

ROYAL BOTANIC GARDENS, KEW

BULLETIN OF MISCELLANEOUS INFORMATION

1932



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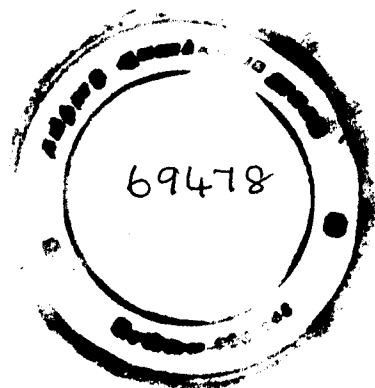
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BULLETIN OF MISCELLANEOUS INFORMATION

No. 1 1932

ROYAL BOTANIC GARDENS, KEW

I.—LEDGER BARK AND RED BARK. J. H. HOLLAND.

In the *Kew Bulletin* No. 3, 1931, pp. 113-117, particulars are given of the introduction of Peruvian or *Cinchona* bark into India. The article, however, only deals with the subject in a general way and it has been thought desirable to give some information on the introduction of *Cinchona Calisaya* var. *Ledgeriana* to the East and the importance of this species together with *C. succirubra* to the cultivation of *Cinchona* at the present time.

The Introduction and Establishment of *Ledgeriana*.

The story of this introduction is of special interest. It begins in 1851 when Charles Ledger, by whose agency the seeds were collected, was interested in the *Cinchona* bark and Alpaca wool trade of Peru and Bolivia. In that year he made an attempt to reach the Amazon through the Bolivian Province of Caupolican, and noted on the banks of the Mamore the trees of *Calisaya* from which his seed was obtained some fourteen years later. He was accompanied by his servant Manuel Incra Mamani, an experienced bark collector who had been in his employ since 1843 (Markham, *Peruvian Bark*, 1860-1880 p. 213). Sir Clements Markham devotes a chapter (l.c. pp. 212-216) to "Mr. Ledger's services in procuring *Calisaya* from Bolivia" in which he refers to a journey made by Ledger in 1858 to Australia with a flock of Alpacas, and goes on to say that "on his return to South America he heard of the enterprise which I had initiated and put in train for introducing cinchona cultivation into India. It appears that he made some attempt to open up communications with me which unfortunately was not successful." He relates how "in his endeavour to secure a supply of the best *Calisaya* seeds Mr. Ledger sent for his old servant Manuel in 1861 and gave him the necessary instructions for collecting seeds from the best kinds of *Cascarilla* trees." It was not, however, until 1865 that the commission could be fulfilled.

The only authority who seems to have been in direct correspondence with Ledger on *Cinchona* is Mr. John Eliot Howard, who, quoting from Mr. Ledger's original letters (*see Pharm. Journ.* March 13, 1880, p. 730) under date Dec. 22nd, 1874, states:—"Manuel Incra Mamani delivered the seed he had collected in June

1865. He then told me that the best bark trees had not produced ripe seed for four years previously. When the trees were full of flower and most promising a frost (*helada*) in April destroyed it all. The inferior sorts had not suffered. He had been cutting bark with his sons and patiently waited for an opportunity for complying with my orders, obtaining only the best sort."

Howard goes on to say that "the seed producing the *Ledgeriana* was gathered according to Manuel from about fifty trees, chiefly of the Rojo sort. . . . The *Calisaya Ledgeriana* of Java is, as I have shown, the legitimate produce of the seed of the 50 trees above mentioned. I should think no botanist has been within some hundred miles of the almost inaccessible banks of the Mamore where these were met with. . . . The first portion of the above seed passed into the hands of the Dutch Government. In my work* the reader will find particulars about its reception in Java.

"Owing to Mr. Ledger's good drying and care the seed arrived in such condition that it had not lost its germinative power. I inspected the remainder at the request of the British purchasers and found it apparently of the best quality and condition."

The best account of the final disposal of the seeds would appear to be that of Karel Wessel van Gorkom ("Handbook of Cinchona Culture." Transl. from the Dutch by B. D. Jackson, pp. 90-95):—

"By July of the same year Ledger had sent the seeds from Arica to his brother in London, to offer them to the English government. As luck would have it an opportunity to enter into correspondence with the English government did not soon present itself, and so the greater part of the seed was bought by Mr. J. W. B. Money, the possessor of extensive Cinchona plantations in British India. With the remainder, Ledger turned to the Dutch government, a preliminary deposit of 100 francs was paid, to which a moderate addition would afterward[s] be added on the germination of the seed in Java, and if it appeared to belong to a good sort. . . .

"These seeds then came in December 1865 into the possession of the Director of Cinchona culture, who one year afterwards was able to report, that about 20,000 had germinated. Ledger thereupon received a further sum of 500 francs and was therewith well content.

"Meanwhile Money had not himself used the seed he had bought, but had exchanged it for *C. succirubra* seed with McIvor, the head of the Government Cinchona culture in Madras. The reason for this was, that he considered his own plantation to be situated too high for the cultivation of *C. Calisaya*, under which name Ledger had offered his treasure. On the other hand, McIvor had already expressed himself repeatedly as not prepossessed in favour of *C. Calisaya* cultivation. The Ledger seed was sown at Ootacamund but produced no plants, at least if any there were, they were not

*The Quinology of the East Indian Plantations, p. 51—letter from Mr. Moens dated Bandung, Java, 5 Dec. 1873, to Mr. Howard.

specially noticed or mentioned.* From a small quantity parted with to a colleague in Bengal, a few trees were raised in Sikkim which first began to attract attention, when the fame of the *Ledger-Calisaya* spread afterwards from Java."

A footnote on this page adds that "The Superintendent of the Government Cinchona nurseries in Bengal, Mr. Gammie, obtained about 800 plants from Ledger's seed and made so many cuttings from them that in 1880 he planted 10 acres of ground with it. Moens, who has seen this planting, says that the type is quite like that we have in Java, but the plants had not developed so strongly." Watt (Comm. Prod. India, 1908, p. 304) refers to this 10 acres reported by Mr. Gammie (in 1880 at Sikkim) under *Ledgeriana*, which "in time became the parent stock of the plants in the present Bengal Plantations."

In the same year, when the trees of *Ledgeriana* raised from the original stock were apparently producing seeds, the Director of Kew (Sir J. D. Hooker) in Kew Report 1880 (p. 11) stated that "A very large number of applications has been addressed to Kew for a supply* of seed. This has been partially responded to, partly through the courtesy of the Dutch Government and partly by a supply from the Indian Government plantations in Sikkim.

"In 1876 some seed was received at Kew from Java, and part of this was communicated to Mr. J. E. Howard, F.R.S., who raised seedlings. He carefully selected the most promising of these . . . and very kindly supplied Kew with cuttings. . . . Three of the rooted cuttings were given to Mr. J. H. Campbell, of Lindoola, Ceylon, who was anxious to have a perfectly authentic strain . . . Three other plants propagated at Kew from the same authentic strain were sent to Jamaica. Mr. Morris reported (September 22) that he was 'delighted with their fine healthy condition.' . . . Mr. Shubrick writes from Greenway, Ootacamund (December 21) a private letter in which there is much interesting information on the local Cinchona culture:—'The *Ledgeriana* seed from Java reached me quite safely. I sowed it carefully in the open air, and both beds, for I kept the packets distinct, germinated well, but very slowly. Several of my

*Dr. King, in his Manual of Cinchona Cultivation in India (1876) p. 15, states that Mr. Money exchanged "no less than thirteen pounds of seeds of the finest Bolivian varieties of this species [*C. Calisaya*] which had been collected by Mr. Ledger, for a quantity of the Red Bark seed, which had by that time begun to be freely produced on the Nilgiri plantation. These thirteen pounds, on Mr. McIvor's lowest calculation of 20,000 seeds to the ounce, should have yielded four millions of plants. Only 60,000 plants were however raised, but these proved to be of three most excellent sorts."

In a report made to the Colonial Secretary, Ceylon, August 20th, 1880 (see Kew Report 1880 p. 33), by Dr. Trimen, it was stated:—"From Mr. Ledger's seed sent to the Nilgiris it is reported that 60,000 seedlings were raised. It would appear that most of these died out, though probably some still exist in Wynaad. A pinch of seed from Southern India was sown in the Sikkim Plantations and Dr. King considers the trees which have resulted there to be precisely the same as some of the forms of *Ledgeriana* which he saw in Java. . . ."

neighbours got packets from Mr. Moens, the Government Gardens at Neddivattum [Naduvattam], and the Liddellsdale Company large packets; both had glass houses and their plants did well, though my beds gave infinitely more plants.”

In 1880 *Ledgeriana* was in strong demand in Jamaica where, with the plants sent by Sir Joseph Hooker from Kew, fresh seed direct from Mr. Moens in Java and from Dr. King in India, this valuable plant was being well established by Mr. (now Sir Daniel) Morris. (see Kew Report 1881, p. 10).

In 1848 when *Calisaya* was regarded as the most important of the Cinchona barks used in medicine, Dr. Weddell, the French explorer, who had visited the Tambopata valley the previous year, described it as a new species (Ann. Sc. Nat. Series iii, x. p. 6); Howard described Ledger Bark as *Cinchona Calisaya* Wedd. var. *Ledgeriana* with Dr. Weddell's concurrence in 1876 (Quin. E. Indian Plantations, p. 84) and Trimen described it as *C. Ledgeriana* Moens, MSS. in 1881 (Journ. Bot. xix. p. 323).*

It may be asked why, when the bulk of the seed which Ledger brought to Europe found its way to India (13 lbs. were bought by Money and only 1 lb. is said to have been sold to the Dutch Government) it was left to the Dutch workers in Java to discover the merits of this plant.

The chief reason for this was that Markham selected the Nilgiris as the main acclimatisation station for the introduction of seed and planting material obtained by him, and by the collecting parties working with him, in S. America. Unfortunately only certain species of Cinchona when tried were found to thrive under the conditions which prevailed there—notably *C. succirubra* and *C. officinalis*. As already quoted, McIvor was not in favour of *Calisaya* types of Cinchona, having seen the failure of the whole of Markham's collection of some 450 plants, which he had with such care collected in the forests of Caravaya, transported over the snow-covered Andes, and finally conveyed in Wardian cases to Ootacamund. It was not likely then that McIvor would expect much success from the Ledger seed, and though he appears to have raised 60,000 seedlings nothing more was heard of them. It was fortunate, however, that a small quantity of this seed found its way to Sikkim, where *Calisaya* was found to thrive fairly well, but, as Moens says, these Ledger seedlings there had not developed as strongly as the plants from the same seed when grown in Java, nor has the bark ever analysed as well. Here fortune was with the Dutch experimenters, as the Ledger seedlings which they raised from Ledger's seed were tried on the volcanic

*With regard to the taxonomy of *C. Calisaya* and *C. Ledgeriana*, we do not consider the latter a distinct species. It may be either a variety or a hybrid of *C. Calisaya*. In the circumstances we recommend that it should be called "*C. Calisaya* var. *Ledgeriana*". Hence in the present paper Ledger Bark is referred to as *C. Calisaya* var. *Ledgeriana*, and occasionally simply *Ledgeriana*. In quoted passages the names given by the respective authors are retained. T. A. SPRAGUE and N. Y. SANDWICH.

soils of the Preanger district, which, even at the present time, grows a large proportion of the total Java acreage and produces 75 per cent. of the total Java quinine output.

In 1872, on the discovery of the superior value of Ledger Bark in Java, Dr. van Gorkom (Cinch. Cult. p. 93) held with Moens the view that "the future must be sought for in *C. Ledgeriana*, that joined to it for the preparation of Quinine only *C. officinalis* could be noticed and for the production of 'druggists' bark *C. succirubra* deserves the front rank," and it was decided that "all plants of every other variety were to be turned out of the nurseries."

In British India, of the species comprising the Grey barks, which were collected by Pritchett in the forests of Huanuco and Huamalis in N. Peru and introduced into Sikkim, Dr. King reported that "*Cinchona micrantha*, *C. peruviana* and *C. nitida* being poor in Quinine, the cultivation of these species is now no longer carried on," and that "*Cinchona Pahudiana** proved worthless, and its cultivation has long since been entirely abandoned" (King, Manual of Cinchona, Calcutta, 1876, p. 20).

Quinine versus Cinchona Alkaloids.

