Indian marine algal flora*, 2 and 3; F. Boeuf, *Le blé en Tunisie*, vols. 1 and 2; H. M. L. Bolus, *Notes on Mesembryanthemum and allied genera*, part 3, March 1938 (3 copies); G. Bondar, *A*

cultura de cacao na Bahia; S. Boothman, *The alpine house and its plants*; N. S. Borkhsenius, *Coccidae of quarantine value for U.S.S.R. and their allied species* (from Commissariat of Agriculture, Quarantine Inspection, Georgia); C. E. B. Bremekamp, *The Malaysian species of the genus Ixora (Rub.)*; British Association for the Advancement of Science, *Report 1937* (from Miss E. M. Wakefield); J. C. Brunet, *Manuel du libraire et de l'amateur de livres*, ed. 3, tomes 1-4 (from Miss M. S. Sprague); *Bulletin de la Station de Recherches Forestières du Nord de l'Afrique*, vol. 1, 1917 (from Directeur, Station de Recherches Forestières du Nord de l'Afrique); A. L. Cabrera, *Revision del genero "Chaetanthera" (Compositae)*; Cambridge, *International Council of Scientific Unions, Reports of Proceedings*, 1937; O. Campese, *Colture tropicali e lavorazione dei prodotti*, vol. 1, *Generalita* (from Ulrico Hoepli (Ed.)); R. C. Ching, *Icones Filicum sinicarum*, fasc. 3; M. A. Coppey, *Mousses nouvelles de l'Indo-Chine et du Yunnan* (from Mr. F. Ballard); B. H. Danser, *The Loranthaceae of French Indo-China and Siam* (3 copies) (from D. F. van Slooten); B. H. Danser, (1) *A revision of the genus Korthalsella*; (2) *The Loranthaceae Lorantheidae of the tropical archipelagos east of the Philippines, New Guinea, and Australia*; H. C. Darby (Ed.), *A scientific survey of the Cambridge district*; (from Dr. W. B. Turrill); O. Degener, *Flora hawaiiensis*, book 2; (from R. W. G. Dennis and D. G. O'Brien, *Boron in Agriculture* (from Director, Boron Agric. Bureau); J. De Toni, *Diagnoses algarum novarum post sylloges editionem descriptarum*, 1: *Myxophyceae* (from dott. G. De Toni); Deutsche Rhododendron-Gesellschaft, *Rhododendron und immergrüne Laubgehölze*; E. De Wildeman, *Dioscorea alimentaires et toxiques (morphologie et biologie). Espèces et variétés Congolaises* (2 copies); R. A. Dyer, *The vegetation of the divisions of Albany and Bathurst*; Empire Forestry Association, *Empire Forestry Handbook 1938*; C. Epling, *The Californian salvias: a review of Salvia, section Audibertia*; A. Ernst, *Stammesgeschichtliche Untersuchungen zum Heterostylieproblem*; W. Ferguson, (1) *Gramineae or grasses indigenous to or growing in Ceylon*, etc.; (2) *The vascular cryptogams of Ceylon*, etc. (from Mr. J. E. Senaratna); Forest Service, U.S. Dep. Agric., *Contrirange plant handbook* (2 copies); F. E. Fritsch and others, *Contributions to our knowledge of the freshwater algae of Africa*, Nos. 2, 6, 11, 12 and 13 (from Prof. F. E. Fritsch); T. Gaarder and E. Alvsaker, *Humusen i udyrket Vestlandsjord* (from Vestlandets forstlige Forsøksstasjon, Bergen, Norway); A. T. Gage, *A history of the Linnean Society of London* (from the Linnean Society); C. A. Gardner and others, (1) *Poison plants of south-western Australia*; (2) *West Australian wildflowers* (from Mr. P. Stanway-Tapp); F. C. Gates, *Grasses in Kansas* (from the Secretary, State Board of Agric., Kansas); A. Guillaumin, (1) *Plantes utiles*, (2) *Plantes utiles*, (3) *Plantes utiles*, (4) *Plantes utiles* (from the Muséum National d'Histoire Naturelle, 4); A. Guillaumin et R. Franquet, *Arbres et*

arbrisseaux utiles ou ornementaux (*Guides aux collections de plantes vivantes du Muséum National d'Histoire Naturelle*, 3) (from Muséum National d'Histoire Naturelle, Paris); I. Haeckel and W. Troll, *Botanische Ergebnisse der deutschen Hindukusch-Expedition*, 1935 (from Dr. I. Haeckel); G. B. E. Hasselberg, *Zur Morphologie des vegetativen Sprosses der Loganiaceen*; Sir A. Hort, *The "Critica Botanica" of Linnaeus*. Translation. (Revised by Miss M. L. Green with introduction by Sir A. W. Hill) (from Lady Hort); M. M. Iljin, *Flora Turkmenii*, tom 2, no. 1; International Grassland Congress, *Report of the Fourth International Grassland Congress*, 1937; H. Jacobsen, *Verzeichnis der Arten der Gattung Mesembryanthemum L.*; F. P. Jonker, *A monograph of the Burmanniaceae*; J. Jundzitt, *Opisanie Roślin*, etc. 1830 (from Dr. T. Wisniewski); U. N. and P. C. Kanjilal and A. Das, *Flora of Assam*, vol. 2 (from the Conservator of Forests, Assam); K. Kluk, (1) *Dykcyonary Roślinny*, etc. 1805-46, 3 vols.; (2) *O Roślinach, ich utrzymaniu, rozmnożeniu i zazyjein*, 2 vols., 1778 and 1797 (from Dr. T. Wisniewski); A. A. Kolakovskii, *Flora Abkhazii*, tom 1 (from the Institute of Culture, Academy of Sciences, Abkhazia); A. J. G. H. Kostermans, *Revision of the Lauraceae*, 3, 4 and 5; Y. Kudo, *Hand-list of exotic orchids in Taiwan* (from Dep. of Forestry, Gov. Res. Inst., Taihoku, Taiwan); E. Latzina, *Index de la flora dendrologica argentina*; R. McVaugh, *Studies in the taxonomy and distribution of the eastern North American species of Lobelia* (from the University of Pennsylvania); R. Maire, *Contributions à l'étude de la flore de l'Afrique du Nord*, fasc. 21-26; S. F. Markham, *The museums and art galleries of the British Isles* (2 copies) (from Carnegie United Kingdom Trust); J. W. Mathews, *Cultivation of non-succulent South African plants* (from the Botanical Society of South Africa); S. Mangham and A. R. Hockley, *Biology for pharmaceutical students and others* (from Prof. S. Mangham); E. D. Merrill and E. H. Merrill; P. Mouterde, *Petite flore des environs de Beyrouth*; R. M. Nattrass, *A first list of Cyprus fungi*; G. Nygaard, *Contributions to our knowledge of the freshwater algae of Africa*, no. 9 (from Miss E. L. Stephens); A. A. Obermeijer, *The South African species of Blepharis*; Oxford University Exploration Club, *British Guiana papers. Scientific results of the Oxford University Expedition to British Guiana in 1929*; L. R. Parodi, *Contribucion al estudio de las Gramineas del género "Paspalum" de la flora uruguaya*; L. Pomini, *Le piante officinali e del Sottobosco spontanee o coltivate della provincia di Vercelli*; O. Posthumus, *Malayan fern studies*, 1: *The synonymy and distribution of the Java ferns*; Reading University Faculty of Agriculture and Horticulture, *Papers read at the third revision course in horticulture*, 1937 (from Prof. R. H. Stoughton); P. K. Reynolds, *The banana* (from Mr. H. Holt); Royal Asiatic Society of Bengal, *Proceedings of the 25th Indian Science Congress, Calcutta*, 1938, part 2, *Presidential Addresses*; G. Sampaio, 34 *botanical*

papets on the flora of Portugal (from the Director, Instituto de Botanica, Faculdade de Ciencias da Universidade, Porto, Portugal); G. Sampaio, *Lista das espécies representadas no Herbário Português*, and Appendixes 1-3 (from Prof. Dr. Americo Pires de Lima); S. Sasaki: *Phytogeographical and floristic studies on the islands series of Kotosyo*, part 1: *Enumeration of hitherto known indigenous pteridophytes and their geographical distribution* (from Dep. of Forestry, Gov. Res. Inst., Taihoku); E. E. Sherff, *Revision of the Hawaiian species of Euphorbia L.*; C. Skottsberg, *Die Flora der Desventuradas-Inseln (San Felix und San Ambrosio)*; G. D. Srivastava, *Flora of Allahabad*; W. T. Stearn, (1) *Epimedium and Vancouveria (Berberidaceae)*, a monograph (2 copies); (2) *Index to genera and families in Presl, Reliquiae Haenkeanae*, vol. 2; Th. Streiffert: *The forests of Sweden* (from the Consul General for Sweden); R. Sudell, *Herbaceous borders and the waterside* (from the Univ. of London Press); C. F. Symington, *Notes on Malayan Dipterocarpaceae*, 1 and 4; M. Szubert, *Spis Roślin Ogródu Botanicznego Krolewskiego-Warszawskiego Uniwersytetu*, 1824 (from Dr. T. Wisniewski); Texas Agricultural Experiment Station, *Catalogue of the flora of Texas* (Bulletin 550); *Valuable plants native to Texas* (Bulletin 551); I. Tollan, *Skoggrenser pa Nordmøre*; R. P. True, *Gall development on Pinus sylvestris attacked by the Woodgate Peridermium*, and morphology of the parasite (from the University of Pennsylvania); W. B. Turrill, *The expansion of taxonomy with special reference to Spermatophyta*; Union-Castle Mail Steamship Co. Ltd., *The South and East African Year-book and Guide for 1939*; R. E. Vaughan and P. O. Wiehe, *Studies on the vegetation of Mauritius*, 1: *a preliminary survey of the plant communities*; R. E. Wean, *The parasitism of Polyporus Schweinitzii on seedling Pinus strobus* (from the University of Pennsylvania); W. J. Zimmer, *The flora of the far north-west of Victoria* (from the Forests Commission of Victoria).

The following periodicals, additional to those mentioned in recent reviews, have been received. These have been presented by the editors, societies or institutions issuing them unless otherwise stated:—*Annales de l'Ecole Nationale d'Agriculture de Grignon*, sér. 2, 1; *Archivos do Instituto de Pesquisas Agronomicas, Pernambuco*, no. 1; *Bulletins of Batum Subtropical Botanical Garden*, no. 1; *Bulletin of the Georgian Experiment Station of Plant Protection*. Ser. A. *Phytopathology*, no. 1; *Bulletins of the Introduction Garden of Subtropical Cultures, Sukhumi*, nos. 1-9; *Calcutta University, Journal of the Department of Science*, vol. 1, no. 1 (New Series); *Contribuciones a la Historia Natural Colombiana*, nos. 1 and 2; *Current Monthly Record of Forest Literature, Imperial Forestry Institute, Oxford*, nos. 1-31; *Jornal de Agronomia*, vol. 1, nos. 1-4; *Journal of the John Innes Association*, nos. 3 and 4; *Journal of the Society for the Bibliography of Natural History*, vol. 1, nos. 1-4 (from Miss M. L. Green); *Research Bulletins, Saito Ho-on Kai Museum*

(*Botany*), nos. 1-5; *Soils and Fertilizers*, vol. 1, nos. 1-6; *Species Lupinorum*, signatures 1 and 2; *Travaux de l'Institut Botanique*, *Bacon*, tomes 1 and 2.

As in former years publications have been received from the Empire Cotton Growing Corporation, the Imperial Agricultural Bureaux, and from Departments of Botany, Agriculture and Forestry at home, in the overseas Empire, and in foreign countries.

We are again indebted to numerous authors of botanical papers who have kindly sent reprints.

The Ordnance Survey Office, Southampton, have presented further maps of the fifth (relief) edition, and additional maps have also been presented by the War Office. Other maps received include five compiled by the National Geographical Society presented by Miss Fischer; an administrative map of U.S.S.R. from the Society for Cultural Relations with Foreign Countries; one of Sarawak from the Royal Geographical Society; one of the Isle of Wight from Mr. H. K. Airy-Shaw; three maps of parts of Brazil from Mr. H. N. Ridley; one of Matonchi Farm, Mwinilunga, compiled and presented by Mr. E. Milne-Redhead; and a map of Kimberley District from Miss Wilman.

ROYAL BOTANIC GARDENS, KEW

LIST OF STAFFS

31ST DECEMBER, 1938

Head Office

DIRECTOR—Sir A. W. Hill, K.C.M.G., M.A., Sc.D., D.Sc. (Adelaide), F.R.S., F.L.S., V.M.H.
ASSISTANT DIRECTOR—J. S. L. Gilmour, M.A., F.L.S.,
ECOMONIC BOTANIST—Sir Geoffrey Evans, C.I.E., M.A., Dip. Agric.
ASSISTANT BOTANIST—B. L. Burtt, B.Sc.
CLERK (HIGHER GRADE)—S. F. Ormsby.