As the object of the Government of India from the outset has been to supply the people of India with a cheap febrifuge rather than to grow barks with a high quinine content, and as analyses showed that the Cinchona species under trial varied greatly in the proportions in which the various alkaloids were present, it soon became evident that the therapeutical value of the alkaloids other than quinine should be investigated. Accordingly Commissions were set up in the Bengal, Madras, and Bombay Presidencies in 1866.

The findings of the Bengal and Bombay Commissions were substantially the same as those of the Madras Commission, which were conveyed in a report from the Government of Madras to the Secretary of State for India, dated 25th March, 1867.

In this report (para. 8) it was stated "the main conclusion which the Members of the Commission have derived from the data before them is that the alkaloids hitherto but little valued in medicine, are scarcely, if at all, inferior as therapeutical agents to quinine," and the Secretary of State in the course of his reply dated 24th May, 1867, agreed that "This result is so important, with reference to the value of those Cinchona species now cultivated in the Government plantations which yield quinidine, chinchonidine, and chinchonine, that it should be made generally known. I have, therefore, directed copies of the report to be furnished to leading physicians and chemists in Great Britain and on the continent." The Medical Committee was by order of Her Majesty's Secretary of State for India supplied with the three alkaloids mentioned for these tests

*This was a new species originally introduced from Peru into Java (Dec. 1854) by M. Hasskarl, the leader of the Dutch expedition to South America (1853-1854) to collect seeds of *Calisaya*. Its cultivation for the same reason (see p. 11) was abandoned in Java in 1862.

from the manufactory of Messrs. Howard & Sons (Parliamentary Returns on East India Cinchona Cultivation, 9th Aug., 1870, pp. 108, 115).

This was a great step forward, but it was not for some time that adequate action could be taken to put these results into effect. This involved the study of cheap and efficient methods of alkaloid extraction and the establishment of Government factories in India. Thus it was not until 1875 that a febrifuge made from the mixed alkaloids of *C. succirubra*, after being tested by the medical service of Bengal and being found a satisfactory substitute for quinine, was manufactured in bulk at a cheap price.

In addition to the Commissions set up in the three Presidencies to investigate the therapeutical value of the Cinchona alkaloids, the Secretary of State for India in the same year (Sept. 1866) appointed Mr. John Broughton, an analytical chemist, "to conduct investigations in concert with the superintendent of cinchona plantations on the Neilgherry Hills." He proceeded to his station at Ootacamund, Madras, in December of the same year. At this period the Secretary of State for India, in his letter of appointment to Mr. Broughton, stated that "the oldest trees on the Neilgherries have now been planted out nearly 4 years, and the analyses of their barks which have been made by Mr. Howard prove that there is a very marked increase of the yield of febrifuge alkaloids under cultivation. The time has now come, therefore, when it is necessary to investigate the causes which regulate the yield of alkaloids from cultivated cinchona barks and to ascertain the preparation of the febrifuge which will combine cheapness with efficacy in the greatest degree" (Parliamentary Returns on East India Cinchona Cultivation, 9th August, 1870, pp. 3, 4).

A preparation called "Quinetum" was manufactured in Java (about 1872), for which only Red Bark (*C. succirubra*) was considered suitable; but this did not last long before the Dutch industry began to concentrate on the manufacture of Quinine from the bark of *C. Calisaya* var. *Ledgeriana* (Agric. Ledger No. 4, 1911, p. 104), although, as stated above, Red Bark was not altogether neglected, being recommended by Moens and van Gorkom for the production of "druggists' bark."

Dr. De Vrij, who was Quinologist to the Dutch Government in Java from 1857 to 1863, proposed the name "Quinetum" for the mixed alkaloids of "Red Bark" after his retirement in 1863 from Java. He continued his work on the Cinchona alkaloids in Holland and in a letter dated The Hague, October 30th, 1872, to the Secretary of State for India, strongly recommended the preparation, as a febrifuge medicine, of the mixed alkaloids of "Red Bark" (*C. succirubra*) grown on the Sikkim plantation. Following this a Quinologist (Mr. C. H. Wood) was appointed for service on the Government plantations in Sikkim. Mr Wood was selected by the Secretary of State for India for this important post in May, 1873, and arrived

in October of the same year at Rungbee to take up his duties (Parliamentary Returns on East India Cinchona Cultivation, 21 March, 1876, p. 126).

The factory output of "Sikkim 'Quinetum'" began in 1875 at 48 lbs., increasing to 7,007 lbs. in 1879. During this year "128,000 ounces of this product were disposed of. This, at 1 rupee an ounce, cost £12,800, the same quantity of quinine at 12s. od. an ounce (its present price) would have cost £76,800, a clear saving of £64,000" (Markham, Peruvian Bark, 1860-1880, p. 432). According to the report of the Government Cinchona Plantations in Bengal, 1921-22 (p. 2), "from 1875 to 1887 this was the sole product manufactured, reaching its greatest output in 1881-82 when nearly 11,000 lbs. were issued."

Owing, however, to the growing preference for quinine by the medical profession, the sale of Cinchona febrifuge had fallen in 1913 to about 1,600 lbs., and consequently there was a reduction in the area of cultivation of *C. succirubra* and an increase in that of *C. Calisaya* var. *Ledgeriana*, and, the report continues, "From 1903 the small demand that still existed for cinchona febrifuge was met by utilising the residue of mixed alkaloids, including a proportion of quinine, left after the extraction of quinine from *C. Ledgeriana*. A small acreage of *C. succirubra*, at present amounting almost to 90 acres, has however all along been kept in cultivation, so as to ensure the possibility of its cultivation being extended when the merits of its mixed alkaloids were rediscovered by the medical profession in general" (l.c.). Following the researches of Major Acton, I.M.S., into the chemistry and therapeutics of Cinchona febrifuge and quinine, which confirmed the conclusions recorded above, "The average annual sale of cinchona febrifuge for the last five years [1917-22] is almost 14,190 lbs. or eight times as much as in 1912-13, and much in excess of the maximum ever issued when it was the sole factory product" (l.c.) and an extension of the cultivation of *C. succirubra* again became advisable.

A Cinchona febrifuge under the name "Malarene" has recently appeared for use in India with some promising results, as indicated by the following extract from Adm. Report, Cinchona Dept., Govt. of Madras, 1923-24, p. 2.

"Noteworthy in the year is the success which the standardised preparation of Cinchona febrifuge—to which the name "Malarene" has been given—has obtained. Trials were made in various hospitals in the Presidency under the control of the Surgeon-General and the report of that officer indicates that for certain forms of Malaria this drug is most efficacious. In some districts so surprisingly good have the results been that 'Malarene' has all but ousted quinine from pride of place. Efforts are being directed to augment the production of 'Malarene' which is fortunately obtainable from Cinchona bark more easily grown than the quinine-yielding species—*Ledgeriana*."

The composition of Cinchona febrifuge mixtures with special reference to their Quinidine content is discussed in a paper in the *Pharmaceutical Journal*, July 28th, 1923, pp. 91-93, by Bernard F. Howard and Oliver Chick, and Mr. Howard has also given some important information on the alkaloids in "Some Notes on the Cinchona Industry" in a pamphlet published by The Institute of Chemistry of Great Britain and Ireland (London, 1931). After enumerating 30 constituent alkaloids isolated from natural Cinchona barks he considers there are "only four natural alkaloids of real commercial importance, viz. the laevo-rotatory Quinine and Cinchonidine and the dextro-rotatory Quinidine and Cinchonine. The two amorphous substances, Quinicine and Cinchonine, are also of some interest in that they are contained in considerable proportions in various types of febrifuges sold on the Indian Market."

In the *Quarterly Journal of Pharmacy* (No. 2, pp. 186-188, 1929) Dr. David Hooper, Quinologist to the Government of Madras (1884-97), contributes a paper on "The Standardisation of Cinchona Febrifuge." Comparing this with the Official Sulphate of Quinine he states "compared with a salt of such purity one would hesitate to render official a mixture of five alkaloids the proportion of which depends upon the exigencies of the Cinchona plantations and the Quinine factories." Quoting from Gage (*Trans. Roy. Soc. Trop. Med.* 1925), he continues "By bark mixture on a sufficient scale and, in time, by selection of trees, a reasonably steady average of alkaloidal constituents could be assured," and concludes "If this policy is pursued and when a preparation containing a suitable and fixed proportion of alkaloids is on the market it will be possible to acknowledge it as an official medicine."

The question of Cinchona febrifuge is now receiving the attention of the Malaria Commission of the League of Nations* and the Medical Director has furnished to the Health Committee a report of a sub-committee which contains the conclusions at which they have arrived, and a preliminary note on the analysis of a new standard preparation to which the name of "Totaquina" has been given. This sub-committee propose that "Totaquina" should contain 70 per cent. of crystallising alkaloids of which not less than 15 per cent. must be quinine. Amorphous alkaloids should not exceed 20 per cent., mineral matter not more than 5 per cent. and water not more than 5 per cent. The following resolution has been passed by the Health Committee of the League of Nations on this report:—The Health Committee, "Notes the conclusions of the sub-committee of pharmacological and chemical experts on the new preparation 'Totaquina.' Requests the Medical Director to arrange, with the Permanent Standards Commission, for the study of the chemical and biological control of this preparation to be continued. . . . These conclusions will be included in the report to be forwarded to the sanitary administrations concerned, which will deal with the

*CH/Malaria/167. (1) Geneva May 13th, 1931.

researches carried out under the auspices of the Malaria Commission in regard to the secondary alkaloids and mixtures of the alkaloids of Cinchona."

Recent medical research has been directed towards the use of a new drug called Beprochin. This preparation is now called "Plasmoquine" (a derivative of quinoline), supplied as "Plasmoquine brand of beprochin"—issued in tablets each containing 0.02 gm. (Plasmoquine Simplex). "Plasmoquine" compound is stated to contain 0.01 gm. of "Plasmoquine" and 0.125 gm. of quinine sulphate in each tablet. The compound tablets are considered the best to use, as the continuous treatment with plasmoquine alone is liable to produce cyanosis. Experiments with this proprietary medicine have been made under the direction of the Medical Officer of Health and Adviser on Tropical Diseases to the Ministry of Health on the prevention of Malaria with "Plasmoquine," and as reported in "The Lancet" (Aug. 15th, 1931, p. 341) it is claimed that "'plasmoquine' effectively prevents mosquito-borne malarial infection among a group of healthy individuals who take the prophylactic doses."

Whether this can be produced at a competitive price with Cinchona alkaloids is not certain, but in view of the present price of tablets of the above preparations it does not seem at all likely that they will displace the natural Cinchona alkaloids.

The importance of the Cinchona alkaloids is still being urged by various authorities. On June 4th, 1924, Sir David Prain gave a lecture at the Chelsea Physic Garden on "The Economic and Hygienic Relationship of Cinchona and its Alkaloids," discussing the alkaloid content of barks and the so-called Cinchona Monopoly in Java. As to the former the report in the *Chemist and Druggist* (June 14th, 1924, p. 827) leads one to infer that medical opinion seems to have undergone little change in attitude towards the use of quinine alone, and that full advantage is not yet taken of Cinchona and its alkaloids. Of the latter he said "this is no more than a quinine monopoly. That monopoly is not the creation of Java; it is a consequence of the fact that yellow bark, which does not thrive in South India, grows better in Java than in any area outside Bolivia, where it has been tried. The preference of the planter everywhere for yellow bark is a result of the fact that the quinine maker pays a better price for that bark."

He gave similar evidence on the Quinine position at a meeting in London of the Royal Commission on Agriculture, in India, June 28th, 1927. The findings of the Commission are given in their report printed in Calcutta (1928), pp. 490-492, where it is stated (p. 490) "the annual total consumption of quinine in India is estimated at 160,000 lbs. of which only 42,000 lbs. are manufactured in the country. In these circumstances the Indian price is determined by the world price and this, as is well-known, is a monopoly price owing to the fact that ninety per cent. of the world's surplus [supply?] of quinine comes from Java."

"If India is to embark on any large campaign for fighting malaria we are convinced that it will first be necessary to reduce considerably the price of Quinine within India and this can only be effected if India is self supporting in production. To achieve this self sufficiency a considerable extension of the present area under Cinchona will be required."

Dr. Cowan in the Empire Forestry Journal, 1929, p. 48, quoting from Sir Patrick Hehir's recent book on "Malaria in India," states that "for India alone, the lowest amount of quinine which would have any effect upon the malaria problem would be about 970,000 lbs. This estimate is based on a consumption of only 20 grains per head per annum. . . ."

"The total consumption in India is about one-sixth of this figure, so that, were India to be in a position to provide for her own minimum requirements she would immediately have to increase her production by eighteen times."