Herbarium and Library

KEEPER—A. D. Cotton, O.B.E., F.L.S.
DEPUTY KEEPER—T. A. Sprague, D.Sc., F.L.S.
BOTANISTS—Miss E. M. Wakefield, M.A., F.L.S.
W. B. Turrill, D.Sc., F.L.S.
C. V. B. Marquand, M.A., F.L.S.
V. S. Summerhayes, B.Sc.
Miss M. L. Green, B.A., F.L.S.
F. Ballard, B.Sc.
N. Y. Sandwith, M.A., F.L.S.
C. E. Hubbard, F.L.S.
E. W. B. H. Milne-Redhead, M.A.
H. K. Airy-Shaw, B.A., F.L.S.

C. E. C. Fischer (*India*).
D. G. Collett, B.Sc. (*South Africa*).
C. A. Gardner (*Western Australia*).
ASSISTANT BOTANISTS—E. Nelmes (*Library*).
Miss C. I. Dickinson, M.A., Dip. Agric.
A. A. Bullock, B.Sc.
TEMPORARY BOTANIST—E. G. S. Brown, B.Sc., Ph.D.
ARTIST—G. Atkinson.
HON. ASSOCIATE (*Transplant and Breeding Experiments*)—E. M. Marsden-Jones, F.L.S.

Jodrell Laboratory

ASSISTANT KEEPER—C. R. Metcalfe, M.A., Ph.D.

Museums

KEEPER—J. Hutchinson, LL.D., F.L.S.
ASSISTANTS—F. N. Howes, D.Sc.
R. Melville, B.Sc., Ph.D., F.L.S.

Gardens

CURATOR—W. M. Campbell, N.D.H.
ASSISTANT CURATORS—A. Osborn (*Arboretum*).
C. P. Raffill, A.H.R.H.S. (*Temperate*).
L. Stenning (*Tropical*).
S. A. Pearce (*Greenhouse and Ornamental*).
G. H. Preston (*Herbaceous*).
CLERK (HIGHER GRADE)—A. Hearn.

INDEX

A.

- Abies Douglasii* Lindl., 80.
 — *excelsa* var. *brevifolia* Cripps ex Gordon, 85.
 — *mucronata* Rafin., 80.
 — *taxifolia* Poir., 80.
Abrus mollis Hance, 276.
Abutilon graveolens var. *hirtum* Mast., 221.
Acacia Farnesiana Willd., 279.
Acanthospermum hispidum DC., 366.
Acaulon N. E. Br., 156.
 — *rosulatum* N. E. Br., 158.
Achimenes brevifolia Morton, 292.
 — *dulcis* Morton, 293.
 — *flava* var. *puberula* Morton, 293.
 — *fimbriata* Rose, 293.
Achyranthes indica Linn., 374.
Acnistus arborescens Schlecht., 370.
Acrostichum aureum Linn., 383.
 Adams, F. Presentation of Miss Mainland's index to localities of diatoms, 400.
 Additions to the flora of Borneo and other Malay islands, 110, 173, 175, 221, 275.
Adenia acuminata Koorders, 112.
 — *borneensis* H. Hallier, 112.
 — *Clementis* Merrill, 112.
 — *cordifolia* Engl., 112.
 — *populifolia* H. Hallier, 112.
 — *smilacina* H. Hallier, 112.
Adinandra cordifolia Ridley, 173.
Aegiphila perplexa Moldenke, 373.
Aeschynomene indica Linn., 277.
 Afghanistan, a new species of Delphinium from, 86.
 African orchids, 141.
 — Rubi in the Kew herbarium, notes on, 177.
 Aglaia, two new names in, 215.
Aglaia triandra Ridley, 215.
 — *trimera* Ridley, 215.
 — *triplex* Ridley, 215.
 — *unifoliolata* Ridley, 215.
Agrostis gigantea Roth., 90.
 — *tenuis* Sibth., 90.
Aira alpina Linn., 90.
 Airy-Shaw, H. K. Contributions to the flora of Borneo, 306.
 — The correct name of the common parsley, 256.
Aistocaulon Poelln., 156.
 — *rosulatum* Poelln., 158.

- Akhtar, S. A. A new species of Delphinium from Afghanistan, 86.
Albizzia stipulata Benth., 279.
Alchemilla australiana Rothm., 270.
 — *Berteroana* Briq., 289.
 — *cashmeriana* Rothm., 273.
 — *chthamalea* Rothm., 274.
 — *frigida* Wedd., 271.
 — *galioides* Benth., 271.
 — *galioides* Treviranus, 271.
 — *Hultenii* Rothm., 272.
 — *Perryana* Rothm., 271.
 — *pseudovenusta* Rothm., 271.
 — *Trollii* Rothm., 272.
 — *ypsilotoma* Rothm., 273.
Alcmene tobagensis Urb., 355.
Alibertia tobagensis Sprague et Williams, 364.
Aloinopsis Schwantes, 155.
 — *aloides* Schwantes, 158.
 — *albinota* Schwantes, 159.
 — *albipuncta* Schwantes, 159.
 — *Broomii* L. Bolus, 160.
 — *cibdela* Schwantes, 159.
 — *Dyeri* L. Bolus, 159.
 — *Gerstneri* L. Bolus, 160.
 — *Jamesii* L. Bolus, 160.
 — *Lodewykii* L. Bolus, 160.
 — *Loganii* L. Bolus, 160.
 — *pallens* L. Bolus, 160.
 — *Peersii* L. Bolus, 160.
 — *rosulata* Schwantes, 158.
 — *rubrolineata* Schwantes, 159.
 — *Schoonesii* L. Bolus, 160.
 — *transvaalensis* Schwantes, 158.
 — *vittata* Schwantes, 158.
 — *Wilmanias* L. Bolus, 160.
 Alpine house, the (review), 311.
Alseodaphne dumicola W. W. Smith, 212.
 Alston, A. H. G. Notes on the flora of Tobago: Pteridophyta, 383.
Alternanthera ficoidea R. Br., 374.
Alyssum fulvescens Sibth. et Sm., 464.
Amaranthus dubius Mart., 373.
 America, contributions to the flora of tropical, 59, 163, 292, 353.
Amorphophallus commutatus Engl., 37.
Amphilophium paniculatum H. B. K., 372.
 Anatomy of *Fraxinus oxycarpa* and *F. Pallisae*, 258.
Aneimia hirsuta Sw., 384.

- Anemopaegma carverense* Armitage, 372.
 — *tobagense* Urb., 372.
Anguria umbrosa H. B. K., 362.
Antennaria compacta Malte, 90.
 Ants of the Royal Botanic Gardens, Kew, the, 390.
Apeiba Schomburgkii Szyszyl., 357.
 — *Tibourbou* var. *membranacea* Lockh., 357.
Aphanes andicola Rothm., 289.
 — *australiana* Rothm., 270.
 — *Berteroana* Rothm., 289.
 — *forma vegeta* Rothm., 289.
 — *pentamera* Rothm., 270.
Aphelandra lineariloba Leonard, 63.
 — *tetragona* Nees, 372.
 — *verticillata* Nees, 64.
Apium crispum Mill., 257.
 — *latifolium* Mill., 258.
 — *Petroselinum* Linn., 257.
 — var. *angustifolium* Hayne, 257.
 — var. *crispifolium* Hayne, 257.
 — var. *crispum* Willm., 257.
 — var. *vulgare* Nois., 257.
 Appointments—
 Corkhill, W. J., 133.
 Evans, G., 350.
 Faulkner, O. T., 396.
 Gibbins, C. B., 397.
 Jones, G. A., 397.
 Prescott, J. A., 214.
 Richardson, A. E. V., 214.
 Robbie, J., 133.
 Robbins, W. J., 52.
Arasococcus micranthus Brongn., 379.
 Arber, A. Herbs (review), 307.
 Argentina, two new species of *Senecio* from, 197.
Arundinaria Walkeriana Munro, 128.
 Artist's herbal, an (review), 172.
 Asiatic botany, a bibliography of Eastern, 310.
Aspilula verbesinoides Blake, 366.
 Assam, a flora of (review), 312.
 —, a new *Eugenia* from, 262.
 —, plants new to, 210.
Aster Gouldii C. E. C. Fischer, 286.
 Australian agricultural appointments, 214.
Avicennia alba Blume, 443.
 — *officinalis* Linn., 443, 444.
 — var. *alba* C. B. Clarke, 444.
 — *marina* var. *alba* Bakh., 444.
 — *sphaerocarpa* Stapf ex Ridley, 443, 444.
 — *tomentosa* Roxb., 444.

- Axonopus amplifolius* Chase, 382.
 — *compressus* Beauv., 382.

B.

- Bailey, J. F. (obit.), 350.
 Baker, J. R. Rain-forest in Ceylon, 9.
 Ballard, F. Herbarium specimens and gas-poisoning, 397.
Balloia suaveolens Linn., 192.
Balsamina capensis DC., 162.
Banisteria apiculata C. B. Rob., 357.
Baphia micrantha Ridley, 280.
 Barnes, E. Flowering plants of Madras city and its immediate neighbourhood, supplement (review), 400.
Barringtonia anacardiifolia Ridley, 284.
 — *Havilandii* Ridley, 284.
Basanacantha phyllosepala Sprague et Williams, 364.
 Bausch, J. A revision of the Eucryphiaceae, 317.
Beaumontia brevifolia Oliv., 295.
Begonia humilis Ait., 362.
Becquerelia cymosa Brongn., 381.
 Bell, C. F., 52.
Beloperone longibracteata Leonard, 72.
Berginia Hintonii Leonard, 64.
Besleria Seitzii Krug et Urb., 371.
 Bewley, W. F., and Harnett, J. The cultivation of mushrooms (review), 316.
 Bibliography of Eastern Asiatic botany (review), 310.
 Binghamia, Haageocereus and *Pseudoespostoa*, 456.
Binghamia Britt. et Rose, 457.
 — *acrantha* Britt. et Rose, 457.
 — *melanostele* Britt. et Rose, 457, 458.
 — *pseudomelanostele* Bullock, 457.
Biophytum intermedium Wright, 32.
 — var. *pulneyense* Edgew. et Hook. fil., 32.
 Birthday honours, 265.
 Biswas, K. A new *Eugenia* from Assam, 262.
 Black poplars, the (review), 313.
Blechnum lanceola Sw., 383.
Boehmeria ramiflora Jacq., 377.
Boerhaavia caribaea Jacq., 373.
 Bolus herbarium, new building at the University of Cape Town for the, 470.

Bonar, L., Roush, L., and Holman, R. M. A laboratory guide for a course in general botany (review), 316.

Books—

Alpine house, the, 311.

Artist's herbal, an, 172.

Bibliography of Eastern Asiatic botany, 310.

Black poplars, the, 313.

Botanical magazine, 86, 265, 311, 399.

Cacti, 169.

Chronica botanica, 265.

Compendium van de Terminologie, &c., 308.

Critica botanica, 217.

Cultivation of mushrooms, the, 316.

Ecology in town and classroom, 172.

Flora of Assam, a, 312.

Flowering plants of Madras city and its immediate neighbourhood; supplement, 400.

Forest bibliography, 88.

Gardener's progress, a, 351.

Hardy bulbs, 170.

Herbals, 307.

How to grow roses, 136.

Laboratory guide for a course in general botany, a, 316.

Lily year-book, the, 171.

Plants for the connoisseur, 314.

Present day rock garden, the, 134.

Sixty years of botany in Britain (1875-1935), 215.

Soilless growth of plants, 314.

Swahili dictionary of plant names, a, 87.

Textbook of general botany, a, 351.

Boothman, S. The alpine house (review), 311.

Borg, J. Cacti (review), 169.

Borneo and other Malay islands, additions to the flora of, 110, 173, 175, 221, 275.

—, contributions to the flora of, 306.

Borreria eryngioides Cham. et Schlecht., 365.

— *ocymoides* DC., 365.

Borziactus Riccobono, 455.

Botanical congress, Stockholm, seventh international, 400.

— gardens of the University of British Columbia, 471.

— magazine (review), 86, 265, 311, 399.

— monkeys, 306.

— name of the Douglas fir, the, 79.

Bothriochloa intermedia var. *acidula* C. E. Hubbard, 383.

Botrychium matricarioides A. Br., 90.

Boulenger, G. A. (obit.), 84.

Bower, F. O. Sixty years of botany in Britain (1875-1935) (review), 215.

Bracher, R. Ecology in town and classroom (review), 172.

Brangham, A. N. The ants of the Royal Botanic Gardens, Kew, 390.

Brasil, four new species of Vernoniaceae collected by Glaziou in, 298.

Bridgesia and Chileniopsis, 300.

Bridgesia Backeb., 300.