The Importance of the Introduction of *Ledgeriana* to the Two Issues—Bark Production and Quinine Separation.

This has influenced the cultivation throughout. The position of Cinchona cultivation in India about the time (1865-75) when *Ledgeriana* proved so successful in Java was that Red Bark (*C. succirubra*) and Crown or Pale Bark (*C. officinalis*) were the only two species amongst those introduced that proved suitable to the conditions in the Nilgiris. Greater attention was here paid to Red Bark, not only because it was more easily grown, but also for the reason that the mixed alkaloid content was the highest and likely to meet, as already stated, the demand for Cinchona febrifuge. Crown Bark was found to thrive well and was the main source of Quinine in Madras since *Calisaya* or Yellow Bark could not be successfully grown in the Nilgiris. "In 1886 the Nilgiri plantations contained about a million and a half plants of all ages of which 40,000 were in permanent plantations." (King, Manual, Cinchona, p. 19).

In Sikkim (N. India) Red Bark succeeded as well as, if not better than, in the Nilgiris; but the position with regard to Crown Bark and Yellow Bark was reversed. In the northern plantation Crown Bark did not thrive so well, but Yellow Bark could be grown more successfully, though it did not yield so high a percentage of quinine as could be obtained in Java. Dr. King reported (Manual, Cinchona, p. 19) that "propagation by cuttings of *C. succirubra* and *C. officinalis* went on vigorously during succeeding years. It gradually, however, became apparent that *officinalis* does not thrive in Sikkim, and, after about 400,000 plants had been put out, all further planting of this species was discontinued, and not only so, but three-fourths of the area covered by it were replanted with *succirubra*. Only 125,000 plants of *officinalis* are therefore now

returned. Of *C. succirubra* there were on the 1st April 1875, 2,390,000 trees.

"The best of all the medicinal Cinchonas—namely *Calisaya* or Yellow Bark—promises to do well in Sikkim, and there were on the plantation on 1st April, 1875, 354,500 trees of that species, besides young plants in the nurseries."

"The great preponderance of *succirubra* trees in the plantation is not due to a preference for that species over *Calisaya*, but to the fact that the Red Bark tree is hardier . . . and has a much wider range, as regards conditions of growth, than *Calisaya*. Owing to the backwardness of *Calisaya* to yield seed, propagation by artificial methods had to be relied on until 1874. During that year the *Calisaya* trees for the first time seeded freely; it was therefore hoped that the rapid extension of this species by seedlings could then be begun. But Mr. Wood, the recently appointed Quinologist, found considerable variation in yield from the bark of the different varieties, of which the best were selected and propagated by cuttings."

It was pointed out that whereas certain of these varieties yielded a bark containing as much as $7\frac{1}{2}$ per cent. of total alkaloid, of which nearly the whole was quinine, others yielded as little as $1\frac{1}{2}$ per cent. of total alkaloid. The best varieties yielded from $5\frac{1}{2}$ - $7\frac{1}{2}$ per cent. of total alkaloid.

Incidentally it is interesting to compare, on Dr. King's authority (Manual, Cinchona, p. 7), the situation in Java at the same period. He states "At the end of the year 1860, the stock in the Java plantations consisted of nearly a million plants of *Cinchona Pahudiana*, with only about 7,000 of *Calisaya*. Having discovered the worthlessness of *Pahudiana*, the Dutch, in 1862, abandoned its cultivation. They also gave up (in 1864) the plan of planting out under forest shade. They have in recent years repeatedly got supplies of seed and plants of the best medicinal sorts from India and Ceylon, and their success of late has been great. According to the latest return (31st March 1875) there are in the Java plantations about two millions of Cinchonas of various ages. At least half of these are of undoubtedly valuable species, and amongst them are a hundred thousand of a variety of *Calisaya*, samples of the bark of some trees of which are said to have yielded on analysis the astonishing amount of from 10 to $13\frac{1}{4}$ per cent. of Crystalline Sulphate of Quinine." In a footnote to this King adds "This wonderful variety of *Calisaya* having been originally raised from seeds collected by Mr. Ledger, has been called by the Dutch *C. Calisaya*, variety *Ledgeriana*."

Present Day Production.

Bengal.—The following information is obtained from the Annual Reports of the Government Cinchona Plantations, Bengal, for 1928-30 and will give some idea of the actual production of bark, quinine and cinchona febrifuge.

The quantity of Bengal bark harvested in the year 1928-29 was 465 tons (1,041,827 lbs.) at which period 2986 acres were under cultivation. Of this area 2306 acres were under *C. Calisaya* var. *Ledgeriana*, 275 under *C. succirubra*, 62 under *C. officinalis*, and of hybrids, 96 under *Ledgeriana* × *officinalis* and 245 under *Ledgeriana* × *succirubra*.

In 1929-30 the quantity of Bengal bark harvested was 1,130,402 lbs. and 1,060,656 lbs. were put through the factory. This latter amount was comprised of 950,458 lbs. of *Ledgeriana*, 22,509 lbs. of *succirubra*, 7188 lbs. of *officinalis* and 80,501 lbs. of "hybrid." From this were manufactured approximately 13,000 lbs. of purified sulphate of quinine and 20,078 lbs. of Cinchona febrifuge.

Madras.—According to a recent estimate (Report of the Government Cinchona Department, Madras, for 1928-29), the Cinchona plantations cover an area of 1858 acres, of which 1105 acres are in the Nilgiris and 753 acres in the Anaimalais, the latter being still quite young. This report states that "as recently as 1922 the general average quinine content of Naduvattam [plantation] bark worked out at 2.18 per cent. due admittedly to the *Succirubra* character of the hybrid tree then extensively planted. In the past year the average is over 100 per cent. above this figure—namely 4.68 per cent. and represents the best results of any year in the history of the plantations. Considering that *Ledgeriana* will not grow on the main plantation at Naduvattam, it is gratifying to possess *Officinalis* and *Robusta* capable of giving such a high outturn of quinine." It is interesting to note the records here that "in the lower part of Naduvattam, termed Moyar, analysis has revealed the presence of some very high grade *Ledgeriana* and seed from the trees has been reserved for the Anaimalai plantation" (see reference below) and that "surprisingly high analyses have been obtained from selected trees of *Cinchona Officinalis*, seed of which was obtained over forty years ago from Jamaica."

From the Nilgiri plantations 194,299 lbs. of bark were harvested in the year under review.

The plantations on the Anaimalai hills appear to have been started about 5 years ago and, in addition to the 753 acres in the permanent areas above mentioned, the nursery stock on 1st April, 1929, included 1,152,569 plants of *Cinchona Calisaya* var. *Ledgeriana*. It is interesting to note this development of *Ledgeriana* in this part of Madras as all previous records show that this variety has never succeeded in the older plantations in the Nilgiris.

Under "Factory Working" it is stated that "the Madras plantations are mostly immature, and were all available bark harvested now, there is not a sufficiency to keep the factory working for more than two to three years," and "one of the main problems of maintaining the factory at an economic level of outturn is the supply of bark."

"The Government of India have assisted the Madras Factory during the past five years with imported bark and thus the production has been maintained at an economic figure."

Java.—In 1927 the number of estates submitting returns in the Dutch East Indies was 138 with 19,656 hectares planted and 14,594 hectares in bearing, the production of bark being 12,692 tons (Report, Commercial Agent, Batavia, 1929, p. 80). Assuming this to be all *Ledgeriana*, on the average of the standard 7 per cent., the yield of quinine would be nearly 900 tons.

Howard in 1931 has estimated that "the actual world's consumption of quinine to-day is approximately 600 tons per annum."

Species and Varieties of Cinchona at present under Cultivation.

By trial and selection there remained in use when Ledger bark came into prominence the following species and varieties.

Cinchona Calisaya Wedd. var. *Ledgeriana* Howard in Quin. E. Indian Plantations (1876) p. 86 [*C. Ledgeriana* Moens. ex Trimen, Journ. Bot. xix (1881) p. 323]. Ledger Bark, Yellow or Calisaya Bark. Native of Bolivia. Cultivated in Java, India, Tanganyika, Cameroons, etc.; thrives in Java (lat. 7° S.) at an altitude of 3500 to 6000 ft. Amount of total alkaloid in the bark (Java) 5 to 10 per cent., and of quinine in "Commercial Ledger bark" 3 to 8 per cent.

C. Calisaya Wedd. in Ann. Sc. Nat. Ser. iii. x. (1848) p. 6. Yellow Bark, Calisaya Bark. Native of Bolivia—wild and cultivated—and S. Peru. A very variable species difficult to cultivate. Grown in India, Java, Cameroons, etc.; succeeds at elevations of from 1500 to 3000 feet in Sikkim (lat. 27° N.). Calisaya quills yield 6 to 7 per cent. of total alkaloid; 3 to 4 per cent. (in Bolivian cultivated) quinine.

C. succirubra Pavon ex Klotzsch in Abh. Akad. Berlin (1857) p. 60. [*C. pubescens* Vahl]. Red Bark. Native of Ecuador (known at the time of the Spanish occupation as a province of Peru). Cultivated in India, Burma, Java, Ceylon, Jamaica, St. Thomas (W. Africa), Tanganyika, Cameroons; succeeds at altitudes of from 3000 to 6000 feet. The hardiest of all the Cinchonas, "Red Bark quills" average 6.5 per cent. (India) and 8.25 per cent. (Java) of total alkaloid; and 1.5 (India) and upwards of 5 per cent. (Java) of quinine.

C. officinalis Linn. Syst. ed. x. (1759) p. 929. [*C. condaminea* L.]. Crown Bark, Loxa, Pale or Peruvian Bark are names by which this bark has been known in the trade since its introduction (1630); "Countess Powder" and "Jesuit's Bark" are also names by which it was originally known, but these have long since gone out of use, the latter continuing to about 1834. The author of the figure in the Botanical Magazine t. 6364 (1863) calls it "La Condamine's Peruvian Bark." Native of Ecuador, also in Colombia, Peru and Bolivia. Cultivated in S. India, Ceylon, etc.; thrives at higher elevations

(6000 to 8500 ft. in the Nilgiris, lat. 11°-12° N.) better than any other of the species. "Pale Bark" quills average 6 per cent. total alkaloids and 3 per cent. (cultivated) of quinine.

All the above species are described in Kew Bull. Add. Series ix. pp. 349-352 where some general information is also given.*

There are two hybrids worthy of mention—"Ledger Hybrid" (*Ledgeriana* × *succirubra*) and *C. robusta* (*officinalis* × *succirubra*).

In Bengal "Ledger-Hybrid" has been found to be inferior to *Ledgeriana* in yield of quinine but it is of more robust habit and can be cultivated in parts where pure Ledger does not do so well. Only a small proportion of the total acreage is under this hybrid in India (Ann. Rep. 1921-22 Bengal p. 1). It was at one time extensively grown in Java, grafted on to *C. succirubra*, but it is reported to be going out of cultivation (Sands, Malay Agric. Journ. vol. x, No. 3, 1922).

The Hybrid *C. robusta* also appears to be now comparatively unimportant in India and Java—where it has been known since about 1881.

Both hybrids are in cultivation at Amani where Ledger-Hybrid has been found to yield from four year old trees over 6 per cent. of quinine, and one sample of bark examined at the Imperial Institute contained 11.30 per cent. of total alkaloid and 8.41 per cent. of quinine, and was therefore of very good quality (Report on Cinchona Bark, Imp. Inst. 1922, pp. 34-35). A sample of *robusta* bark from the same source was found to contain 7.61 per cent. of total alkaloid and 2.66 per cent. quinine—these percentages being considered high, as this bark generally contains 5 to 6 per cent. of total alkaloid and 2 per cent. of quinine.

It will be seen that in all the species of *Cinchona* known, there are comparatively few worthy of cultivation and that at the present time they are practically reduced to two—*C. Calisaya* var. *Ledgeriana* and *C. succirubra*, the one for the production of quinine and the other for the production of "druggists' bark" for official use and in the preparation of Cinchona febrifuge for local use. The latter species—

*The elevations given above are adapted briefly from King (Manual of Cinchona) and Watt (Commercial Products of India).

The climate at certain altitudes may vary according to latitude but as the best situations for growing Cinchona are chiefly in the Tropics, the differences are not important. Within these limits, however, winds and exposure are more serious in their effects, hence the usual recommendation to plant on the slopes of mountain valleys.

On the Nilgiris in India it was found by McIvor that "In standing the violence of storms, the 'Crown barks' rank first, the 'Red' second, the 'Grey' third and the 'Yellow' fourth" (see King, l.c. p. 28).

The success in the cultivation in Java would seem to be largely due to the selection of land at a suitable height above sea level, on the slopes of extinct volcanos and on intermediate plateaux, where the soil, of volcanic origin, is porous and open in character, enriched with humus (Malayan Agric. Journ. March 1922 and June 1931).

The total alkaloid and quinine content are quoted from Greenish (Materia Medica, 1929 ed.).

owing to its vigorous growth under varying conditions of soil and altitude—is now often recommended as a stock on which to graft good strains of the former species.

In Java—where as already stated *Ledgeriana* has long been the only source of bark for quinine production—according to W. N. Sands who visited the Island in January 1922 for the purpose of studying the industry as carried on there, the *Ledgeriana* types can only be successfully grown on their own roots in virgin land, of which there is a very limited area now available. Practically all the fields when replanted are put under selected *Ledgeriana* strains grafted on *C. succirubra* which for the production of bark is grown on a few estates where the elevation and land are not as a rule suitable for *Ledgeriana*. "On all large estates it is extensively sown to produce seedlings for grafting purposes only."

The cultivation is well understood in India and Java, the only countries producing bark on a commercial scale outside of South America.

At the present time the slow, laborious and costly methods employed in the early days, of "mossing," "shaving," and "coppicing" of the trunks of trees about eight years old, when harvesting the bark, are giving way to a rotation system of thinning out or pruning, beginning about the fourth year, and final uprooting when the tree has reached an age—approximately ten years—at which the maximum yield of alkaloid may be obtained from the roots, stems and branches: the land being afterwards replanted.

Evidence of the Need for Expansion of Cultivation and of the Suitability of Different Parts of the Empire to this Cultivation.

The findings of Commissions, the conclusions come to by various Committees and the researches of medical and botanical specialists on the subject of Cinchona, all afford evidence that there is good scope for increased production. The most promising countries, other than Bengal and Southern India, in the British Empire are those where it has already been proved by production of bark on a commercial scale including Burma, Ceylon, and Jamaica. Also there are in the Museum at Kew samples of bark obtained by trial cultivation which indicate the possibilities of development in parts of Tanganyika and British Cameroons.

The Amani samples submitted for report to the Imperial Institute (see Bull. Imp. Inst. 1918, pp. 386-388 and 1920, pp. 22-25, and Indian Trade Enquiry Report on Cinchona Bark 1922, pp. 34, 37) included *Cinchona Calisaya* var. *Ledgeriana*, *succirubra*, *robusta* and Hybrid (*Ledgeriana* × *succirubra*), all of which were found to be of good quality, equal to Java. Those from the British Cameroons were not named—though of the samples (No. 1, 2, 3, 4) submitted, the results showed that all were of good quality "furnishing from 6.7 to 8.2 per cent. of quinine sulphate and consignments of similar

quality would be very suitable for the manufacture of quinine sulphate." It was suggested that samples, 1, 2 and 3 were probably derived from the "Ledger-type" of *Cinchona* while sample 4 was probably derived from a "hybrid." The barks came from Buea (3300 feet alt.) where (August 1930), according to Mr. Maitland the present Superintendent, Botanic Gardens, Victoria, the species growing and in existence prior to the war were *succirubra*, *Ledgeriana* and *Calisaya*. Specially selected seed from Java of *succirubra* and *Ledgeriana* had recently been received and established at Buea for seed purposes.

Experiments are being made in British Malaya where, according to a report of the Department of Agriculture for the half-year ended June 30, 1930, *Cinchona Calisaya* var. *Ledgeriana* and *C. succirubra* under cultivation at the Experimental Plantation, Cameron's Highlands (4750 feet alt.), have shown good growth. Prepared samples of bark from both species had been sent to the Quinologist, Calcutta, for analysis and report on the Alkaloidal Content (Bull. Imp. Inst. 1930, p. 509).

Extensive private *Cinchona* plantations at one time existed in Ceylon (1872) to 1883* and S. India, chiefly under Crown Bark (*Cinchona officinalis*) and Red Bark (*C. succirubra*); but they could not compete successfully with the production of Yellow Bark (*C. Calisaya* var. *Ledgeriana*) in Java, owing to overproduction and the price on the market for Crown Bark being so much less than that obtained for Yellow Bark from Java. The planters then neglected *Cinchona* and planted Tea and other plantation crops which were found more profitable.

The *Cinchona* industry has little or nothing to fear in competition with the original sources in South America. Twenty-five years ago it was stated that "the once flourishing business in Peruvian bark is now almost entirely superseded by the cultivated barks from the East Indies. On an average only 60 to 70 tons are shipped yearly as compared with 500 tons to 800 tons in previous years" (Cons. Rep. Ecuador, 1906).

In 1927 out of a total of 812 tons—still called "Peruvian bark" in the Customs returns—from all sources imported into the United Kingdom, Java contributed 550 tons, British India 53 tons, other British countries 10 tons, and Peru 43 tons: whilst in 1928 and 1929 only about 20 tons in each year were imported into this country from Peru.

The synthetic production of *Cinchona* alkaloids also seems to be as far off as ever, Howard (*Cinchona Industry*, 1931) quoting his father's remarks of 1906—which appear to be equally true to-day,

*In Ceylon the cultivation began about 1870; it "rose from 500 acres in 1872 to 64,000 acres in 1883, the export of bark at its maximum (1887) being nearly 16,000,000 lbs." In 1909 there was only 156,081 lbs. of bark exported (Macmillan, *Tropical Gardening and Planting*, p. 420). In 1915 the exports of bark had fallen to about 20,000 lbs. and at the present time there are no records of any export.

states "The synthesis of quinine has always been hitherto an unattainable aim. It has been frequently attempted . . . and used to have a pecuniary as well as scientific attraction, but, from the commercial standpoint, can we hope to beat nature with her synthesis of 10 per cent. *Ledgeriana*?" The further discussion of this question does not appear to be of serious import.

The main purpose of this paper will have been served in presenting a few facts from which it is hoped satisfactory conclusions can be drawn, more especially in the right selection of species of *Cinchona* to meet the modern demands of the grower, the manufacturers and the users.

There is an extensive literature on *Cinchona* from all points of view, including several books, but the following are recent references on the botany and cultivation.

"*Cinchona*" in Comm. Prod. India, Sir G. Watt, pp. 302-310 (John Murray, London, 1908).

"*Cinchona* in Java from 1872 to 1907," D. Hooper, in Agric. Ledger, No. 4, 1911, pp. 35-106, being extracts translated from the "Scheikundige Bijdragen Tot de Kennis der Java-Kina" by the late K. W. van Gorkom, published 1908.

Annual Reports of the Government *Cinchona* Plantations and Factory in Bengal—the 68th year 1929-30.

"The *Cinchona* (Quinine) Industry in Java," W. N. Sands, in the Malayan Agricultural Journal, Vol. x, No. 3, 1922 (Reprinted in the Tropical Agriculturist (Ceylon) Dec. 1922, pp. 352-370).

Report by the Imperial Institute on *Cinchona* Bark grown in India, St. Helena, East Africa and the Cameroons (Indian Trade Enquiry Series), 1922, pp. 1-40.

Malaria and Quinine (Amsterdam-Bureau for Increasing the use of Quinine) pp. 1-58: illustrated (Amsterdam 1927).

"*Cinchona* in the Empire: Progress and Prospects of its Cultivation," Dr. J. M. Cowan, in "Empire Forestry Journal" Vol. 8, No. 1, 1929, pp. 45-53.

"The Standardisation of *Cinchona* Febrifuge," Dr. David Hooper, in Quarterly Journal of Pharmacy, Vol. 2, No. 2, 1929, pp. 186-188.

"Some Notes on the *Cinchona* Industry," Bernard F. Howard, pp. 1-22 (issued by the Institute of Chemistry of Great Britain and Ireland, London, 1931).

"The Rubiaceae of Ecuador," Paul C. Standley, Field Museum of Natural History, Chicago. Publication 285. Botanical Series, Vol. vii, No. 2, 1931, pp. 188-200.

"*Cinchona* culture in Java, its History and present Situation." Lecture by Dr. M. Kerbosch at the Missouri Botanical Garden, St. Louis. Reprinted from *De Bergcultures*, No. 18, May 2, 1931, in The Tropical Agriculturist (Ceylon), Vol. lxxvii, pp. 277-304.

"The genus *Cinchona* in Bolivia," H. H. Rusby, in Bull. Torrey Bot. Club, Vol. 58, No. 9, p. 523, 1931.

II.—CONTRIBUTIONS TO THE FLORA OF TROPICAL AMERICA: IX.* T. A. SPRAGUE AND N. Y. SANDWITH.

THE TABEBUIAS OF BRITISH GUIANA AND TRINIDAD.

The genus *Tabebuia* Gomes (Bignoniaceae) is here understood almost in the same sense as in Bentham and Hooker's *Genera Plantarum*, but as including also the genus *Couralia* Splitg. which seems to differ in nothing but the opaque corky wings of the seeds. It thus includes, in addition to the typical simple-leaved species, the trifoliolate and quinquefoliolate ones referred by K. Schumann to a separate genus, for which he adopted the name *Tecoma* Juss. sensu Seem. The synonymy of the genus is therefore as follows:—

Tabebuia Gomes, Obs. Bot. ii. 7, t. 2 (1803); Benth. et Hook. f. Gen. Pl. ii. 1042 (1876).

Tecoma Juss. Gen. 139 (1789), partim; Seem. in Journ. Bot. 1863, 19; K. Schum. in Engl. & Prantl, Nat. Pflanzenf. iv. 3b, 236 (1894); Bur. et K. Schum. in Mart. Fl. Bras. viii. pars 2, 315 (1897).

Couralia Splitg. in Hoeven & de Vriese, Tijdschr. Nat. Gesch. Phys. ix. 14 (1842); Benth. et Hook. f. l.c.; K. Schum., l.c. 238; Bur. et K. Schum. l.c. 345.

Rehder (Mitteil. Deutsch. Dendr. Ges. 1913, 262) accepted the genus *Tabebuia* in the same sense as Bentham and Hooker, and showed that the name *Tecoma* Juss. (1789), which originally covered species of three genera, namely, *Stenolobium* D. Don, *Campsis* Lour. and *Tabebuia* Gomes, should properly be applied to *Stenolobium*. These conclusions were accepted by Urban (Fedde, Repert. xiv. 304-306: 1916). Schumann himself had admitted that the only character separating *Tabebuia* from *Tecoma* (sensu Seem.) was the simple leaves, and if this character is accorded generic value, it separates species which have in other respects much in common. This is well illustrated by the series (1) *T. cassinoides*, (2) *obtusifolia*, (3) *stenocalyx*, (4) *longipes*, (5) *roraimae*, (6) *dura*, which seems to form a very natural group. All have a lepidote calyx. The first three species have simple leaves, and the last two have 3-5-foliolate leaves, while those of *T. longipes* are intermediate in type, being 1-foliolate, with the lamina articulate to the petiole. As far as the sum total of their morphological characters is concerned, species (5) and (6) are certainly nearer (1) and (2) than they are to the 3-5-foliolate species of "*Tecoma*" (sensu Seem.) with a stellately tomentose calyx, such as *T. serratifolia* (*T. araliacea*) or *T. Arvelanadae* (*T. Ipe*). The nature of the indumentum seems to be of far greater importance than the number of leaflets. And if two genera are recognised, to which should *T. longipes* be assigned, to *Tabebuia* on account of its single lamina, or to "*Tecoma*" because of the presence of an articulation at the apex of the petiole, indicating that the leaf is compound?

*Continued from *K.B.* 1931, p. 492.

Another series of species which seem to be closely related is represented by (1) *T. lepidota* (5-3-foliolate), (2) *T. trachycarpa* (simple-leaved) and (3) *petrophila* (leaves usually simple, a single unequally 2-foliolate one seen). These are all native of Cuba and agree in the possession of short shoots, lepidote leaves and calyces, and corollas glabrous outside, purple in *T. lepidota* and *T. trachycarpa*, not known in *T. petrophila*. Here a very close relationship seems to subsist between *T. lepidota*, which has 5-3 leaflets, and *T. trachycarpa*, which has simple leaves, though according to Schumann's classification they should be assigned to separate genera.

The genus *Tabebuia* is of considerable economic importance as containing numerous species yielding valuable timbers (vide Record, Timbers of Tropical America, pp. 532-544). Among those included in the present paper are the "Black Poui" of Trinidad, or "Cogwood" of Tobago (*T. rufescens*), the "Hakkea" or "Hackia" of sandy soil in British Guiana (*T. hypolepra*, sp. nov.) and the "Yellow Poui" of Trinidad or "Washiba" of British Guiana (*T. serratifolia*).