British Columbia, botanical gardens of the university, 471.

Brownea latifolia Jacq., 359.

Brownlowia elliptica Ridley, 227.

— *glabrata* Stapf ex Ridley, 228.

— *Riedelii* Hemsl., 227.

— *riparia* Ridley, 228.

Brotera Spreng., 189.

— *persica* Spreng., 192.

Bruce, E. A., and Bullock, A. A. On the synonymy and distribution of *Strychnos innocua* Del., 45.

Bryce, G., 265.

Bucuragenia hirsuta Leonard, 71.

Buettneria scabra Ridley, 225.

Bulbs, hardy (review), 170.

Bullock, A. A. Binghamia, Haageocereus and Pseudoeuphorbia, 454.

— Chileniopsis and Bridgesia, 300.

— Further notes on the genus *Bursera*, 163.

— Lectotypes of *Nananthus* and *Aloinopsis*, 153.

— Neoporteria and Chilenia, 296.

— *Pedilanthus* versus *Tithymalus*, 468.

—, and Bruce, E. A. On the synonymy and distribution of *Strychnos innocua* Del., 45.

—, and Marquand, C. V. B. *Callicarpa subpubescens* Hook. et Arn., 399.

—, and Sprague, T. A. *Penstemon campanulatus* and *P. Kunthii*, 1.

Burma, contributions to the flora of, 294.

Bursera, further notes on the genus, 163.

Bursera bicolor Engl., 163.

— *bipinnata* Engl., 164.

— *coyucensis* Bullock, 164.

— *diversifolia* Rose, 164.

Bursera dubia Bullock, 165.

— *elemifera* Baill., 164.

— *excelsa* Engl., 165.

— *fragrantissima* Bullock, 165.

— *glabrifolia* Engl., 164.

— *grandifolia* Engl., 165.

— var. *robusta* Bullock, 166.

— *heterosthes* Bullock, 166.

— *Hintoni* Bullock, 166.

— *laxiflora* S. Wats., 166.

— *longipes* Standl., 166.

— *ovalifolia* Engl., 167.

— *penicillata* Engl., 167.

— *sessiliflora* var. *pubivalvis* Bullock, 167.

— *Simaruba* Sarg., 358.

— *Tecomaca* Standl., 168.

— *trimera* Bullock, 168.

— *velutina* Bullock, 168.

Burt, B. D. (obit.), 301.

Burt, B. L. Meerburgh's *Impatiens capensis*, 161.

— The taxonomic position of *Tetralthalamus*, 458.

C.

Cabrera, A. L. Two new species of *Senecio* from Argentina, 197.

Cacti (review), 169.

Cactus Humboldtii H. B. K., 456.

— *isogona* H. B. K., 456.

— *villosus* Monville, 301.

Calanthe biloba Lindl., 213.

Callicarpa angustifolia King et Gamble, 412, 413.

— *arborea* Roxb., 411, 412.

— var. *villosa* King et Gamble, 411, 413.

— *cana* Linn., 412, 413.

— var. *typica* Bakh., 413.

— *cuspidata* Roxb., 414, 415.

— *glandulosa* Fletcher, 199, 412, 414.

— *lanata* Linn., 412, 413.

— *longifolia* Lam., 412, 414.

— var. *lanceolaria* C. B. Clarke, 412, 414.

— var. *subglabrata* Schauer, 414.

— *macrophylla* Vahl, 412, 414.

— *Maingayi* King et Gamble, 411, 413.

— *Poileanei* Dop, 412, 413.

— *psilocalyx* C. B. Clarke, 412, 415.

— *rubella* Lindl., 412, 414.

— *subpubescens* Hook. et Arn., 399.

— *tomentosa* Linn., 412.

— var. *lanata* Bakh., 413.

— var. *typica* Bakh., 413.

Callicarpa villosa Roxb., 413.

— *villosissima* Ridley, 412.

Calophyllum Benjamina Ridley, 119.

— *cuspidatum* Ridley, 119.

— *elegans* Ridley, 118.

— *fragrans* Ridley, 120.

— *frutescens* Ridley, 121.

— *glaucescens* Ridley, 120.

— *globuliferum* Ridley, 121.

— *Hosei* Ridley, 120.

— *Molloyi* Ridley, 122.

— *palustre* Ridley, 121.

— *pustulatum* Ridley, 118.

Calyptanthus sericea Griseb., 360.

— sp. ? 360.

Calyptrocarya glomerulata Urb., 382.

— *intermedia* C. B. Clarke, 382.

Canavalia rosea DC., 276.

— *turgida* Grah., 277.

Cansdale, A. S., and others. The black poplars (review), 313.

Capparis flexuosa Linn., 355.

Carallia confinis var. *pauciflora* Bl., 282.

— *coriifolia* Ridley, 283.

— *cuprea* Ridley, 282.

— *viridiflora* Ridley, 282.

Carapa borneensis Becc., 290.

— *carnosula* Zoll. et Mor., 288.

— *indica* Juss., 291.

— *moluccensis* Lam., 288.

— *obovata* Bl., 288.

— *procera* DC., 292.

Carex, notes in, 106, 242.

Carex aethiopica var. *stolonifera* Boeck., 247.

— *cuprea* Nelmes, 247.

— *cyrtosaccus* C. B. Clarke, 244.

— *elgonensis* Nelmes, 245.

— *exploratorum* Nelmes, 108.

— *Graeffeana* Boeck., 109.

— var. *samoensis* Nelmes, 110.

— *Greenwayi* Nelmes, 244.

— *illegitima* Cesati, 468.

— *longipedunculata* subsp. *cuprea* Kükenth., 247.

— *Mackenziei* Krecz, 90.

— *magellanica* Lam., 90.

— *norvegica* Willd. ex Schk., 90.

— *philippinensis* Nelmes, 109.

— *Preussii* K. Schum., 246.

— var. *camerunensis* Nelmes, 247.

— *simensis* var. *stolonifera* Kükenth., 247.

— *Thomasii* Nelmes, 245.

— *vallis-rosae* K. Schum., 243.

Careya lanceolata Ridley, 285.

- Carlourrightia coyucana* Leonard, 67.
 — *lanceolata* Leonard, 66.
 — *mucronata* Leonard, 66.
Carludovica coronata Gleason, 380.
 — *insularis* Gleason, 380.
Carpodontos Labill., 318.
 — *lucidus* Labill., 326.
Carum Petroselinum Benth., 257.
 — var. *crispum* Beck, 258.
 — var. *typicum* Beck, 258.
Caryopteris paniculata C. B. Clarke, 437.
Casearia Moultonii Ridley, 111.
 — *spinescens* Griseb., 355.
 — *Stapfiana* Ridley, 110.
 — *sylvestris* Sw., 355.
Cassia bacillaris Linn. fil., 359.
 — *patellaria* DC., 359.
Castanola insignis Schellenb., 275.
Castanopsis purpurea Barnett, 105.
Catasetum macrocarpum Rich., 377.
Catopsis sessiliflora Mez, 379.
Cayaponia racemosa Cogn., 362.
 Cell theory, the centenary of the, 472.
 Centenary of the cell theory, the, 472.
Cephaelis muscosa Sw., 365.
Cephalocereus melanostele Vaupel, 458.
Ceratanthus calcaratus G. Taylor, 296.
Ceratophyllum tobagenense Sprague et Sandwith, 373.
Cereus aurovillus K. Schum., 456.
 — *pseudomelanostele* Werderm. et Backeb., 457.
Cestrum alternifolium var. *pendulinum* O. E. Schulz, 370.
 Ceylon, rain-forest in, 9.
Chalerothyrsus amplexicaulis Lindau, 65.
 Chandler, S. E., 265.
Chaptalia nutans Polak, 367.
Cheirostylis pauciflora Lindl., 126.
Chelone angustifolia H. B. K., 4.
 — *atropurpurea* Sweet, 5, 6.
 — *campanulata* Cav., 3.
 — *campanuloides* Andr., 5.
 — *elegans* H. B. K., 5, 6.
 — *rosea* Sweet, 5, 7.
Chilenia and *Neoporteria*, 296.
Chilenia Backeb., 297.
Chileniopsis and *Bridgesia*, 300.
Chileniopsis Backeb., 301.
Chiococca parvifolia Wulfschl. ex Griseb., 364.
 Chronica botanica (review), 265.
Chrysophyllum argenteum Jacq., 367.
Cirrhopetalum elatum Hook. fil., 213.
 — *Wallichii* Lindl., 213.
Citharexylum spinosum Linn., 373.
 Clay, S. The present day rock garden (review), 134.
Clematis caracasana DC., 355.
 — *Buchananiana* DC., 294.
 — *Kerriana* Drumm. et Craib, 294.
 — *subpeltata* Wall., 295.
Cleome aculeata Linn., 355.
Clerodendrum calamitosum Linn., 431.
 — *Colebrookianum* Walp., 490.
 — *deflexum* Wall., 424, 426.
 — *disparifolium* Blume, 424, 426, 427.
 — *fragrans* Willd., 425, 430.
 — *Garrettianum* Craib, 424, 427.
 — *glandulosum* Colebr. ex Lindl., 425, 430.
 — *gratum* Kurz, 437.
 — *hastato-oblongum* C. B. Clarke, 428.
 — *indicum* O. Kuntze, 425, 431.
 — *inermis* Gaertn., 424, 425, 426.
 — var. *neriifolium* Wall., 425.
 — *infortunatum* Linn., 425, 430.
 — *lankawiense* King et Gamble, 426.
 — *lasioccephalum* C. B. Clarke, 425, 430.
 — *Lloydianum* Craib, 424, 427.
 — *macrophyllum* var. *myrmecophilum* Ridley, 428.
 — *neriifolium* Wall. ex Schauer, 424, 425, 426.
 — *nutans* Wall., 427.
 — *paniculatum* Linn., 425, 429.
 — *penduliflorum* Wall. ex Schauer, 424, 427.
 — *Schmidtii* C. B. Clarke, 424, 428.
 — *serratum* Spreng., 425, 428.
 — var. *Wallichii* C. B. Clarke, 425, 429.
 — *siphonanthus* C. B. Clarke, 431.
 — *umbratile* King et Gamble, 424, 428.
 — *Vanprukii* Craib, 425, 428.
 — *venosum* Wall. ex C. B. Clarke, 425, 428.
 — var. *pubescens* Fletcher, 205, 425, 428.
 — *villosum* Blume, 425, 429.
Clidadium surinamense Linn., 366.
Clidemia hirta D. Don, 361.
 — var. *elegans* Griseb., 361.
 — *pustulata* DC., 361.
 — *trinensis* Griseb., 361.
Clinopodium chamaedrys Vahl, 187.
Clitoria rubiginosa Juss., 359.
Clusia minor Linn., 355.
Cnestis palata Merrill, 275.
Coccoloba venosa Linn., 374.
Codonanthe Eggersii Urb., 371.
Colchicum hiemale Freyn, 468.
 — *Steveni* Kunth, 467.
Coleus Blumei Benth., 188, 373.
Columnnea scandens Linn., 371.
Combretum chinense var. *pubescens* King, 283.
 — *sundaicum* Miq., 283.
 Compendium van de Terminologie, &c. (review), 308.
Congea azurea Wall., 440.
 — *connata* Fletcher, 208, 440.
 — *siamensis* Fletcher, 209, 440.
 — *tomentosa* Roxb., 439, 440.
 — var. *azurea* C. B. Clarke, 439, 440.
 — *villosa* Wight, 439, 440.
 Congress, Stockholm, seventh international botanical, 400.
 Conifer names, new, 85.
Connarus euphlebius Merrill, 275.
 — *falcatus* Bl., 275.
 — *grandis* Jack, 275.
 — *Jachianus* Schellenb., 276.
 — *mutabilis* Bl., 276.
 — *odoratus* Hook. fil., 276.
 — *villosus* Jack, 276.
 — *Winkleri* Schellenb., 276.
 Connoisseur, plants for the (review), 314.
Conostegia icosandra Urb., 361.
 Contributions to the flora of Borneo, 306.
 Contributions to the flora of Burma, 294.
 Contributions to the flora of Siam, 24, 98, 127, 199, 445.
 Contributions to the flora of tropical America, 59, 163, 292, 353.
 Convolvulaceae collected by the Oxford University Expedition to Sarawak, 175.
Convolvulus stoloniferus Cyr., 466.
Copiapoa cinerascens Britt. et Rose, 298.
Corchorus acutangulus Lam., 229.
 — *aestuosus* Linn., 357.
Cordia Clarkei Brace ex Prain, 211.
 Corkhill, W. J., 133.
Cornutia corymbosa Burm. fil., 418.
 — *quinata* Lour., 434.
 Cotton, A. D., 264.
Contoubea spicata Aubl., 368.
 Coutts, J., 52.
Craibiodendron Henryi W. W. Smith, 210.
 — *Mannii* W. W. Smith, 210.
Craniolome versicolor Reichb., 296.
Cratoxylon celebicum Bl., 115.
Cratoxylon cochinchinense var. *calcareum* Ridley, 115.
 — *floribundum* F.-Vill., 115.
 — *formosum* Dyer, 115.
 Critica botanica (review), 217.
 Croizat, L. Euphorbia (Diacanthium) Deightonii, a new succulent from West Africa, with brief notes on some allied species, 53.
Crossandra Haenkeana Nees, 64.
Crotalaria assamica Benth., 295.
 — *retusa* Linn., 276.
 — *chinensis* Linn., 276.
Croton gossypifolius Vahl, 376.
 — *lobatus* Linn., 376.
 Cultivation of mushrooms, the (review), 316.
 Cultivation of plants without soil (review), 314.
Cuphea denticulata H. B. K., 362.
 — *setosa* var. *glabrescens* Koehne, 362.
Curculigo scorzonifolia Baker, 379.
Cyclocarpa stellaris Afzel., 277.
Cynometra Elmeri Merrill, 279.
 — *inaequalifolia* A. Gray, 279.
Cynorchis gabonensis Summerhayes, 143.
 — *parva* Summerhayes, 148.
Cyphomandra tobagenensis Sandwith, 370.
 Cyprus, additions to the flora of, 460.
 D.
Danthonia spicata Beauv., 90.
Daphnopsis caribaea Griseb., 375.
 Das, A., Kanjilal, U. N., and Kanjilal, P. C. A flora of Assam (review), 312.
 Delphinium from Afghanistan, a new species of, 86.
Delphinium kabulianum Akhtar, 86.
Deschampsia alpina Roem. et Schult., 90.
 — *caespitosa* Beauv., 90.
Desmanthus depressus H. et B., 360.
Desmodium cephalotes Wall., 277.
 — *gangeticum* DC., 277.
 — *laxiflorum* DC., 277.
 — *ovalifolium* Wall., 277.
 — *pulchellum* Desr., 277.
 — *reticulatum* Champ., 277.
Desmoncus horridus Splitg., 380.
Dianthus cyprius A. K. Jackson et Turrill, 462.
 Diatoms, index to localities of, 400.
Diceratostele Summerhayes, 151.
 — *gabonensis* Summerhayes, 151.