The species of *Tabebuia* have not been adequately studied hitherto, and some of those yielding important timbers have not yet been identified, owing to absence of corresponding herbarium material. As the result of the present investigation, the three important timber trees mentioned above have been critically determined, and it has been established that *T. glomerata* is a synonym of the previously described *T. rufescens*, and that *T. araliacea* of Brazil is synonymous with *T. serratifolia* of the West Indies and Venezuela. Up to the present these have been treated respectively as independent species in all botanical works.

KEY TO THE BRITISH GUIANA AND TRINIDAD SPECIES.

Calyx lepidote outside: corolla white:

Leaves simple or 1-foliolate:

Lamina not articulated to petiole; calyx elongate-tubular; corolla-tube narrowly cylindric in the lower two thirds, narrowly funnel-shaped above, with dense groups of plate-shaped glands outside below the lobes.....1. *stenocalyx*.

Lamina articulated to petiole, or petiole obviously thickened at apex; calyx campanulate or tubular-campanulate; corolla-tube funnel-shaped, without groups of glands below the lobes2. *longipes*.

Leaves 3-5-foliolate:

Leaflets oblong, elliptic-oblong or obovate, obtuse or rounded above, sometimes shortly apiculate, lateral nerves distinctly impressed above.....3. *roraimae*.

Leaflets ovate-oblong to narrowly lanceolate, acutely acuminate, lateral nerves slightly raised above:

Leaflets shining above, ultimate reticulation raised on lower surface; terminal leaflet 9–13 cm. long, lateral nerves 6–9 on each side; inflorescence lax.....4. *dura*.
 Leaflets dull above, ultimate reticulation not raised on lower surface; terminal leaflet 11–20 cm. long, lateral nerves 12–14 on each side; inflorescence contracted...5. *aquatis*.
 Calyx stellate-pubescent or tomentellous outside; corolla yellow (colour not known in *T. floccosa*):
 Leaves 5-foliolate; flowers in terminal inflorescences; calyx-lobes not subulate; corolla glabrous outside; disk sessile:
 Calyx clothed outside with a persistent coarse or fine tomentum:
 Leaflets pubescent with both simple and stellate hairs, rather densely lepidote on the lower surface; calyx tomentose.....
 6. *rufescens*.
 Leaflets pubescent with stellate hairs only, sparingly and inconspicuously lepidote on the lower surface; calyx tomentellous below, somewhat glabrescent above between the nerves.....7. *subtilis*.
 Calyx clothed outside with a sparser and easily removable indumentum:
 Finest veinlets on upper surface of leaflets raised, areoles impressed-punctate, lower surface densely lepidote; calyx-lobes more or less ribbed outside.....8. *hypolepra*.
 Finest veinlets on upper surface of leaflets slightly impressed or at any rate not raised, areoles flat or convex, usually not obviously impressed-punctate, lower surface sparingly lepidote; calyx lobes not ribbed.....9. *serratifolia*.
 Leaves 3-foliolate; flowers solitary, terminal; calyx-lobes subulate; corolla subtomentose outside; disk peltately attached.....10. *floccosa*.

1. ***T. stenocalyx*** *Sprague et Stapf* in Kew Bull. 1910, 196; Urb. in Fedde, Repert. xiv. 304 (1916).—*Schlegelia violacea* Griseb. Fl. Brit. W. Ind. 445 (1861), partim, excl. syn.
 TRINIDAD. St. Anne, fl. April, *Crueger*. Near bungalow on Mt. Harris, Central Range Reserve, in poor soil, a smallish tree, fl. and fr. July, *Marshall in Trinidad Bot. Gard. Herb.* 12222. Government House Grounds, fl. Sept., *Broadway* 2888, fr. Aug., *Broadway*. Botanic Gardens, fl. and fr. March, *Trinidad Bot. Gard. Herb.* 3566.
 BRITISH GUIANA. Barama River, Pomeroon District, *im Thurn in Jenman* 1947.
 BRAZIL. Specimen cultivated in Hort. Kew (Herb. Hook.).
 As stated by Sprague and Stapf, l.c. the specimens from British Guiana and Brazil have proportionately narrower leaves with more numerous lateral nerves, but we cannot separate them specifically.
 Mr. R. O. Williams informs us that *T. stenocalyx* is apparently a common plant in Trinidad, and mentions the following additional material in the Trinidad Herbarium: no. 12503, Quare Road, Brooks; no. 11856, Sangre Grande, Williams; Arima, Dannouse.

2. ***T. longipes*** *Baker* in Hook. Ic. Pl. t. 1738 (1888).

BRITISH GUIANA. Hooroobe, in wet savannahs, fl. and fr. April, *Jenman* 3723. Upper Demerara River, fl. and fr. Sept., *Jenman* 4256. Lama, fl. April, *Jenman* 4700. N. W. District, Waini River, Turebaru Creek, in swampy land inundated at high tide, *Brit. Guiana Forestry Dep.* 901. N. W. District, Barima River, *De La Cruz* 3377. Potaro River, Kaieteur Savannah, *Jenman* 830, 1064. Demerara, *Parker*. British Guiana, without locality, *Appun* 833. Guiana, labelled "*Bignonia monophylla*," *Herb. Forsyth*.

A tree, 8–20 m. high, known as "White Cedar" and furnishing a useful wood for indoor purposes. On the Upper Demerara River and on the Waini River it is known by the Arawak name "Warikuri" or "Warakuri."

The specimens from the Kaieteur Savannah have a somewhat different facies, the leaves being markedly areolate beneath, but we have been unable to separate them specifically. Possibly they may represent an edaphic form.

3. ***T. roraimae*** *Oliv.* in Trans. Linn. Soc. ser. 2, ii. 280, t. 45 (1887); N. E. Brown in Trans. Linn. Soc. ser. 2, vi. 57 (1901).—*Tecoma roraimae* K. Schum. in Engl. & Prantl, Nat. Pflanzenf. iv. 3b, 238 (1894). *Tabebuia triphylla* Klotzsch in Rich. Schomb. Reise, iii. 1085 (1848); Rich. Schomb. Travels, ed. Roth. ii. 209 (1923); non DC.

BRITISH GUIANA. Southern slope of Roraima, at 1800 m., fl. Nov., Dec., *Rich. Schomburgk* 980 (*Rob. Schomburgk* 641). Roraima, 1500 m., fl. Dec., *im Thurn* 64. Roraima, on upper slopes, *McConnell and Quelch* 33. Roraima, 1600 m., fl. Dec., *Ule* 8761.

A small tree (3–10 m. high, according to Ule).

4. ***T. dura*** (*Bur. et K. Schum.*) *Sprague et Sandwith*, comb. nov.—*Tecoma dura* *Bur. et K. Schum.* in Engl. & Prantl, Nat. Pflanzenf. iv. 3b, 238 (1894). *Tabebuia fluviatilis* Klotzsch in Rich. Schomb. Reise, iii. 1085 (1848), non DC.

BRITISH GUIANA. Roraima, on the southern slopes, *Rich. Schomburgk* 928 (*Rob. Schomburgk* 658). Edge of water and along cataracts, *Rob. Schomburgk*.

A tree (according to Rich. Schomb. l.c.).

5. ***T. aquatilis*** (*E. Mey.*) *Sprague et Sandwith*, comb. nov.—*Bignonia aquatilis* *E. Mey.* in Nov. Act. Nat. Cur. xii. 780 (1825). *Bignonia digitata* *E. Mey.* l.c. 782. *Bignonia fluviatilis* *G. F. W. Meyer*, Prim. Fl. Esseq. 212 (1818); an Aubl. partim? *Couralia fluviatilis* Splitg. in Hoeven & de Vriese, Tijdschr. Nat. Gesch. Phys. ix. 15 (1842); *K. Schum.* in Mart. Fl. Bras. viii. pars 2, 347 (1897). *Zeyheria fluviatilis* *Miq.* in Flora 1842, xxv. 428. *Zeyheria digitata* *Miq.* l.c. 431. *Tabebuia fluviatilis* *DC.* in DC. Prodr. ix. 215 (1845). *Tecoma Meyeriana* *DC.* l.c. 221; *Miq.* Stirp. Surinam. Sel. 121, 122 (1850). *Tecoma fluviatilis* *Miq.* l.c. 121. *Tecoma insignis* *Miq.* l.c. 122, 123.

BRITISH GUIANA. Lower Demerara River, fl. Dec., *Jenman* 4319, and fl. May, *Jenman* 4345. Bank of Corentyne River near Orealla, common in water by riverside, fl. Sept., Oct., *Jenman* 477 and *in Thurn*. Demerara, *Parker*. Demerara, *unknown collector*, 71 (Mus. Brit.).

SURINAM. Paramaribo, fl. April, *Samuels* 51. Without locality, *Hostmann* 384, 1036; *Hostmann* sine numero in Herb. Goetting. (syntype of *Bignonia aquatilis* E. Mey.); *Kegel* sine numero in Herb. Goetting.

FRENCH GUIANA. Without locality, *Aublet* (Mus. Brit.) *Mélinon* 65, 223 (Herb. Paris.), *Martin* (Herb. Paris.).

BRAZIL. Pará: Breves, Furo Macujabim, fl. Aug., *Guedes in Herb. Amaz. Mus. Pará* 2215 (Mus. Brit.).

A small tree or shrub (about 3 m. high, according to *Jenman*), apparently confined to river-banks. Vernacular names: "Hack-ooya," "Whoua-whoua" (Brit. Guiana); Courali (Surinam).

Bignonia fluviatilis Aubl. Hist. Pl. Guiane Franç. ii. 655, iv. t. 267 (1775) is a very doubtful plant based, according to Ernst Meyer and Splitgerber and Miquel, on material of two very different species. Aublet's general illustration and his fig. 1 (leaf) were identified with *Bignonia aquatilis* E. Mey. and *Couralia fluviatilis* Splitg. respectively by the authors of these species. E. Meyer described the leaflets of his *Bignonia aquatilis* as being rounded at the base, which agrees with Aublet's illustration, whereas Splitgerber described the leaflets of his *Couralia fluviatilis* as being acuminate or obtuse at the base (rounded in a specimen in Aublet's herbarium). On the other hand, a specimen from Aublet's herbarium named *Bignonia fluviatilis* in Herb. Mus. Brit. has the leaflets attenuate at the base. A specimen collected by Parker in Demerara (Herb. Kew) agrees with the description of *Bignonia aquatilis* E. Mey. and with Aublet's general illustration, but all the other specimens cited above have the leaflets more or less narrowed at the base.

The Surinam specimens of *Couralia fluviatilis* described by Splitgerber were stated by him to possess seeds with coriaceous wings, a character which led him to base the new genus *Couralia* on this species. Aublet, on the other hand, both described and figured the seeds of his *Bignonia fluviatilis* as having a membranous margin, possibly owing to a mixing of specimens.

Since the application of the name *Bignonia fluviatilis* Aubl. is so uncertain, we reject it and the later combination *Tabebuia fluviatilis* as nomina dubia, and adopt the specific epithet *aquatilis* proposed by E. Meyer.

6. ***T. rufescens*** J. R. Johnston in Proc. Amer. Acad. xl. 696 (1905); Urb. in Fedde, Repert. Sp. Nov. xiv. 305 (1916), in obs.—*Tecoma spectabilis* Griseb. Fl. Brit. W. Ind. 447 (1861), non Planch. *Tabebuia serratifolia* Rolfe in Kew Bull. 1893, 267, non (Vahl) Nichols. *Tabebuia glomerata* Urb. in Fedde Repert. Sp. Nov. xiv. 305 (1916);

R. C. Marshall, Sylvic. Notes Timber Trees Trinidad and Tobago, 40 (1930).

COLOMBIA. Without locality, without flowers or fruit, *Triana* 362 (Mus. Brit.).

VENEZUELA. Margarita Island: San Juan Mountain, 500 m., fl. and fr. July, J. R. Johnston 79 (fragment of type in Herb. Berol.). Quebrada Sebucan, not uncommon, without flowers or fruit, *Ernst* 496 (Mus. Brit.).

TRINIDAD. Chacachacare Island, *Crueger* 257. Without locality, *Lockhart, Fendler* 527. Cultivated in Victoria Square, Port of Spain, fl. and fr. Febr., *Broadway* 5558. Cultivated in Queen's Park Hotel Yard, fl. March, *Britton* 2658. According to R. C. Marshall, l.c. this species tends to be found more in the south of the island and occurs rather on the heavier clay soils than on the sands.