Dichapetalum tetramerum Ridley, 234.
Dichromena ciliata Vahl, 381.
 — *ebracteata* Standl., 381.
Dicliptera aquatica Leonard, 70.
Didymocarpus Gambleanus C. E. C. Fischer, 36.
 — *lanuginosus* Wight, 37.
 — *macrostachyus* E. Barnes, 37.
 — *Rottlerianus* var. *lanuginosus* C. B. Clarke, 37.
Dimetra Kerr, 127.
 — *Craibiana* Kerr, 127.
Diplacorchis conica Summerhayes, 141.
Dioclea megacarpa Rolfe, 359.
Dioscorea alata Linn., 380.
Diospyros glandulosa Lace, 210.
 — *Vanprukii* Bakh., 24.
 Director, the, 133, 214.
Disa patula var. *transvaalensis* Summerhayes, 148.
 — *stenoglossa* H. Bolus, 149.
 Diseases in Nigeria, a preliminary list of plant, 17.
 Douglas Fir, the botanical name of the, 79.
Drymaria cordata Willd., 355.
Drymonia serrulata Mart., 371.
Dryopteris pyramidata Maxon, 383.
Duguetia tobagensis R. E. Fries, 355.
 Dunn, S. T. (obit.), 214.
Duranta Plumieri Jacq., 411.
Durio cupreus Ridley, 221.

E.

Echinocactus ambiguus Hildm., 298.
 — *Aspillagai* Söhrens, 298.
 — *Cumingii* Hopffer, 300.
 — *Fobeanus* Miesckley, 298.
 — *fuscus* Mühlenpfordt, 298.
 — *Jussieu* Monville, 297.
 — *Kunzii* Först., 298.
 — *napinus* Philippi, 298.
 — *nidus* Söhrens, 297.
 — *occultus* Philippi, 298.
 — *Reichei* K. Schum., 298.
 — *senilis* Philippi, 298.
 — *subgibbosus* Haw., 297.
Echinocalyx Benth., 75.
Echinops nivus Wall., 295.
 Ecological isolation, 384.
 Ecology in town and classroom (review), 172.
Ehretia macrophylla Wall., 211.
Elaeocarpus Beccarii Warb., 234.
 — *brevipes* Merrill, 233.
 — *crassifolius* Ridley, 231.
 — *euneurus* Stapf, 234.

Elaeocarpus Gambir Becc., 233.
 — *glaber* Bl., 234.
 — *Hullettii* King, 234.
 — *insignis* Ridley, 231.
 — *Jackianus* Wall., 234.
 — *lasionyx* Stapf ex Ridley, 232.
 — *luridus* Stapf ex Ridley, 232.
 — *Mastersii* King, 234.
 — *microphyllus* Warb., 234.
 — *ochraceus* Stapf ex Ridley, 230.
 — *parvifolius* Wall., 234.
 — *polyanthus* Ridley, 230.
 — *polycarpus* Stapf ex Ridley, 230.
 — *polystachyus* var. *borneensis* Ridley, 229.
 — *Scortechinii* King, 234.
 — *sphaeroblastus* Stapf ex Ridley, 233.
 — *stipularis* Bl., 233.
 — *lomentosus* Bl., 233.
Elaphoglossum Lingua Brack., 383.
Eleutheranthera ruderalis Sch. Bip., 367.
Ellipanthus Kingii Boerl. et Koord., 275.
 — *sarawakensis* Schellenb., 275.
 Ellis, C., and Swaney, M. W. Soilless growth of plants (review), 314.
Emilia sonchifolia DC., 367.
Entada polystachya DC., 360.
Epidendrum fragrans Sw., 377.
Episcia mimuloides Benth., 371.
 Epling, C. A synopsis of the Labiatae of the Guianas, 187.
Eranthemum ciliatum R. Ben., 212.
 — *fasciculatum* Oerst., 69.
Eremanthus curumbensis Philipson, 298.
 — *pinnatifidus* Philipson, 299.
Erigeron bonariensis Linn., 366.
 — *spathulatus* Vahl, 366.
Erithalis fruticosa Linn., 364.
 — *odorifera* Jacq., 364.
Eryngium foetidum Linn., 363.
Erythroxylum cumanaense H. B. K., 357.
 — *ovatum* var. *splendens* O. E. Schulz, 357.
Espositoa Britt. et Rose, 458.
 — *melanostele* Bullock, 458.
Eucryphia Cav., 318.
 — *Billardieri* Spach, 327.
 — var. *Milliganii* Benth., 329.
 — *cordata* Cav., 332.
 — *cordifolia* Cav., 331.
 — *glandulosa* Focke, 322.
 — *glutinosa* Baill., 322.
 — var. *plena* hort., 324.

Eucryphia lucida Baill., 326.
 — var. *Milliganii* Summerhayes, 329.
 — *hybrida* Bausch, 331.
 — *intermedia* Bausch, 325.
 — *Milliganii* Hook. fil., 329.
 — *Moorei* F. Muell., 320.
 — *nymansay*, 325.
 — *nymansensis* Bausch, 324.
 — *patagonica* Speg., 335, 336.
 — *pinnatifida* C. Gay, 322.
 — *pinnatifolia* C. Gay, 322.
 — *Rostrevor*, 325.
 Eucryphiaceae, a revision of the, 317.
 Eugenia from Assam, a new, 262.
Eugenia assamica Biswas et Purkayastha, 262.
 — *monticola* var. *latifolia* Krug et Urb., 361.
 — *Cruegeri* Krug et Urb., 361.
Eulophia Helleborina Hook. fil., 143.
Eupatorium inulifolium forma *suaveolens* Hieron., 365.
 — *macrophyllum* Linn., 366.
 Euphorbia (Diacanthium) Deightonii, a new succulent from West Africa, with brief notes on some allied species, 53.
Euphorbia aleppica Linn., 466.
 — *Apios* Linn., 467.
 — *Barleri* N.E. Br., 54, 55.
 — *biglandulosa* Desf., 467.
 — *Deightonii* Croizat, 58.
 — *garuana* N.E. Br., 54.
 — *Hermestiana* Lem., 54.
 — *kamerunica* Pax, 53.
 — *lasiocarpa* Kl., 375.
 — *Maddeni* Boiss., 213.
 — *Myrsinites* Linn., 467.
 — *Oerstadiana* Boiss., 376.
 — *thymifolia* Linn., 376.
 — *trigona* Haw., 54.
 Evans, G., 350.
Evolvulus sericeus Sw., 369.
Exacum pumilum Griseb., 36.
 Extra-floral nectaries on Osmanthus leaves, 254.

F.

Fagus orientalis in Greece, on the occurrence of, 38.
Fagus glandulosa Poepp. et Endl., 322.
 — *glutinosa* Poepp. et Endl., 322.
 — *orientalis* Lipsky, 38.
 — *silvatica* Linn., 38.
 Faulkner, O. T., 396.
 Fauna and flora of the Royal Botanic Gardens, Kew, additions to the wild, 390.

Ficus grenadensis Warb., 376.
Fimbristylis ferruginea Vahl, 381.
 — *monostachya* Hassk., 381.
 Fischer, C. E. C. Plants new to Assam, 210.
 — Three new species from Tibet, 285.
Fleurya aestuans Gaud., 376.
 Flora of Assam, a (review), 312.
 — of Borneo and other Malay islands, additions to the, 110, 173, 175, 221, 275.
 — of Borneo, contributions to the, 306.
 — of Burma, contributions to the, 294.
 — of Cyprus, additions to the, 460.
 — of Siam, contributions to the, 24, 98, 127, 199, 445.
 — of the city of Madras (review), 400.
 — of the nearer East, on the, 460.
 — of tropical America, contributions to the, 59, 163, 292, 353.
 Forest bibliography (review), 88.
 Formation of intumescences containing fatty substances on the stem of Khaya ivorensis, the, 137.
 Four new species of Vernoniae collected by Glaziou in Brasil, 298.
Fraxinus oxycarpa and *F. Pallisae*, anatomy of, 258.
Fritillaria acmopetala Boiss., 467.
 Fumigation of herbarium specimens, 397.

G.

Galedupa Echinocalyx Prain, 75.
 — *intermedia* Prain, 75.
 — *Wallichiana* Prain, 75.
 Gardener's progress, a (review), 351.
 Gardner, H. M., 285.
Garcinia caudiculata Ridley, 116.
 — *calophyllifolia* Ridley, 115.
 — *Havilandii* Stapf, 118.
 — *lanceola* Ridley, 116.
 — *memecyloides* Ridley, 117.
 — *minimiflora* Ridley, 118.
 — *umbellulata* Ridley, 117.
 — *vidua* Ridley, 115.
Garrettia siamensis Fletcher, 437.
Gastrochilus pseudodistichus Schlechter, 213.
Gentiana Amarella var. *uliginosa* Wahlenb., 90.
 — *serra* Franch., 296.
Geranium columbinum Linn., 464.
Geum heterocarpum Boiss., 465.

Geunsia farinosa Bl., 415.
 — var. *typica* forma *farinosa* Bakh., 415.
 — *pentandra* Merrill, 415.
 Gibbins, C. B., 397.
 Glaziou in Brasil, four new species of Vernoniaceae collected by, 298.
Gleichenia bifida Spreng., 384.
 — *flexuosa* Mett., 384.
Glossocarya crenata Fletcher, 205, 437, 438.
 — *longiflora* Fletcher, 205, 437, 438.
 — *mollis* Wall. ex Griff., 437.
 — *prennoides* Ridley, 437, 438.
 — *siamensis* Craib, 437, 438.
Gmelina arborea Roxb., 422.
 — *asiatica* Linn., 422, 423.
 — var. *philippinensis* Bakh., 423.
 — var. *typica* Bakh., 423.
 — var. *villosa* Bakh., 423.
 — *attenuata* Fletcher, 203, 422.
 — *Hystrix* Schult. ex Kurz, 422.
 — *paniculata* Fletcher, 204, 422.
 — *tomentosa* Fletcher, 204, 422, 423.
 — *villosa* Roxb., 422, 423.
Gnoteris Raf., 189.
Gonzalagunia spicata Maza, 364.
Gonolobus ciliatus Schlechter, 368.
 — *tobagensis* Urb., 368.
 — *viridiflorus* Roem. et Schult. 368.
Gouania polygama Urb., 358.
 Goulding, E. (obit.), 133.
 Grebenchikoff, O. On the occurrence of *Fagus orientalis* in Greece, 38.
 Greece, on the occurrence of *Fagus orientalis* in, 38.
 Green, M. L., and Sprague, T. A. The botanical name of the Douglas fir, 79.
 Greenland, 1937, notes on a botanical journey in S.W., 89.
 Greenway, P. J. A Swahili dictionary of plant names (review), 87.
Grewia glabra Bl., 229.
 — *umbellata* Roxb., 229.
 Grey, C. H. Hardy bulbs (review), 170.
 Grove, W. B. (obit.), 82.
 Growth of plants, soilless (review), 314.
 Guianas, a synopsis of the Labiatae of the, 187.
Guettarda parviflora Vahl, 364.
 — *scabra* Lam., 364.
Guilandina Wallichiana Graham, 75.
 Gustafsson, C. E. Notes on African Rubi in the Kew herbarium, 177.

Guttiferae, the genus *Tetralthalamus* excluded from, 458.
Gymnadenia macrantha Lindl., 143.
Gymnanthera insularum King et Gamble, 447.
Gymnemopsis calcicola Kerr, 451.-

H.

Haageocereus Backeb., 457.
 — *auricolor* Backeb., 455.
 — *pseudomelanostele* Backeb., 457.
 — *rigidissimus* Backeb., 455.
Habenaria alata Hook., 377.
 — *ceratopetala* A. Rich., 144.
 — *cornuta* Lindl., 144.
 — *cornutella* Summerhayes, 144.
 — *dactylostigma* Schlechter, 146.
 — *gabonensis* Reichb. fil., 144.
 — *Helleborina* Nichols., 143.
 — *hetaeroides* Summerhayes, 147.
 — *Lelyi* var. *macroceras* Summerhayes, 148.
 — *Linderi* Summerhayes, 146.
 — *microsaccus* Kraenzl., 146.
 — *Milnei* Reichb. fil., 144.
 — *parva* Summerhayes, 148.
 — *psiloceras* Welw. ex Reichb. fil., 144.
 — *Staudtiana* Kraenzl., 144.
 — *Staudtii* Kraenzl. ex Rolfe, 144.
 — *stenorhynchos* Schlechter, 146.
 — *subcornuta* Schlechter, 144.
 Hardy bulbs (review), 170.
 Harnett, J., and Bewley, W. F. The cultivation of mushrooms (review), 316.
 Hay, T., 285.
 — Plants for the connoisseur (review), 314.
Hedychium venustum Wight, 213.
Heliconia hirsuta Linn. fil., 378.
 — *psittacorum* Linn. fil., 379.
Henrietta multiflora Naud., 362.
 Herbal, an artist's (review), 172.
 Herbars (review), 307.
 Herbarium specimens and gas-poisoning, 397.
Heteropteris macrostachya Juss., 357.
Hibiscus radiatus Cav., 221.
Hippocratea brachystachys Ridley, 241.
 — *indica* Willd., 242.
 — *macrantha* Korth., 242.
 — *trilobulata* Ridley, 241.
 — *volubilis* Linn., 358.
Hippothronia Benth., 189.
Hirtella silicea Griseb., 360.
 — *triandra* Sw., 360.

Hole, R. S. (obit.), 305.
 Holman, R. M., and Robbins, W. W. A textbook of general botany (review), 351.
 —, Roush, L., and Bonar, L. A laboratory guide for a course in general botany (review), 316.
Homalium calciphilum Ridley, 112.
 — *caryophyllaceum* Benth., 111.
 — *frutescens* Warb., 111.
 — *Hosoi* Merrill, 111.
 — *obovale* Teyssm., 111.
 Hort, A. The "Critica Botanica" of Linnaeus (review), 217.
 Horticultural autobiography, a (review), 351.
 Hubbard, C. E. Notes on the flora of Tobago: Gramineae, 382.
Hymenopyramis acuminata Fletcher, 206, 438.
 — *brachiata* Wall. ex Kurz, 438, 439.
 — *cana* Craib, 438, 439.
 — *siamensis* Craib, 438, 439.
 — *vesiculosa* Fletcher, 206, 438.
Hypoestes triflora Roem. et Schult., 296.
Hypothronia Schrank, 189.
Hypoxis decumbens Linn., 379.
Hyptis Jacq., 189.
 — *acuta* Benth., 195.
 — *arbores* Benth., 190, 191.
 — subsp. *bracteosa* Briq., 191.
 — subsp. *guianensis* Briq., 191.
 — *aspera* Mart. et Gal., 193.
 — *atrovirens* Poit., 196, 373.
 — *barbata* Schrank, 193.
 — *brevipes* Poit., 195.
 — var. *glabrior* Benth., 195.
 — var. *lanceifolia* Briq., 195.
 — var. *remotidens* Briq., 195.
 — var. *serrata* Briq., 195.
 — *canaminensis* Rusby, 193.
 — *canescens* Kunth, 193.
 — var. *arvensis* Benth., 193.
 — *capitellata* Jenn., 194.
 — *Chamaedrys* Willd., 188.
 — *crenata* var. *angustifolia* Benth., 194.
 — *congesta* Leonard, 192.
 — *dilatata* Benth., 194.
 — *globifera* G. F. W. Meyer, 195.
 — *hirsuta* Kunth, 195.
 — *inflata* Spreng., 188.
 — *inundata* Hertzog, 194.
 — *jurruana* Loesn. ex Pilger, 196.
 — *laciniata* Benth., 193.
 — *lanceifolia* Thonn., 195.

Hyptis lanceolata Poir., 195.
 — *lantanifolia* Poit., 196.
 — var. *glabra* Kosterm., 196.
 — *lurida* Spreng., 188.
 — *melanosticta* Griseb., 195.
 — *micrantha* Pohl ex Benth., 193.
 — *microcephala* Bert. ex Benth., 194.
 — *microphylla* Pohl ex Benth., 194.
 — *mutabilis* Briq., 192.
 — var. *Bromfieldi* Briq., 192.
 — var. *canescens* Briq., 193.
 — var. *cuneata* Briq., 193.
 — var. *micrantha* Briq., 193.
 — var. *Pavoniana* Briq., 193.
 — var. *polystachya* Briq., 193.
 — var. *rostrata* Briq., 192.
 — var. *spicata* Briq., 192.
 — *nepetoides* Fisch. ex Schrank, 192.
 — *paludosa* St. Hil. ex Benth., 194.
 — *Parkeri* Benth., 196.
 — var. *verbenifolia* Epl., 196.
 — *pascuorum* Mart. ex Schmidt, 196.
 — *pectinata* Poit., 190, 192, 373.
 — *Plumieri* Poit., 192.
 — *polystachya* Kunth, 193.
 — var. *longiflora* Benth., 193.
 — *procumbens* Cham. et Schlechtd., 196.
 — *pseudo-chamaedrys* Poit., 188.
 — *recurvata* Poit., 194.
 — var. *grandifolia* Benth., 194.
 — var. *hirsutior* Benth., 194.
 — *rostrata* Salzm. ex Benth., 192.
 — *Salzmanni* Benth., 190, 191.
 — var. *filipes* Benth., 191.
 — *singularis* Glaziou, 192.
 — *siderotricha* Briq., 195.
 — *spicata* Poit., 192.
 — var. *Bromfieldi* Benth., 193.
 — var. *micrantha* Benth., 192.
 — var. *rostrata* Benth., 192.
 — *suaveolens* Poit., 190, 192.
 — *tenella* Briq. et Spruce, 196.
 — *tenuiflora* Benth., 192.
 — *trichocalyx* Briq. ex Micheli, 193.
 — *verbenifolia* Mart. ex Schmidt, 196.

I.

Ichnanthus pallens Munro, 382.
Illigera villosa C. B. Clarke, 212.

Impatiens Akha Bedd., 34.
 — *biflora* Walt., 161, 162.
 — *capensis* Meerburgh, 162.
 — *Duthiae* L. Bolus, 162.
 — *fulva* Nutt., 161, 162.
 — *Marlothiana* G. M. Schulze, 162.
 — *munnaensis* E. Barnes, 32.
 — *pandata* E. Barnes, 33.
 India, new or little known plants from southern, 32, 123.
Indigofera tinctoria Linn., 276.
Inga punctata Willd., 360.
 International botanical congress, Stockholm, seventh, 400.
Ipomoea littoralis Boiss., 466.
 — *stolonifera* J. F. Gmel., 466.
 — *triloba* Linn., 369.
Isachne disperma Doell., 383.
 Isolation, ecological, 384.

J.

Jackson, A. K., and Turrill, W. B.
 Additions to the flora of Cyprus, 460.
Jacobinia capitata Leonard, 71.
Jacquemontia elongata Britton, 369.
 — *tomentella* var. *micrantha* H. Hallier, 175.
Jacquinia Barbasco Mez, 367.
 — *revoluta* Jacq., 367.
Jasminum calcicolum Kerr, 26.
 — *carissoides* Kerr, 27.
 — *Craibianum* Kerr, 27.
 — *dumicola* W. W. Smith, 210.
 — *insularum* Kerr, 28.
 — *plumosum* Kerr, 28.
 — *Puffi* Kerr, 29.
 — *rarum* Kerr, 29.
 — *sempervirens* Kerr, 30.
 — *stellipilum* Kerr, 30.
 — *trangense* Kerr, 31.
 — *virgatum* Kerr, 31.
 Jones, G. A., 265, 397.
Justicia comata Lam., 373.

K.

Kanjilal, P. C., Kanjilal, U. N., and Das, A. A flora of Assam (review), 313.
 Kanjilal, U. N., Kanjilal, P. C., and Das, A. A flora of Assam (review), 312.
Kayea calophylloides Ridley, 123.
 — *oblongifolia* Ridley, 122.
 — *paniculata* Merrill, 123.
 Kew, the ants of the Royal Botanic Gardens, 390.
Khadia carolinensis L. Bolus, 160.

Khaya ivorensis, the formation of intumescences containing fatty substances on the stem of, 137.
Khaya ivorensis A. Chev., 137.
 — *senegalensis* DC., 137.
Kokoona lanceolata Ridley, 237.
 — *ovato-lanceolata* Ridley, 236.
Knema glauca Warb., 307.
Krugia ferruginea Urb., 360.
Kurrimia minor Ridley, 235.
 — *paniculata* Wall., 235.
Kyllinga monocephala Rottb., 381.

L.

Labiatae of the Guianas, a synopsis of the, 187.
 Laboratory guide for a course in general botany, a (review), 316.
Lachemilla arborescens Rothm., 270.
 — *frigida* Rothm., 271.
 — *galloides* Rothm., 271.
 — *Hultenii* Rothm., 272.
 — *Mutellina* Rothm., 271.
 — *Perryana* Rothm., 271.
 — *pseudovernusta* Rothm., 271.
 — *Steinbachii* Rothm., 271.
 — *Trevirani* Rothm., 271.
Lactuca triquetra Boiss., 465.
Lagenandra toxicaria var. *Barnesii* C. E. C. Fischer, 126.
Lantana aculeata Linn., 410.
 — *Camara* Linn., 410.
 — *indica* Roxb., 410.
 — *mixta* Linn., 410.
 — *salviifolia* Jacq., 410.
Lasiacis divaricata Hitchcock, 382.
 Leckie, W. G., 265.
 Lectotypes of *Nananthus* and *Aloinopsis*, 153.
 Leonard, E. C. *Plantae hintonianae*: *Acanthaceae*, 59.
Leonotis nepetifolia R.Br., 187.
Leonurus sibiricus Linn., 187.
Lepidogathis alopecuroides Griseb., 373.
Leptochloa virgata Beauv., 382.
Leucaena glauca Benth., 360.
 Lily year-book, the (review), 171.
Lindenbergia philippensis Benth., 211.
 Linnaeus, the "Critica Botanica" of (review), 217.
Linociera calcicola Kerr, 129.
 — *caribaea* Knobl., 367.
 — *erionrhachis* Kerr, 130.
 — *microbotrya* Kerr, 130.
 — *procera* Kerr, 131.
 — *sutepensis* Kerr, 131.
 — *velutina* Kerr, 132.

Lippia nodiflora Rich., 410.
Lithocarpus aggregatus Barnett, 104.
 — *Craibianus* Barnett, 103.
 — *Falconeri* Rehder, 102, 472.
 — *lappaceus* Rehder, 100, 472.
 — *longispinus* Barnett, 100.
 — *intermedius* Barnett, 101.
 — *pallaniensis* Barnett, 104.
 — *recurvatus* Barnett, 101.
 — *rufescens* Barnett, 102.
Lobivia Britt. et Rose, 300.
Lobularia maritima Desv., 461.
Loxanthocereus Backeb., 457.
Lycianthes pauciflora subsp. *tobagoensis* Bitt., 369.
Lycopsis arvensis Linn., 211.

M.