TOBAGO. Rockley Vale, fr. Jan., *Broadway* 3637 (Mus. Brit.; Herb. Berol.). Botanic Station, *Broadway* 2989 (Mus. Brit.). In forests in the interior, near Frenchfield, 400 m., fl. and fr. Oct., *Eggers* 5532 (Herb. Berol.).

GRENADE. Without locality, *Broadway* 1494 (Herb. Berol. ex Urb. l.c.).

ST. VINCENT. Forest near Lowman's Village, western spurs of Mt. St. Andrew's, 480 m. fl. May, H. H. and G. W. Smith 1652. Without locality, *Guilding*. Cultivated in the Botanic Garden, *Powell* 3.

MARTINIQUE. Introduced, *Hahn* 1449.

JAMAICA. Cultivated in Hope Gardens, fl. Aug., *Harris* 30.

A small tree, attaining a height of 9-15 m., and furnishing a useful hardwood. Vernacular names: "Black Poui," "Poui Vert" (Trinidad); "Cogwood" (Tobago); "Poui," "Greenheart" (Grenada).

Urban (l.c.) separated his *Tabebuia glomerata* from *T. rufescens* J. R. Johnston (which was based on material with very young leaves), by the shape of the leaflets, length of the pedicels, and shape of the calyx-lobes. We are unable to distinguish two species on these characters. Cultivated specimens from Jamaica exhibit a considerable amount of variation in the shape of the leaflets, some being obovate, cuneate at the base, and others, belonging to the same collecting, elliptic, subcordate at the base.

Seedlings, and young trees of this species, have very coarsely serrate leaflets, whereas those of older trees are entire.

7. ***T. subtilis*** Sprague et Sandwith, sp. nov.; affinis *T. rufescens* J. R. Johnston, a qua indumento subtiliore, foliolis pilis stellatis tantum pubescentibus, subtus sparse inconspicue lepidotis, calyce inferne tomentello superne inter nervos glabrescente differt.

Arbor parva, ramulis hornotinis foliiferis brevibus tenuibus ad 10 cm. longis ad 2 mm. diametro leviter applanatis sulcatis dense conspicue stellato-tomentellis, indumento subtili siccitate pallide ferrugineo. *Folia* quinato-digitata, raro ternata; petiolus foliorum

bene evolutorum 5-7 cm. longus, indumento ramulorum senectute deterrenti praeditus; petioluli indumento simili, terminales 1.3-3 cm. longi, intermedii 1-2 cm. longi, inferiores vulgo 3-8 mm. longi; foliola anguste lanceolata vel oblanceolata, vel oblongo-elliptica, apice sensim longe acutiuscule acuminata, acumine 0.5-2.5 cm. longo, basi cuneatim attenuata usque rotundata, terminalia saepius 5-14.5 cm. longa, 0.8-4 cm. lata, exteriora minora, integra, juniora membranacea, supra nigrescentia, subtus pallidiora, utrinque praesertim nervis dense stellato-pubescentia, nonnunquam subtus dense tomentosa glandulis nigrescentibus sessilibus patelliformibus hic illic praesertim secus nervum medium satis copiosis conspersa, adulta satis rigida, tenuiter coriacea, supra nitida conspicue laxe reticulata, costa stellato-pubescente ceterum glabra, dense impresso-punctata, subtus laxe reticulata dense stellato-pubescentia usque glabrescentia, nervis primariis utroque costae latere saepius 10-14 ascendenti-arcuatis prope marginem anastomosantibus. *Inflorescentiae* terminales, ex apice ramulorum annotinorum defoliorum ortae, vel nuda vel ramulis axillaribus foliatis novellis consociatae, raro e ramulo annotino axillares, corymboso-thyrsoideae vel corymboso-racemosae, brevissimae, nonnunquam ramulos hornotinos foliatis terminantes, rhachi 0.6-2 cm. longa, rhachi pedicellis bracteis bracteolisque pilis stellatis dense ferrugineo-tomentellis; bractae lineari-subulatae, 0.5-2 cm. longae; pedicelli vulgo 0.3-1 cm. longi; bracteolae fere in medio pedicello vel infra positae, bracteis similes sed breviores. *Calyx* anguste campanulatus, lobis inclusis 1-1.7 cm. longus, apice tubi (statu applanato) circiter 1 cm. latus, saepe bilabiatus, labio altero breviter bilobo altero trilobo, lobis triangulari-ovatis saepe crasse apiculatis 1.5-5 mm. longis 2-6 mm. latis, conspicue costato-nervosus, extra inferne pilis ferrugineis dense stellato-tomentellus, supra inter nervos nigrescens sparsius indutus et glandulis nigris patelliformibus immersis hic illic conspersus. *Corolla* lutea, infundibularis, 6-9 cm. longa lobis inclusis, extra glabra vel superne, praecipue in venis, stellato-puberula; lobi ad 2 cm. longi, ciliati; tubus intus antice villosus, parte inferiore infra insertionem staminum villosa. *Stamina* longiora (antica) circiter 1.2 cm. supra basin corollae tubi inserta, filamentis 2.5 cm. longis basi villosis; breviora (lateralia) circiter 0.9 cm. supra basin inserta, filamentis 2 cm. longis inferne (2.5 mm.) villosis; antherarum thecae divaricatae, singulae 3 mm. longae. *Staminodium* circiter 0.8 cm. supra basin insertum, 1.2 cm. longum, glabrum. *Discus* breviter cupularis, vix 1 mm. altus. *Ovarium* lineari-oblongum, 6 mm. longum, minute sparse stellato-puberulum; stylus circiter 3 cm. longus, breviter stellato-puberulus. *Ovula* circiter 8-seriata, seriebus singulis multiovulatis. *Capsula* elongato-linearis, superne attenuata, 45-50 cm. longa, infra medium ad 1.2 cm. lata, irregulariter costata et subtilius striata, pilis minutis ferrugineis stellatis subtiliter pubescens. *Semina* alis inclusis 2.5-4 cm. lata, nucleo 4-6 mm. longo, 1-1.8 cm. lato.

BRITISH GUIANA. Mazaruni River: on rocks by waterside, Macreba Falls, Kurupung River, fl. and fr. Aug., *Altson* 353 (type). Potaro River: on rocks, Tumatumari Falls, fl. Sept., *Jenman* 7393; by riverside, Coobanatok, fl. Oct., *Jenman* 7461; Pacatout Falls, fl. March, *Jenman* 5189.

According to Altson, *T. subtilis* is a small tree, common on rocks by the waterside, with most of the flowers borne on leafless branches. Calyx green, brown-tomentose, commonly punctured by (?) hummingbirds. Corolla yellow, easily falling. Vernacular name: "Arawing-yek" (Acawai).

8. *T. hypolepra* *Sprague et Sandwith*, sp. nov.; affinis *T. serratifoliae* (Vahl) Nicholson, a qua venulis ultimis foliolorum supra elevatis areolis impresso-punctatis, pagina inferiore dense lepidota, calycis lobis extra plus minusve costatis differt.

Arbor excelsa, circiter 30 m. alta, 30 cm. diametro; ramuli summi annotini crassi, lignosi, cinerei, glabrescentes; hornotini pilis siccitate pallide ferrugineis dense furfuraceo-stellato-pubescentes. *Folia* quinato-digitata, raro ternata; petiolus 2.5-8 cm. longus, juventute stellato-pubescent, mox glabrescent, costatus, supra inferne applanatus ceterum late canaliculatus; petioluli similes, terminales 1.7-3.7 cm. longi, intermedii 1-2.5 cm. longi, inferiores vulgo 4-8 mm. longi; foliola oblongo-lanceolata, lanceolata, oblonga vel obovato-oblonga, exteriora minora nonnunquam ovata, apice plus minusve conspicue breviter vel longe acuminata, basi saepius inaequilatera obtusa vel rotundata, terminalia 8.5-14.5 cm. longa, 2.8-5.2 cm. lata, exteriora minora, integra, tenuiter coriacea, supra nitidula, costa nervisque stellato-pubescentibus, mesophyllo glabrescente lepidibus impressis exceptis, intricatissime reticulata, venulis ultimis elevatis, areolis impressis lepidibus lapsis conspicue punctatis, subtus pallida subglaucescentia, epilosa axillis nervorum saepius foveolato-barbellatis exceptis, dense conspicue lepidota vel lepidibus delapsis punctata, reticulatione multo minus conspicua areolisque saepe sub lepidibus conditis, nervis lateralibus utroque costae latere saepius 10-12 ascendentibus rectiusculis parallelis tum marginem versus arcuato-anastomosantibus. *Inflorescentiae* in ramulis nudis vel foliatis terminales vel etiam axillares, brevissimae, umbellatae, stellato-tomentosae; bractae bracteolaeque ut videtur lineares brevissimae, maturae haud visae; pedicelli breves, 1.5-5 mm. tantum longi. *Calyx* campanulatus, lobis inclusis 0.8-1.2 cm. longus, apice tubi (statu applanato) ad 8 mm. latus, irregulariter 5-lobus, lobis triangulari-ovatis saepius crasse apiculatis ad 4 mm. longis ad 5 mm. latis, saepius superne nervosus, extra satis dense stellato-pubescent, margine lorum membranaceo glabrescente. *Corolla* laete lutea, campanulato-infundibularis, lobis inclusis 6-7 cm. longa, tubi parte basali cylindrica 6-7 mm. longa, limbo 5-6.5 cm. lato, extra glabra; lobi 2-3 cm. longi, sparse ciliati, intus inferne sparse villosuli; tubus intus antice villosus, juxta insertionem staminum brevius villosus.

Stamina (sicut staminodium) circiter 4–6 mm. supra basin corollae tubi inserta, inferne dense breviter villosa; longiora (antica) 1.5–1.9 cm. longa, breviora (lateralia) 1.2–1.3 cm. longa; antherarum thecae divaricatae, singulae vix 3 mm. longae. *Staminodium* plus minusve curvatum, 5–8 mm. longum. *Discus* cupularis, vix 1 mm. altus. *Ovarium* leviter compressum, ambitu lanceolato-oblongum, 4 mm. longum, 1.5 mm. latum, densissime lepidotum; stylus 2.5 cm. longus, ut videtur glaber. *Ovula* circiter 8-seriata, seriebus singulis multiovulatis. *Capsula* desideratur.

BRITISH GUIANA. Essequibo River: Moraballi Creek, in Wallaba forest, on sandy ridge, fl. Nov., *Sandwith* 594 (type). Takewah Hill, fl. June, *Jenman* 6613. Potaro River: Tumatumari Falls, fl. Oct., *Jenman* 7437. Corentyne River, near Ulafenna River, *Brit. Guiana For. Dep.* 580A.

FRENCH GUIANA. St. Jean, concession Bouvet, *Benoist* 1238 (Herb. Paris.).

The type-material from Moraballi Creek was from a large tree 30 m. high, 30 cm. in diameter. Flowers on old branchlets, separate from leaves, bright yellow, hairy within on anterior side of tube and throat, lobes very frilly-edged. Vernacular name: "Hakkea" (Arawak).

This species is mentioned by Record (Timbers of Tropical America, 540: 1924) as the commonest species of "hackia" in British Guiana, having yellow flowers, and growing chiefly on sandy hills.

9. *T. serratifolia* (Vahl) Nicholson Dict. Gard. iv. 1 (1888); Urb. in Fedde, Repert. Sp. Nov. xiv. 305 (1916); R. C. Marshall, Sylvic. Notes, Timber Trees Trinidad and Tobago, 40 (1930).—*Bignonia serratifolia* Vahl Ecl. ii. 46 (1798). *Tecoma serratifolia* G. Don, Gen. Syst. iv. 224 (1838); Griseb. Fl. Brit. W. Ind. 447 (1861); Pittier, Pl. Usuales Venez. 203 (1926). *Bignonia flavescens* Vell. Fl. Flum. 252 (1825); Ic. vi. t. 51 (1827). *Tecoma flavescens* Mart. in DC. Prodr. ix. 216 (1845). *Bignonia araliacea* Cham. in Linnaea, vii. 683 (1832). *Tecoma araliacea* DC. in DC. Prodr. ix. 221 (1845); Bur. et K. Schum. in Mart. Fl. Bras. viii. pars 2, 328 (1897); Pulle, Enum. Vasc. Pl. Surinam, 428 (1906). *Tabebuia araliacea* Morong et Britton in Ann. N. Y. Acad. Sc. vii. 190 (1893), quoad syn. *Bignonia araliacea* Cham., excl. specim. et descr. *Tecoma speciosa* DC. in DC. Prodr. ix. 218 (1845). *Tecoma conspicua* DC. l.c. 221. *Bignonia conspicua* Rich. ex DC. l.c., pro syn. *Tecoma nigricans* Klotzsch in Rich. Schomb. Reise, iii. 1159 (1848), nomen.—*Guirapariba* Marcgr. Hist. Pl. 118, cum ic. (1648).