McFarland, J. H., and Pyle, R.
 How to grow roses (review), 136.
Maba inconstans Griseb., 367.
 Mainland, A. M. Index to localities of diatoms, 400.
Malacocarpus napinus Britt. et Rose, 298.
 — *Reichei* Britt. et Rose, 298.
Malanea macrophylla Bartl., 364.
 Malayan species of *Sindora*, a note on certain, 73.
 Malay islands, additions to the flora of Borneo and other, 110, 173, 175, 221, 275.
Malvastrum coromandelianum Garcke, 356.
Mandevilla hirsuta K. Schum., 368.
 — *subsagittata* Woodson, 368.
 Mansfield, L. An artist's herbal (review), 172.
Maranta gibba Sm., 378.
Marcgravia tobagensis Urb., 356.
Marila grandiflora Griseb., 355.
 Marquand, C. V. B., and Bullock, A. A. *Callicarpa* subpubescens Hook. et Arn., 399.
Marsdenia calcicola Kerr, 452.
 — *ericaulis* Kerr, 452.
 — *macrophylla* Fourn., 368.
 — *maculata* Hook., 368.
 Marsden-Jones, E. M., and Turrill, W. B. Researches on *Silene maritima* and *S. vulgaris*: xxi. Further research on the genetics of anthocyanin and other characters in *S. maritima*, 248.
Marssonina subcaulis Urb., 371.
Marsypianthes Chamaedrys O. Kuntze, 187.
 — *hyptioides* Mart. ex Benth., 187.

Marsypianthes hyptioides var. *arenosa* Benth., 188.
 — var. *bracteosa* Benth., 188.
 — var. *eriocephala* Benth., 188.
 — var. *umbrosa* Benth., 188.
 — *viscosa* Klotzsch, 188.
Martinella obovata Bur. et K. Schum., 372.
Matucana Britt. et Rose, 301.
Maxillaria liparophylla Summerhayes, 377.
Medinilla malabarica Bedd., 124.
 Meerburgh's *Impatiens capensis*, 161.
Meladerma Kerr, 445.
 — *deciduum* Kerr, 447.
 — *insularum* Kerr, 447.
 — *puberulum* Kerr, 447.
Melanthera nivea O. E. Schulz, 366.
Melothria guadalupensis Cogn., 362.
Merremia dissecta Hall. fil., 369.
 — *Korthalsiana* van Ooststr., 175.
 — *umbellata* Hall. fil., 369.
 Merrill, E. D., and Walker, E. H.
 A bibliography of Eastern Asiatic botany (review), 310.
Mesembryanthemaceae, notes on, 153.
Mesembryanthemum Linn., 153.
 — *albinotum* Haw., 159.
 — *albipunctum* Haw., 159.
 — var. *majus* Haw., 159.
 — *aloides* Haw., 158, 159.
 — *carolinense* L. Bolus, 160.
 — *cibdelum* N. E. Br., 159.
 — *crassipes* Marloth, 158.
 — *rosulatum* Kensit, 158.
 — *rubrolineatum* N. E. Br., 159.
 — *transvaalense* Rolfe, 158.
 — *vittatum* N. E. Br., 158.
Mesosphaerum P. Br., 189.
 — *arboreum* O. Kuntze, 191.
 — var. *bracteosum* Rusby, 191.
 — *atrorubens* O. Kuntze, 196.
 — *barbatum* O. Kuntze, 193.
 — *brevipes* O. Kuntze, 195.
 — *canescens* O. Kuntze, 193.
 — *capitellatum* Jenn., 194.
 — *dilatatum* O. Kuntze, 194.
 — *graveolens* O. Kuntze, 192.
 — *hirsutum* O. Kuntze, 195.
 — *laciniatum* O. Kuntze, 193.
 — *lanceolatum* O. Kuntze, 195.
 — *lantaniifolium* O. Kuntze, 196.
 — *melanostictum* O. Kuntze, 195.
 — *microphyllum* O. Kuntze, 194.
 — *mutabile* O. Kuntze, 192.
 — *paludosum* O. Kuntze, 194.

Mesosphaerum Parkeri O. Kuntze, 196.
 — *pectinatum* O. Kuntze, 192.
 — *polystachyum* Cook et Collins, 193.
 — *recurvatum* O. Kuntze, 194.
 — *Salzmanni* O. Kuntze, 191.
 — *siderotrichum* Briq., 195.
 — *spicatum* Rusby, 192.
 — *tenellum* Briq., 196.
 — *verbenifolium* O. Kuntze, 196.
 — *yungasense* Britton ex Rusby, 193.
Metastelma decipiens Schlechter, 368.
 Metcalfe, C. R. Anatomy of *Fraxinus oxycarpa* and *F. Pallisac*, 258.
 — Extra-floral nectaries on *Osmanthus* leaves, 254.
 Mexican Society of Natural History, 472.
Miconia hypoleuca Triana, 361.
 — *laevigata* DC., 361.
Microcos gracilis Stapf ex Ridley, 229.
 — *Havilandii* Ridley, 228.
 — *laurifolia* Burret, 228.
 — *subpetala* Stapf ex Ridley, 228.
Mikania micrantha H. B. K., 366.
 — *scabra* DC., 366.
Mimosa sepriaria Benth., 280.
 — *pudica* Linn., 360.
Mirabilis jalapa Linn., 212.
Monadenia leydenbergensis Kraenzl., 149.
 Monkeys, botanical, 306.
Monstera Fendleri Engl., 381.
 — *obliqua* Walp., 381.
 — *perusa* de Vriesse, 381.
 Morton, C. V. New Mexican Gesneriaceae, 292.
Mucuna acuminata Grah., 277.
 — *monosperma* Roxb., 277.
Muntingia Calabura Linn., 357.
 Mushrooms, the cultivation of (review), 316.
Myxopyrum confertum Kerr, 133.

N.

Nananthus N. E. Br., 153.
 — *albinotus* L. Bolus, 159.
 — *albipunctus* Schwantes, 159.
 — *aloides* Schwantes, 158.
 — *cibdelus* Schwantes, 159.
 — *Comptonii* L. Bolus, 160.
 — *difformis* L. Bolus, 160.
 — *Dyeri* L. Bolus, 159.
 — *Orpenii* L. Bolus, 161.
 — *Peersii* L. Bolus, 160.

Nananthus Pole-Evansii N. E. Br., 159.
 — *rubrolincatus* Schwantes, 159.
 — *villatus* Schwantes, 158.
Napeanthus subacaulis Benth et Hook. fil. ex O. Kuntze, 371.
Neclandra coriacea Griseb., 375.
 Nectaries on *Osmanthus* leaves, extra-floral, 254.
 Nelmes, E. Notes on *Carex*, 106, 242.
 Neoporteria and *Chilenia*, 296.
Neoporteria Britt. et Rose, 297.
 — *chilensis* Britt. et Rose, 297.
 — *fusca* Britt. et Rose, 298.
 — *Jussieu* Britt. et Rose, 297.
 — *nidus* Britt. et Rose, 298.
 — *nigricans* Britt. et Rose, 298.
 — *occulta* Britt. et Rose, 298.
 — *senilis* Backeb., 298.
 — *subgibbosa* Britt. et Rose, 297.
Nepeta mutabilis L. C. Rich., 192.
 — *pectinata* Linn., 192.
Nervilia subintegra Summerhayes, 150.
 New or little known plants from southern India, 123.
 New York Botanical Garden, 52.
Nichelia Bullock, 297.
 — *fusca* Bullock, 298.
 — *Jussieu* Bullock, 297.
 — *nidus* Bullock, 297.
 — *nigricans* Bullock, 298.
 — *occulta* Bullock, 298.
 Nigeria, a preliminary list of plant diseases in, 17.
 Note on certain Malayan species of *Sindora*, a, 73.
 Notes on *Xylocarpus*, 288.

O.

Oberonia brevifolia Lindl., 153.
 — *disticha* Schlechter, 152.
 Obituary notices:—
 Bailey, J. F., 350.
 Boulenger, G. A., 84.
 Burt, B. D., 301.
 Dunn, S. T., 214.
 Grove, W. B., 82.
 Goulding, E., 133.
 Hale, R. S., 305.
 Rendle, A. B., 81.
 Rogers, C. G., 84.
 Thompson, H. N., 303.
 Zahlbruckner, A., 304.
Ocimum Basilicum Linn., 188, 189.
 — *gratissimum* Linn., 188.
 — *micranthum* Willd., 188, 189, 373.
 — *sanctum* Linn., 188, 189.

Ocotea leucoxydon Mez, 375.
Odontonema brevipes Urb., 373.
Olea fragrans Thunb., 254.
Olyra latifolia Linn., 383.
 Ooststroom, S. J. van. Convolvulaceae collected by the Oxford University Expedition to Sarawak, 175.
Operculina alata Urb., 369.
Ophiorrhiza caudata C. E. C. Fischer, 125.
 — *incarnata* C. E. C. Fischer, 124.
 — *munarensis* C. E. C. Fischer, 35.
Ornithopus compressus Linn., 464.
 Orchids, African, 141.
Osbeckia aspera Wight et Arn., 34.
 — *glauc* Benth., 34.
 — *hawensis* C. E. C. Fischer, 34.
 — *reticulata* Bedd., 124.
 — *truncata* D. Don ex Wight et Arn., 123.
 — *wynadensis* C. B. Clarke, 35.
Osmanthus leaves, extra-floral nectaries on, 254.
 — *fragrans* Lour., 254.
 — *ilicifolius* Mouillef., 254.
 Ossowski, A. The formation of intumescences containing fatty substances on the stem of *Khaya ivorensis*, 137.
 Oxford University Expedition to Sarawak, 1932, Convolvulaceae collected by the, 175.

P.

Palaquium rivulare H. J. Lam, 307.
Panicum fasciculatum Sw., 382.
 — *maximum* Jacq., 382.
Paracryphia Bak. fil., 336.
Paravallis macrophylla Pierre, 295.
Paravilex siamica Fletcher, 437.
Parkia speciosa Hassk., 280.
Paspalum decumbens Sw., 382.
 — *paniculatum* Linn., 382.
 — *saccharoides* Linn., 382.
 — *vaginatum* Sw., 382.
Passiflora cyanea Mast., 362.
 — *laurifolia* Linn., 362.
 — *tuberosa* Jacq., 362.
Paullinia excisa Radlk., 358.
Pavonia fruticosa Fawc. et Rendle, 356.
 — *Typhalaea* Cav., 356.
Pectis humifusa Sw., 366.
Pedicularia curvipes Hook. fil., 211.
Pedilanthus versus Tithymalus, 468.
Pedilanthus Neck., 468.

Pellacalyx cristatus Hemsl., 282.
 — *Lobbii* Schimp., 282.
Pellinia Molina, 318.
 — *chilensis* Molina, 332.
 — *cordifolia* Molina, 332.
Pennisetum polystachyon Schult., 383.
 — *setosum* L. Rich., 383.
Penstemon campanulatus and *P. Kunthii*, 1.
Penstemon angustifolius Poir., 4.
 — *campanulatus* Willd., 3.
 — *Gentryi* Standley, 3.
 — *Kunthii* G. Don, 4.
 — *pulchellus* Lindl., 3.
Pentace cordifolia Ridley, 227.
Peperomia emarginella C. DC., 374.
 — *rotundifolia* var. *ovata* Dahlst. ex C. DC., 374.
Periploca purpurea Kerr, 448.
Petiveria alliacea Linn., 374.
Petraea volubilis Linn., 411.
Petroselinum anatolicum Freyn et Sint., 258.
 — *crispum* auct. kew. 257.
 — var. *anatolicum* Airy-Shaw, 258.
 — var. *crispum* Airy-Shaw, 257.
 — var. *latifolium* Airy-Shaw, 258.
 — *hortense* var. *crispum* L. H. Bailey, 258.
 — var. *latifolium* Wolf, 258.
Petroselinum Karst., 257.
 — *sativum* var. *crispum* Gaudin, 257.
 — var. *latifolium* Gaudin, 258.
 — var. *silvestre* Alef., 258.
 — var. *vulgare* Alef., 258.
 — subvar. *crispum* Coss. et Germ., 257.
 — subvar. *latifolium* Coss. et Germ., 258.
 — *vulgare* var. *crispum* S. F. Gray, 257.
 — var. *latifolium* S. F. Gray, 258.
Pharus latifolius Linn., 382.
Phaseolus luteus Bl., 277.
Phenax Sonneratii Wedd., 377.
 Philipson, W. R. Four new species of *Vernonieae* collected by Glazion in Brasil, 298.
Philoxerus vermicularis Pal., 374.
Phinsea multiflora Morton, 292.
Phlogacanthus pubinervius T. And., 296.
Phoradendron piperoides Trel., 375.
 — *trinervium* Griseb., 375.