COLOMBIA. Llanos de San Martin, without flowers or fruit, *Triana* 4114 (Mus. Brit.).

VENEZUELA. Provinces of Zulia, Lara, Portuguesa, Carabobo and Miranda (fide Pittier, l.c.) Zulia: Veras Altas, on the road from Maracaibo to Machiques, pretty frequent, fl. Oct., *Pittier* 10508.

ST. VINCENT. Without locality, *Guilding*.

TRINIDAD. Common in the northern range of mountains, *Lockhart* 198. Port-of-Spain: Queen's Park, fl. and fr. April, *Broadway* 4165; Hillside, fl. March, *Britton* 2629; Botanic Garden, fl. June, *Hart* 3695. Radix Point, Mayaro, fl. July, *Williams and Sampson in Herb. Trin.* 11739. Without locality, *Fendler* 524. According to R. C. Marshall, l.c., *T. serratifolia* is widely distributed throughout Trinidad, chiefly on poor soils.

BRITISH GUIANA. Essequibo River: Moraballi Creek, in morabukea—mixed forest, fl. Nov., *Sandwith* 612. Banks of the Takutu River, fl. April, May, *Rich. Schomburgk* 501 (*Rob. Schomburgk* 409). Savannah, *Pollard* 39.

SURINAM. Without locality, *Hostmann* 1055, *Focke*.

FRENCH GUIANA. Maroni, *Sagot* 1142. Charvein, *Benoist* 697 (Herb. Paris.). Without locality, *Poiteau*, *Aublet* (Mus. Brit.) *Martin* (Mus. Brit.).

BRAZIL. Pará: Tauaú, fl. Sept., *Spruce* 148. Pernambuco: Tapera, fl. Dec., *Pickel* 135 (Mus. Brit.). Also from Goyaz, Rio de Janeiro and S. Paulo (*vide* Bur. et K. Schum. l.c.).

BOLIVIA. Dep. Santa Cruz: Prov. Sara, in campos and woods, Buenavista, fl. Sept., *Steinbach* 6414, 7211.

Bureau and K. Schumann recorded this species from Paraguay on the authority of Morong and Britton in Ann. N.Y. Acad. Sc. vii. 190 (1893). Since Morong, however, stated that the corolla of his "*Tabebuia araliacea*" was bright purple, and white-downy outside, it was obviously not that species but *T. Avellanadae* Griseb., which is widely spread in Paraguay.

T. serratifolia is a tall tree, with smooth silvery bark, and attaining a height of 25–30 m. Vernacular names: "Poui," "Yellow Poui," "White Poui" (Trinidad); "Curari," "Curariguo," "Curarire," "Coralibe," "Pui" (Venezuela, fide Pittier, l.c.); "Washiba" (British Guiana); "Groenhart" (Surinam, fide Pulle, l.c.); "Pao d'Arco" (Lower Amazons); "Ipé" (Brazil). According to Record (Timbers of Tropical America, 540: 1924), the "Washiba" of British Guiana [*T. serratifolia*] is similar to the common "Hackia" of sandy hills [*T. hypolepra*] but occupies the flat clay lands along streams, and consequently is of larger size and better timber form.

10. *T. floccosa* (Klotzsch ex Bur. et K. Schum.) *Sprague et Sandwith*, comb. nov.—*Tecoma floccosa* Klotzsch in Rich. Schomburgk, Reise, iii. 971 (1848), nomen; Bur. et K. Schum. in Mart. Fl. Bras. viii. pars 2, 318 (1896).

BRITISH GUIANA. On the banks of the Essequibo River, fl. Jan., Feb., *Rich. Schomburgk* 334 (typus in Herb. Berol.).

A remarkable and rather isolated species, though the characters by which it was distinguished from its congeners by K. Schumann are not so striking when seen as they appear from description. The flowers seem to be solitary on the ends of the branchlets on the only

specimen extant, but only a single flower, from which the corolla has fallen, is still in situ. Schumann dissected a second flower, the parts of which we have seen in a capsule affixed to the sheet. The disk is patelliform and peltately attached, being strongly constricted in its basal third; it is about 0.8 mm. long altogether, the constricted base being 0.3 mm. long. It seems to us somewhat misleading to describe the disk as "stipitate," without mentioning the length of the "stipes." Judging from a part of an ovary dissected by Schumann present in the capsule, the ovary (which appears to have been oblong-ovoid, not pyriform) cannot have been more than 1.5 mm. long, excluding the glabrous quadrangular basal portion of the style, which is present at its apex. It is densely ferrugineous-lepidote, and had 6-8 vertical rows of ovules in each loculus. The trifoliolate leaves and subulate calyx-lobes (3-3.5 mm. long) form the best distinguishing marks of the species.

III.—PRELIMINARY LIST OF FUNGI OR DISEASES OF ECONOMIC PLANTS IN TANGANYIKA TERRITORY. G. B. WALLACE.

The present list does not include records made prior to 1927. It is hoped that a complete list will be published later including these records, those made by German investigators before the British administration of the country, and further details concerning the distribution and economic importance of the organisms and diseases enumerated.

Unless otherwise stated the identification of the organism or disease has been made by the staff of the Imperial Mycological Institute, Kew. Where no number is given the material has been collected and identified by the officer whose initials appear after the record.

Each record shows the name of the host plant, the part affected, the organism or disease and, where known, the author and reference to the original description, the locality and date of collection. The initials of the collector are followed by a number indicating the exact identity of the specimen.

When material has been sent to the Imperial Mycological Institute a corresponding specimen has been retained in the Mycological Laboratory, Morogoro.

The following abbreviations are used: *G.B.W.* = G. B. Wallace, Mycologist, Department of Agriculture, Morogoro; *H.H.S.* = H. H. Storey, Plant Pathologist, East African Agricultural Research Station, Amani.

Agave sisalana Perrine ex Engelm.

On leaves:

Botryodiplodia Theobromae Pat., Bull. Soc. Myc. Fr. viii, p. 136, 1892.

Near Moshi, 30.6.27. & 1.7.27., *G.B.W.* 947 & 1209.

Colletotrichum Agaves Cav., Hedwigia xxxi, p. 315, 1892.
Mamba, 11.5.27, *G.B.W.* 937.
Cucurbitaria Agaves Syd. & Butl., Annal. Mycol. ix, 4, p. 406, 1911.

Kilosa, Jan. 1929, *G.B.W.* 1329.

Microdiplodia Agaves (Niessl.) Tassi, Bull. Lab. Orto, Bot. Sienna, p. 29, 1902.

Karanga, near Moshi, 2.3.28, *G.B.W.* 1095.

Physiological leaf diseases:

"Banding disease" at bases of leaves; probably a deficiency disease. *G.B.W.*

"Sun scorch," most common at the end of the rains. *G.B.W.*

Rotting after cutting. *G.B.W.*

Aloe sp.

On leaves:

Uromyces Aloës (Cooke) P. Magn., Ber. Deutsch. Bot. Gesellsch., x, p. 48, 1892.

Marangu, 19.5.27, *G.B.W.* 1046.

Ananas sativus Schult. f.

In stem:

Ceratostomella paradoxa Dade, Trans. Brit. Myc. Soc. xiii, p. 191, 1928. (*Thielaviopsis paradoxa* (de Seynes) von Höhn.).
Kasanga, 9.8.28, *G.B.W.* 1276.

Apium graveolens L.

On leaves:

Cercospora Apii Fresen., Beitr. z. Mycol., Heft. iii, p. 97, 1863.
Nduruma, 23.6.27, *G.B.W.* 1164.

Arachis hypogaea L.

Rosette disease (virus). Muhesa, 1930, *H.H.S.*

On leaves:

Cercospora personata (B. & C.) Ellis, Journ. Mycol. i, p. 63, 1885.
Near Arusha, 18.6.27, *G.B.W.* 1161.

Bougainvillaea spectabilis Willd.

On twigs:

Phomopsis sp.
Morogoro, 30.6.30, *G.B.W.* 1398.

Brassica oleracea L.

On leaves:

Alternaria circinans (B. & C.) Bolle, Meded. Phytopath. Lab. Willie Commelin Sch. vii, p. 26, 1924.
Marangu, 13.5.27, *G.B.W.* 224; Kirua Rombo, 26.5.27, *G.B.W.* 957.

Cajanus Cajan Millsp. (*C. indicus* Spreng.).

On leaves :

Cercospora Cajani P. Henn., Hedwigia xii, p. 309, 1902.

Kasanga, 9.8.28, *G.B.W.* 1275.

Oidiopsis taurica (Lév.) Salm., Ann. Bot. xx, p. 187, 1906.

Kasanga, 9.8.28, *G.B.W.* 1274.

Stems :

Lisea sp.

Mountains above Ruvu, 14.6.30, *G.B.W.* 1388.

Roots :

Rhizoctonia sp. (?)

Mountains above Ruvu, 14.6.30, *G.B.W.* 1389 & 1390.

Capsicum annuum L.

On fruit :

Alternaria tenuis Nees, Syst. d. Pilze und Schwämme, p. 72, 1817.

Mwika, 16.5.27, *G.B.W.* 1096.

Gloeosporium piperatum Ell. & Ev., in Halstead, Rept. Botan. Dept. New Jersey Exper. Stat. xi, p. 358, 1890.

Kirua Rombo, 27.5.27, *G.B.W.* 1041.

Vermicularia Capsici Syd., Annal. Mycol. xi, p. 329, 1913.

Kirua Rombo, 27.5.27, *G.B.W.* 1041.

Carica Papaya L.

On leaves :

Ovulariopsis Papayae van der Bijl, Trans. Roy. Soc. S. Africa ix pt. 2, p. 189, 1921.

Moshi, 9.5.27, *G.B.W.* 863.

On fruit :

Colletotrichum gloeosporioides (Penz.) Sacc., Syll. iii, p. 735, 1884.

Morogoro, 12.11.28, *G.B.W.* 1309.

Cinchona sp.

On twigs :

Phomopsis sp.

Near Moshi, 10.5.27, *G.B.W.* 1050.

Citrus Aurantium Auct.

On leaves :

Alternaria tenuis Nees, loc. cit.

Marangu, 13.5.27, *G.B.W.* 941.

Colletotrichum gloeosporioides (Penz.) Sacc., loc. cit.

Mishati, 22.5.27, *G.B.W.* 1044.

At collar :

Cytospora sp.

Moshi, Feb. 1930, *G.B.W.* 1369.

In fruits :

Nematospora Coryli Pegl., Rendic. della R. Accad. dei Lincei, Seduta del 7 Nov. 1897.

Moshi, 27.1.30, *G.B.W.* 1371.

C. limonia Osbeck.

On twigs and branches :

Haplosporella (Sphaeropsis) sp. The spores are intermediate in size between *Sp. malorum* and *H. hesperidica* Speg. : average of 20 is 18.3 x 10.6, range 16-21 x 9-12 microns.

Morogoro, 13.11.29, *G.B.W.* 1353.

On bark over form of canker :

Physalospora fusca N. E. Stevens, Mycologia xviii, p. 210, 1926.

Morogoro, 16.11.29, *G.B.W.* 1354. Confirmed by N. E. Stevens.

Cocos nucifera L.

On leaves :

Pestalozzia palmarum Cooke, Grevillea iv, p. 115, 1876.

Bagamoyo, 31.8.27, *G.B.W.* 1169.

On leaf sheaths :

Diplodia epicocos Cooke, Grevillea v, p. 102, 1877.

Bagamoyo, 31.8.27, *G.B.W.* 1172.

Physiological disease on nuts :

"Gummosis," as described by Welsford, Rept. of Mycologist, Dept. Agric., Zanzibar, 1926. *G.B.W.*

Coffea arabica L.

On leaves :

Cercospora coffeicola B. & C., Grevillea ix, p. 99, 1881.

Uluguru Mountains, 21.8.28, *G.B.W.* 1284.

Colletotrichum coffeanum Noack, Zeitschr. f. Pflanzenkr. xi, p. 202, 1901.