Phthirusa pyrifolia Eichl., 375.
 — *Theobromae* Eichl., 375.
Phyllanthus acuminatus Vahl, 376.
 — *Niruri* Linn., 376.
Phyllomphax galeandra Schlechter, 213.
 — *Helleborina* Schlechter, 143.
 — *macrantha* Summerhayes, 143.
Picea Abies var. *acrocona* Dallimore, 85.
 — — var. *brevifolia* Dallimore, 85.
 — — forma *albida* Dallimore, 85.
 — — forma *argentea* Rehd., 85.
 — — *excelsa* var. *brevifolia* Hornbrook, 85.
 — — forma *acrocona* Th. M. Fries, 85.
 — — forma *argentea* Hornbrook, 85.
Picramnia tetrandra Sw., 358.
Pilea inaequalis Wedd., 377.
 — *microphylla* Liebm., 377.
 — *tobagensis* Urb., 377.
Pinus Chylla Lodd., 85.
 — *Dicksonii* hort. ex Carrière, 85.
 — *excelsa* Wall. ex Lamb., 85.
 — — *zebrina* Beissner, 85.
 — *Griffithii* McClelland, 85.
 — *nepalensis* De Chambr., 85.
 — — var. *zebrina* L. H. Bailey, 85.
 — *Strobilus excelsa zebrina* Croux ex Bailly, 85.
 — *taxifolia* Lamb., 80.
 — *Wallichiana* A. B. Jackson, 85.
 — — forma *zebrina* A. B. Jackson, 85.
Piper pellatum Linn., 374.
 — *Schackii* C. DC., 374.
 — *tobagoanum* C. DC., 374.
Pisonia fragrans Dum. Cours., 373.
 Plant diseases in Nigeria, a preliminary list of, 17.
 Plants for the connoisseur (review), 314.
 — new to Assam, 210.
Platanthera Helleborina Rolfe, 143.
 — *macrantha* Kraenzl., 143.
Platycentrum clidmioides Naud., 381.
Plectranthus scrophularioides Wall., 212.
Pleurothallis ovalifolia Reichb. fil., 377.
Pogostemon nigrescens Dunn, 212.
 — *Waltii* C. B. Clarke, 296.
 Poisoning of herbarium specimens, 397.

Polunin, N. Notes on a botanical journey in S.W. Greenland, 1937, 89.
 Poplars, the black (review), 313.
Porophyllum ellipticum Cass., 366.
Portulaca oleracea Linn., 464.
 — *Wightiana* Wall., 123.
Potamogeton natans Linn., 90.
Premna amplexans Schauer, 417, 421.
 — *angustior* Ridley, 419.
 — *annulata* Fletcher, 199, 417, 421.
 — *Collinsae* Craib, 416, 419.
 — *cordifolia* Roxb., 416, 418.
 — *coriacea* var. *oblonga* C. B. Clarke, 415, 417.
 — *corymbosa* Rottl. et Willd., 416, 418.
 — — var. *angustior* Fletcher, 416, 419.
 — — var. *minor* Fletcher, 416, 419.
 — — var. *obtusifolia* Fletcher, 416, 419.
 — *dubia* Craib, 415, 417.
 — *flavescens* Ham. ex C. B. Clarke, 416, 420.
 — — var. *glabrior* C. B. Clarke, 416, 420.
 — *foetida* Reinw. ex Blume, 416, 418.
 — *fulva* Craib, 416, 420.
 — *Garrettii* Fletcher, 200, 415, 418.
 — *herbacea* Roxb., 417, 421.
 — *integrifolia* Linn., 418, 419.
 — — var. *angustior* C. B. Clarke, 419.
 — — var. *minor* Ridley, 419.
 — — var. *obtusifolia* P'ei, 419.
 — *latifolia* Roxb., 416, 420.
 — — var. *cuneata* C. B. Clarke, 416, 420.
 — — var. *mucronata* C. B. Clarke, 416, 420.
 — *mucronata* Roxb., 420.
 — *nana* Coll. et Hemsl., 417, 421.
 — *obtusifolia* R.Br., 419.
 — *paniculata* Fletcher, 201, 417, 421.
 — *parasitica* Blume, 418.
 — *pyramidata* Wall. ex Schauer, 416, 419.
 — *quadridentata* Fletcher, 201, 417, 421.
 — *racemosa* Wall. ex Schauer, 415, 417.
 — *repens* Fletcher, 202, 417, 421.
 — *scandens* Roxb., 415, 417.
 — *serrata* Fletcher, 202, 417, 421.
 — *serratifolia* Linn., 418.

Premna siamensis Fletcher, 203, 417, 421.
 — *tomentosa* Willd., 419.
 — *trichostoma* Miq., 416, 418.
 — *viburnoides* Wall., 420.
 — *villosa* C. B. Clarke, 415, 418.
 Prescott, J. A., 214.
Prestonia exserta Standl., 368.
 — *tobagensis* Urb., 368.
Proteopsis Ekmaniana Philipson, 300.
 — *insculpta* Philipson, 299.
 — *lanuginosa* Philipson, 300.
Pseuderanthemum axillare Leonard, 68.
 — *fasciculatum* Leonard, 69.
Pseudosporobolus Backeb., 458.
 — *melanostele* Backeb., 458.
Pseudosuga Douglasii Carr., 80.
 — — var. *pumila* Beissner, 85.
 — *mucronata* Sudw., 80.
 — *taxifolia* Britton, 80.
 — *taxifolia* Rehder, 80.
 — — var. *pumila* M. L. Green, 85.
Psychotria pendula Urb., 365.
 — *tobagensis* Urb., 365.
 — *uliginosa* Sw., 365.
Pueraria phaseoloides Benth., 277.
 Pullé, A. A. Compendium van de Terminologie, &c. (review), 308.
Pycnanthemum subulatum Blanco, 195.
Pygeum Beccarii Ridley, 281.
 — *Havilandii* Ridley, 281.
 — *Hookerianum* var. *borneense* Ridley, 281.
 — *lampungum* Miq., 282.
 — *parviflorum* Miq., 282.
 — *stipulaceum* King, 282.
 Pyle, R., and McFarland, J. H. How to grow roses (review), 136.
Pyrethrum Balsamita var. *tanacetoides* Boiss., 466.

Q.

Quercus glabricupula Barnett, 99.
 — *Falconeri* Kurz, 472.
 — *lappacea* Roxb., 472.
 — *lenticellata* Barnett, 98.
 — *longistyla* Barnett, 100.
 — *wangsaiensis* Barnett, 99.

R.

Rabiea N. E. Br., 156.
 — *albivola* N. E. Br., 159.
 — *albipuncta* N. E. Br., 159.
 — *carolinensis* N. E. Br., 160.
 — *cibdela* N. E. Br., 159.

Rabiea Lesliei N. E. Br., 160.
 — *tersa* N. E. Br., 160.
Raddia guianensis Hitchcock, 383.
 Rain-forest in Ceylon, 9.
 Ramayya, K., 265.
Ranunculus bullatus Linn., 461.
 — *Ficaria* Linn., 461.
 — — var. *grandiflorus* Schultz, 461.
Rauwolfia Lamarchii DC., 367.
 Rendle, A. B. (obit.), 81.
Renealmia bracteosa Griseb., 378.
 Revision of the Eucryphiaceae, a, 317.
Rhododendron taiense Hutch., 24.
Rhynchospora polyphylla Vahl, 381.
 Richardson, A. E. V., 214.
 Ripon professorship, the, 133.
Rivina humilis Linn., 374.
 Ridley, H. N. Additions to the flora of Borneo and other Malay islands, 110, 173, 221, 275.
 — Notes on Xylocarpus, 288.
 — Two new names in Aglaia, 215.
 Robbie, J., 133.
 Robbins, W. J., 52.
 Robbins, W. W., and Holman, R. M. A textbook of general botany, 351.
 Rock garden, the present day (review), 134.
 Rogers, C. G. (obit.), 84.
Rolandra fruticosa O. Kuntze, 365.
 Roses, how to grow (review), 136.
 Rothmaler, W. *Alchemillae novae*, 269.
Rousoopsis javanica Planch., 275.
 Roush, L., Holman, R. M., and Bonar, L. A laboratory guide for a course in general botany (review), 316.
 Rubi in the Kew herbarium, notes on African, 177.
Rubus sect. *Afro-digitati* C. E. Gust., 178.
 — — *Afro-idaei* Focke, 179.
 — — *Afro-montani* Focke, 177.
 — *adenocomus* Focke, 180.
 — *adenophloeus* Focke, 179.
 — *Adolfi-Friederici* Engl., 180.
 — *alceifolius* Poir., 280.
 — *angulosus* Focke, 280.
 — *apetalus* Poir., 180.
 — — var. *roseus* C. E. Gust., 182.
 — *assaortinus* Chiov., 181.
 — *atrocoeruleus* C. E. Gust., 185.
 — *borbonicus* Pers., 180.
 — *Chiesae* Chiov., 178.
 — *Chiovendae* C. E. Gust., 185.

Rubus dictyophyllus Oliv., 179.
 — *Doggettii* C. H. Wright, 178.
 — *Ecklonii* Focke, 180.
 — *elongatus* Sm., 281.
 — *exsuccus* A. Rich., 181.
 — *Friesiorum* C. E. Gust., 177.
 — — var. *elgonensis* C. E. Gust., 178.
 — — var. *Hageniae* C. E. Gust., 178.
 — *Gardnerianus* O. Kuntze, 281.
 — *glomeratus* Bl., 281.
 — *inedulis* Rolfe, 186.
 — *intercurrents* C. E. Gust., 186.
 — — var. *confluens* C. E. Gust., 186.
 — *interjungens* C. E. Gust., 181, 182.
 — *iringanus* C. E. Gust., 184.
 — *kingaensis* Engl., 184.
 — — var. *pubescens* C. E. Gust., 184.
 — *kirungensis* Engl., 184.
 — — var. *glabrescens* C. E. Gust., 184.
 — *madagascariensis* C. E. Gust., 185.
 — *myrianthus* Baker, 178.
 — *Petitianus* A. Rich., 182.
 — *pinnatus* Willd., 182.
 — — var. *afrotropicus* Engl., 183.
 — — forma *glaber* C. E. Gust., 183.
 — — forma *subglandulosus*, C. E. Gust., 183.
 — *Quartinianus* A. Rich., 185.
 — — var. *Pappianus* C. E. Gust., 185.
 — *rigidus* Sm., 185.
 — — var. *huillensis* Focke, 186.
 — — var. *incisus* C. E. Gust., 186.
 — — var. *Mundtii* Focke, 186.
 — — forma *lachnocarpus* C. E. Gust., 186.
 — *runghensis* Engl., 184.
 — *runssorensis* Engl., 178.
 — *Scheffleri* Engl., 183.
 — *Steudneri* Schweinf., 179.
 — — var. *aberensis* Engl., 179.
 — *Stuhlmannii* Engl., 183.
 — — var. *aberdarensis* C. E. Gust., 183.
 — *transvaliensis* C. E. Gust., 185.
 — — var. *kyimbilensis* C. E. Gust., 185.
 — *ulugurensis* var. *apricus* C. E. Gust., 180.
 — *Volkensii* Engl., 178.

Rudgea Freemani Sprague et Williams, 365.
Ruellia fulgida Andr., 372.
 — *Galeottii* Leonard, 59.
 — *oaxacana* Leonard, 60.
 — *spissa* Leonard, 61.
Rustia pauciflora Solereder, 363.

S.

Salacia amentacea Ridley, 239.
 — *Bartlettii* Ridley, 239.
 — *Beccarii* Ridley, 238.
 — *castaneifolia* Ridley, 241.
 — *flavescens* Kurz, 237.
 — *Klossii* Ridley, 240.
 — *latifolia* Wall., 237.
 — *leucoclada* Ridley, 239.
 — *litseifolia* Ridley, 240.
 — *megasperma* Ridley, 237.
 — *minutiflora* Ridley, 238.
 — *prinoideus* DC., 237, 240.
 — *sphaerocarpa* Rusby, 358.
 Sampson, H. C., 350.
 Sandwith, N. Y. Contributions to the flora of tropical America: xxxvii.
 Notes on the flora of Tobago, 353.
Santaloides cordatum Schellenb., 275.
 — *floridum* O. Kuntze, 275.
 — *Havilandii* Schellenb., 275.
 — *ovale* Schellenb., 275.
 — *simplicifolium* O. Kuntze, 275.
Saraca elegans Ridley, 278.
 — *Hullettii* Prain, 278.
 — *longistyla* Ridley, 279.
 Sarawak, 1932, Convolvulaceae collected by the Oxford University Expedition to, 175.
Saussurea Chapmanii C. E. C. Fischer, 287.
Schaueria Hassk., 189.
 — *graveolens* Hassk., 192.
Schoenobiblus grandifolia Urb., 375.
Scleria latifolia Sw., 381.
 — *pterota* Presl, 381.
Secamone siamica Kerr, 448.
Securidaca corymbosa Turcz., 115.
Selinum Petroselinum E. H. L. Krause, 257.
 Senecio from Argentina, two new species of, 197.
 — *Comberi* Cabrera, 197, 198.
 — *neuquensis* Cabrera, 199.
 — *nudicaulis* Ham., 295.
Sequoia gigantea var. *pendula* Lavallée, 86.
 — *Wellingtonia* var. *pendula* M. L. Green, 86.
Setaria barbata Kunth, 383.

Setaria paniculifera Fourn. ex Hemsl., 383.
 Seventh international botanical congress, Stockholm, 400.
Siagonaryhen Mart. ex J. A. Schmidt, 189.
 Siam, contributions to the flora of, 24, 98, 127, 199, 445.
Sida acuta Burm., 356.
 — *antillensis* Urb., 356.
 — *glomerata* Cav., 356.
 — *linifolia* Juss., 356.
 — *retusa* Linn., 221.
Sideritis glandulifera Post, 466.
 — *perfoliata* Linn., 466.
Silene Behen Linn., 464.
Silene maritima and *S. vulgaris*, researches on, 248.
Siler cordifolium Boiss., 465.
 Sindora, a note on certain Malayan species of, 73.
Sindora Echinocalyx Prain, 75.
 — *intermedia* Prain, 75.
 — *parvifolia* Backer ex Heyne, 77.
 — *parvifoliola* Symington, 77.
 — *velutina* Baker, 77.
 — *Wallichii* Benth., 75.
 — — var. *intermedia* Baker, 75.
 — — var. *ovalifolia* Maingay, 75.
 — — var. *siamensis* Baker, 75.
Sipolisia lanuginosa Glaziov ex Oliv., 300.
 Sixty years of botany (review), 215.
Sloanea javanica Bl., 229.
Smilax cumananensis Willd., 380.
 Soiless growth of plants (review), 314.
Solanum dolichostylum O. E. Schulz, 369.
 — *lanceifolium* Jacq., 369.
 — *nigrum* var. *americanum* O. E. Schulz, 369.
 — *scabrum* Vahl, 369.
 — *Seafortianum* Andr., 369.
Solenospermum apiculatum Ridley, 235.
 — *aquatilis* Ridley, 236.
Sonerila Barnesi C. E. C. Fischer, 35.
Sophora occidentalis Linn., 359.
 — *tomentosa* Linn., 359.
 South India, new or little known plants from, 32.
Spatholobus littoralis Hassk., 277.
 — *persicinus* Ridley, 278.
Spegazzinia Backeb., 300.
Sphenodesma ferruginea Briq., 442.
 — *involutrata* Robinson, 441.
 — *mehongensis* Dop, 441, 442.
 — *microstylis* C. B. Clarke, 441, 442.

Sphenodesma mollis Craib, 441, 443.
 — *odorata* Fletcher, 207, 441, 442.
 — *orbicularis* Fletcher, 208, 441, 442.
 — *pentandra* Jack, 441, 442.
 — *triflora* Wight, 441, 442.
 — *unguiculata* C. B. Clarke, 441.
Sphyrospermum burifolium Poepp. et Endl., 367.
Spilanthes uliginosa Sw., 366.
Sporobolus virginicus Kunth, 382.
 Sprague, T. A., and Bullock, A. A. Penstemon campanulatus and P. Kunthii, 1.
 Sprague, T. A., and Green, M. L. The botanical name of the Douglas fir, 79.
Stachytarpheta indica Vahl, 411.
 — *jamaicensis* Vahl, 411.
Stenandrium mexicanum Leonard, 62.
Stephanotis pilosa Kerr, 453.
Sterculia arachnifera Ridley, 223.
 — *bicolor* Mast., 222.
 — *borneensis* Ridley, 224.
 — *campaniflora* Ridley, 224.
 — *cuspidata* Ridley, 224.
 — *Hewittii* Ridley, 222.
 — *laevis* Wall., 222.
 — *luzonica* Warb., 222.
 — *pallidiflora* Ridley, 223.
 — *rhoioidifolia* Stapf ex Ridley, 222.
 — *Scortechinii* King, 222.
 — *subpellata* var. *velutina* Ridley, 222.
 Stockholm, seventh international botanical congress, 400.
 Stoker, F. A gardener's progress (review), 351.
 Strychnos innocua Del., on the synonymy and distribution of, 45.
Strychnos alnifolia Baker, 47.
 — *Behrensiana* Gilg et Busse, 47.
 — *Burtoni* Baker, 47.
 — *dschurica* Gilg ex A. Chev., 49.
 — *dysophylla* Benth., 47.
 — *innocua* Del., 46.
 — — var. *pubescens* Solered., 46.
 — *Lokua* A. Rich., 47.
 — *penduliflora* Baker, 49.
 — *Quagua* Gilg, 47.
 — *randiiformis* Baill., 47.
 — *spinosa* Lam., 49.
 — *trichisioides* Baker, 47.
 — *Unguacha* A. Rich., 46.
 — — var. *dschurica* Gilg, 46.
 — — var. *dysophylla* Gilg, 46.
 — — var. *grandifolia* Gilg, 46.
 — — var. *micrantha* Gilg, 47.
 — — var. *microcarpa* Gilg, 47.

Strychnos Unguacha var. *obovata* De Wild., 47.

— var. *polyantha* Gilg, 47.

— var. *Steudneri* Gilg, 47.

— var. *retusa* Chiov., 47.

— *xerophila* Baker, 47.

Stylogyne lateriflora Mez, 367.

Sudan, horticultural appointments in the, 133.

Summerhayes, V. S. African orchids, 141.

— Notes on the flora of Tobago: Orchidaceae, 377.

Swahili plant names (review), 87.

Swaney, M. W., and Ellis, C. Soilless growth of plants (review), 314.

Suertia Loei Craib, 211.

Symington, C. F. A note on certain Malayan species of *Sindora*, 73.

Symphorema involucreatum Roxb., 441.

— *Jackianum* Kurz, 441, 442.

— *unguiculatum* Kurz, 441.

Symplocos spectabilis Brand, 295.

Synedrella nodiflora Gaertn., 366.

Synopsis of the Labiatae of the Guianas, a, 187.

T.

Tabebuia glomerata Urb., 372.

— *rufescens* J. R. Johnst., 373.

— *serratifolia* Nichols., 372.

Tabernaemontana citrifolia Jacq., 368.

Tarrietia albiflora Ridley, 225.

Taxonomic position of *Tetralthalamus*, the, 458.

Tectona grandis Linn. fil., 415.

Tephrosia candida DC., 276.

Teramnus labialis Spreng., 359.

Terminalia borneensis Ridley, 283.

Termstroemia aneura Miq., 174.

— *Beccarii* Stapf ex Ridley, 174.

— *citrina* Ridley, 173.

— *denticulata* Ridley, 174.

— *Hosei* Ridley, 174.

— *japonica* var. *denticulata* Pierre, 176.

— *magnifica* Stapf ex Ridley, 175.

— *oligostemon* Krug et Urb., 356.

Tetrapteris discolor DC., 357.

Tetralthalamus, the taxonomic position of, 458.

Tetralthalamus Lauterbach, 458.

Textbook of general botany, a (review), 351.

Thompson, H. N. (obit.), 303.

Three new species from Tibet, 285.

Thymus biserratus Blanco, 195.

Tibet, three new species from, 285.

Tillandsia bulbosa Hook., 379.

— *usneoides* Linn., 379.

— *utriculata* Linn., 379.

Tithymalus Mill., 468.

Tobago, notes on the flora of, 353.

Tobagoa maleolens Urb., 365.

Tothill, J. D., 52.

Tournefortia bicolor Sw., 368.

— *hirsutissima* Linn., 368.

— *Roxburghii* C. B. Clarke, 296.

Toxocarpus lagenifer Kerr, 449.

— *oblancoatus* Kerr, 450.

— *ovatus* Kerr, 450.

Trachelospermum anceps Dunn et Will., 295.

— *auritum* Schneid., 210.

Tradescantia geniculata Jacq., 380.

— *multiflora* Sw., 380.

Tragia volubilis Linn., 376.

Trema micranthum Bl., 378.

Tresanthera condensinoides Karst., 363.

— *pauciflora* K. Schum. ex Solereder, 363.

Trichodesma sinicum Brand, 296.

Trichomanes crispum Linn., 383.

— *polypodioides* Linn., 383.

Trichostigma octandrum H. Walt., 374.

Trifolium pratense Linn., 464.

— *subterraneum* Linn., 464.

Trimezia martinicensis Herb., 379.

Triumfetta pseudo-cana Sprague, 229.

Tropical America, contributions to the flora of, 292.

Tunica Kennedyae A. K. Jackson et Turrill, 462.

Turrill, W. B. Ecological isolation, 384.

—, and Jackson, A. K. Additions to the flora of Cyprus, 460.

—, and Marsden-Jones, E. M. Researches on *Silene maritima* and *S. vulgaris*: xxi. Further research on the genetics of anthocyanin and other characters in *S. maritima*, 248.

Tussacia pulchella Reichb., 371.

Tylophora riparia Kerr, 451.

U.

Uraria lagopodioides DC., 277.

Urena lobata Linn., 221.

— var. *scabriuscula* DC., 221.

— var. *tomentosa* DC., 221.

Ureva baccifera Linn., 376.

Ureva acasana Gaud., 377.

Unguacha Simiarum Hochst., 46.

V.

Vallis anceps C. E. C. Fischer, 295.

— *arborescens* C. E. C. Fischer, 295.

Vanilla heterophylla Summerhayes, 149.

Verbena officinalis Linn., 410.

Vernonia blanda DC., 210.

— *cylindricaps* C. B. Clarke, 295.

— *scorpioides* Pers., 365.

Vernoniae collected by Glaziou in Brasil, four new species of, 298.

Viburnum atro-cyanum C. B. Clarke, 210.

Vicia lathyroides Linn., 465.

— *tibetica* C. E. C. Fischer, 285.

Vigna lutea A. Gray, 277.

Viola Kitabeliana Roem. et Schult., 461.

— *occulta* Lehm., 461.

Vitex Agnus-castus var. *trifolia* Kurz, 432.

— *canescens* Kurz, 431, 433.

— *coriacea* C. B. Clarke, 431, 434.

— *gamosepala* Griff., 432, 436.

— *glabrata* R. Br., 432, 435.

— *heterophylla* Roxb., 432, 434.

— var. *typica* H. J. Lam, 434.

— var. *undulata* C. B. Clarke, 432, 434.

— *involucratum* Presl, 441.

— *leucosylon* Linn., 436.

— *limoniifolia* Wall. ex Kurz, 431, 433.

— *longisepala* King et Gamble, 432, 436.

— *Negundo* Linn., 431, 433.

— *ovata* Thunb., 432.

— *peduncularis* Wall. ex Schauer, 432, 436.

— *Pierrei* Craib, 431, 433.

— *pubescens* Vahl, 432, 435.

— *quinata* Williams, 432, 434.

— *repens* Blanco, 433.

— *stamica* Williams, 432, 435.

— *sumatrana* var. *urceolata* King et Gamble, 432, 434.

— *trifolia* Linn., 431, 432.

Vitex trifolia var. *ovata* Makino, 431, 432.

— var. *repens* Ridley, 433.

— var. *unifoliolata* Schauer, 432.

— *urceolata* C. B. Clarke, 434.

— *vestita* Walp. ex Kurz, 432, 436.

W.

Walker, E. H., and Merrill, E. D. A bibliography of Eastern Asiatic botany (review), 310.

Waltheria americana Linn., 356.

Wallingtonia gigantea var. *pendula* Carrière, 86.

West, J. A preliminary list of plant diseases in Nigeria, 17.

Winteraceae, the genus *Tetralthalamus* included in, 459.

Wissadula periplocifolia Thw., 221.

X.

Xanthophyllum glabrescens Ridley, 113.

— *Hosei* Ridley, 113.

— *molle* Ridley, 114.

— *pallidum* Ridley, 113.

— *purpureum* Ridley, 114.

Xanthosoma Jacquinii Schott, 380.

Xiphidium caeruleum Aubl., 379.

Xylocarpus, notes on, 288.

Xylocarpus australasicus Ridley, 291.

— *benadirensis* Mattei, 288.

— *Forsteri* Miq., 291.

— *gangeticus* Parkinson, 291.

— *Granatum* Koen., 288.

— *guineensis* Roem., 292.

— *mekongensis* Pierre, 291.

— *minor* Ridley, 289.

— *moluccensis* Roem., 288, 291.

— *parvifolius* Ridley, 290.

— *procerus* Steud., 292.

— *touloucouina* Steud., 292.

Z.

Zanthoxylum A. (obit.), 304.

Printed under the authority of His Majesty's Stationery Office
By the East Essex Recorders, Ltd., Ltd.

(2224) Wt. 17/82 800 5/80 1/2. Ltd. Gp. 381.

69483

JL 54

Im 56, N3,

N39