Near Moshi, 10.5.27, *G.B.W.* 865.

Hemileia vastatrix B. & Br., Gard. Chron., p. 1157, 1869.

Uluguru Mountains, 21.8.28, *G.B.W.* 1283.

Leptosphaeria coffeicola Maubl. in Delacroix & Maublanc "Maladies des Plantes Cultivées dans les Pays Chauds"

p. 329, 1911.

Uluguru Mountains, 21.8.28, *G.B.W.* 1295.

On twigs :

Colletotrichum coffeanum Noack., loc. cit., associated with die-back in **C. arabica**, and, together with a twig-boring beetle, with die-back in **C. robusta**.

Marangu, 13.5.27, *G.B.W.* 1119.

Leptosphaeria sp.

Tukuyu, 16.11.28, *G.B.W.* 1315 : Moshi, Nov. 1928, *G.B.W.* 1316-1318.

"Witches' Broom" (physiological ?).

Moshi, 1927, *G.B.W.*

On stems :

Phomopsis sp.

Singida, 9.8.28, *G.B.W.* 1278 & 1279.

Cherries :

"Cherry-fall" (physiological?) descr. in Tanganyika Territory Dept. Agric. Annual Report 1929/30, pt. 2, pp. 46-47, and Mycol. Leaflet No. 7, 1930.

Near Moshi, 8.2.30, *G.B.W.* 1374.

In beans :

Nematospora Coryli Pegl., loc. cit., disease described in Tang Terr. Dept. Agric. Ann. Rpt. 1929/30, pt. 2, pp. 45-46, and Mycol. Leaflet No. 9, 1930; full account in "Tropical Agriculture," Vol. VIII, pp. 14-17, 1931.

Near Moshi, 1.1.30, *G.B.W.* 1383.

In roots :

"*Armillaria mellea* disease."

Arusha, 26.6.27, *G.B.W.* 1110.

Rhizoctonia bataticola (Taub.) Butl. (*Macrophomina Phaseoli* (Maubl.) Ashby, Trans. Brit. Myc. Soc. xii, p. 141, 1927.).

Singida, 9.8.28, *G.B.W.* 1280.

Cucurbita Pepo L.

On leaves :

Cercospora Cucurbitae Ell. & Ev., Journ. of Mycol. iv, p. 3, 1888.

Kilosa, 17.9.27, *G.B.W.* 1187.

Dianthus Caryophyllus L.

On leaves :

Uromyces caryophyllinus (Schrank) Wint.

Mountains above Morogoro, 19.6.30, *G.B.W.* 1395.

Septoria Dianthi Desm., Ann. Sci. Nat., 3 sér., xi, p. 346, 1884.

Near Arusha, 2.5.27, *G.B.W.* 836.

Dolichos Lablab L.

In seeds :

Nematospora Coryli Pegl., loc. cit.

Morogoro, Oct. 1929, *G.B.W.* 1356.

Dracaena sp.

On leaves :

Dothiorella sp.

Near Moshi, 18.6.27, *G.B.W.* 1113.

Eriodendron sp.

On leaves :

Ramularia Eriodendri Racib.

Morogoro, 17.9.29, *G.B.W.* 1343.

Eriobotrya japonica Lindl.

On leaves :

Ascochyta Eriobotryae Vogl., Ann. R. Acc. Agric., Torino LI, p. 22 (Extr.), 1908.

Near Moshi, 18.6.27, *G.B.W.* 1162.

Ficus Carica L.

On leaves :

Kuehneola Fici Butl., Annal. Mycol., xii, p. 76, 1906.

Near Arusha, 2.5.27, *G.B.W.* 838.

Fragaria vesca L.

On leaves :

Mycosphaerella Fragariae (Tul.) Oudem., Révis. Champig. ii, p. 216, 1897.

Near Moshi, 25.6.27, *G.B.W.* 958.

Gossypium hirsutum L.

On leaves :

Alternaria tenuis Nees, loc. cit.

Morogoro, 31.10.27, *G.B.W.* 1219; Kilosa, 15.9.27.

Bacterium malvacearum E.F.S. "Bacteria in relation to plant diseases," i, p. 171, 1905.

Morogoro, 19.6.28, *G.B.W.* 1247.

Kuehneola Gossypii Arthur, North American Flora, vii, p. 187, 1912.

Near Morogoro, 23.9.27, *G.B.W.* 1195.

Mycosphaerella gossypina (Atk.) Earle, Bull. Torrey Bot. Club, xviii, p. 307, 1891.

Kilosa, 15.9.27, *G.B.W.* 1194; near Morogoro, 13.9.27, *G.B.W.* 1179.

Phyllostica Malkoffii Bubak, Annal. Mycol. vi, p. 24, 1908.

Morogoro, 9.6.28, *G.B.W.* 1243.

Ramularia areola Atk., Bot. Gaz. xv, p. 166, 1890.

Kilosa, 2.3.28, *G.B.W.* 1176.

On stems :

Bacterium malvacearum E.F.S., loc. cit.

Near Morogoro, 24.6.28, *G.B.W.* 1248.

Diplodina sp.

Ufipa, July 1928, *G.B.W.* 1262.

In bolls :

Aspergillus niger van Tiegh, Ann. Sci. Nat. Bot., ser. V, viii, p. 240, 1867.

Kilosa, 17.9.27, *G.B.W.* 1203.

Bacterium malvacearum E.F.S. loc. cit. *G.B.W.*

Diplodia gossypina Cooke, Grevillea vii, p. 95, 1879.

Morogoro, 3.9.27, *G.B.W.* 1215.

Gibberella moniliformis Winel., Jour. Agr. Res. xxviii, p. 920, 1924.

- Near Morogoro, 13.7.28, *G.B.W.* 1257.
Monilia sitophila group.
 Near Kilosa, 22.9.27, *G.B.W.* 1196.
Nematospora Gossypii A. & N., Ann. of Bot. XL, clvii, p. 76, 1926.
 Morogoro, 9.12.28, *G.B.W.* 1319.
 On roots :
Rhizoctonia Crocorum (Pers.) D.C., Fl. Franç., vi, p. 110, 1815.
 Morogoro, 11.7.28, *G.B.W.* 1256.
- Hemerocallis aurantiaca** Baker
 On leaves :
Vermicularia liliacearum Westend., Prodrum. Florae Batavae, II, pt. iv, p. 113, 1866.
 Near Arusha, 2.5.27, *G.B.W.* 828.
- Hibiscus esculentus** L.
 On leaves :
 ? *Colletotrichum Hibisci* Pollacci, Atti Ist. Bot. Pavia, II, ser. v, p. 16, 1896.
 Morogoro, 28.8.28, *G.B.W.* 1289.
Libertella affinis D. Sacc., Atti Soc. Ven. Trent di Sc. Nat. II, ser. ii, p. 477, 1896.
 Morogoro, 28.8.28, *G.B.W.* 1292.
- Manihot Glaziovii** Müll.—Arg.
 On leaves :
 Mosaic or Leaf-curl (virus).
 1930, *H.H.S.*
- M. utilisissima** Pohl
 On leaves :
Cercospora Henningsii Allesch., in P. Henn. Die Pflanzenwelt Ostafrikas, teil C, p. 35, 1895.
 Marangu, 13.5.27, *G.B.W.* 943.
 Mosaic or Leaf-curl (virus).
 1930, *H.H.S.*
- Morus alba** L.
 On stem :
Sphaeropsis Mori Berl.
 Morogoro, 18.10.29, *G.B.W.* 1350.
 On leaves :
Kuehneola Fici Butl., loc. cit.
 Morogoro, 28.7.29, *G.B.W.* 1336.
- M. indica** L.
 On leaves :
Ovulariopsis moricola Del., Bull. Soc. Myc. France xix, p. 347, 1903.
 Morogoro, 31.7.28, *G.B.W.* 1265.

- Septogloeum Mori* (Lev.) Br. & Cav., I Funghi Parass. No. 21, 1892. (Exsicc. with descr.).
 Mishati, 22.5.27, *G.B.W.* 934.
 and stems :
Bacterium Mori B. & M., emend. E.F.S.
 Ident. *E. M. Doidge*.
 On stems :
Eutypa ludibunda Sacc. Syll. I, p. 167, 1882.
 Morogoro, 21.10.29, *G.B.W.* 1351.
Sphaeropsis heterospora Passer., Mem. R. Accad. Lincei, Roma, 4 ser. VI, p. 100, 1890.
 Morogoro, 20.11.28, *G.B.W.* 1310.
- Musa sapientum** L.
 On fruit :
Gloeosporium Musarum Cooke & Mass., Grevillea xvi, p. 3, 1887.
 Kirua Rombo, 27.5.27, *G.B.W.* 788.
- Nerium Oleander** L.
 On leaves :
Cercospora neriella Sacc., Mich. ii, p. 294, 1881.
 Near Moshi, 18.6.27, *G.B.W.* 1118.
 Leaves and stems :
Pseudomonas Savastanoi E.F.S., var. *Nerii* C. O. Smith, Phytol. xviii, 6, 1928.
 Morogoro, 19.8.29, *G.B.W.* 1340, det. *G.B.W.*
- Nicotiana Tabacum** L.
 On leaves :
Erisiphe cichoracearum DC., Fl. Franç. ii, p. 274.
 Moshi, 26.4.27, *G.B.W.* 874 ; 12.5.27, *G.B.W.* 939.
 Leaf-curl (prob. physiological).
 1930, *H.H.S.*
- Oryza sativa** L.
 On heads :
Phyllosticta glumarum Sacc., in Nuovo Giorn. Bot. Ital., N.S. xxiii, 2, p. 207, 1916.
 Kasanga, Uluguru Mountains, 8.8.28, *G.B.W.* 1271b.
- Oxalis** sp. (wild).
 On leaves :
Aecidium sp., appar. not of *P. Maydis* Béreng.
 Marangu, 13.5.27, *G.B.W.* 944.
- Panicum maximum** Jacq.
 On leaves :
Coniosporium inquinans Dur. & Mont., Flore Alger. Cryptog. i, p. 327, 1849.
 Near Morogoro, 13.5.28, *G.B.W.* 1258.

Pennisetum ciliare (L.) Link.

In heads :

Sphacelia sp.

Coll. A. H. Ritchie.

Cerebella sp. on the *Sphacelia* sp.

Coll. A. H. Ritchie.

Pennisetum spicatum Schult. (P. typhoideum Stokes).

On leaves :

Phyllachora Penniseti (?) Sydow, in Annal. Mycol. xiii, p. 39, 1915.

Morogoro, 5.7.28, G.B.W. 1253.

Puccinia Penniseti Zimmerm., Bericht. Deutsche Ostafrika ii, p. 16, 1904.

Kimamba, 22.9.27, G.B.W. 1204.

In heads :

Sphacelia sp.

Kimamba, 22.9.27, G.B.W. 1183.

Cerebella Sorghi-vulgaris Subram., Journ. Asiatic Soc., Bengal, N.S. xvii, p. 206, 1921.

G.B.W. 1183.

Phaseolus acutifolius A. Gray.

In seeds :

Nematospora Coryli Pegl., loc. cit.

Morogoro, 8.8.30, G.B.W. 1399.

P. lunatus L.

In seeds :

Nematospora Coryli Pegl., loc. cit.

Morogoro, 15.10.29, G.B.W. 1348.

P. radiatus L.

On leaves :

Erysiphe Polygoni DC., Fl. Franç. ii, p. 273, 1805.

Morogoro, 15.8.28, G.B.W. 1282.

In seeds :

Nematospora Coryli Pegl., loc. cit.

Morogoro, 8.8.30, G.B.W. 1404, det. G.B.W.

P. vulgaris L.

On leaves :

Uromyces appendiculatus (Pers.) Link, in Observ. ii, p. 28, 1816.

Mamba, near Moshi, 12.5.27, G.B.W. 940 : Kirua Rombo, near

Moshi, 26.5.27, G.B.W. 956.

Isariopsis griseola Sacc., Michelia i, p. 273, 1878.

G.B.W. 956 (see above).

On pods :

Colletotrichum lindemuthianum (Sacc. & Magn.) Bri. & Cav.,

Funghi Parass., no. 50, 1892.

Mkuu, near Moshi, 28.5.27, G.B.W. 1042.

On roots :

Rhizoctonia bataticola (Taub.) Butl. (C strain) (*Macrophomina Phaseoli* Ashby), loc. cit., probably.

Lushoto, May 1930, G.B.W. 1380.

Prunus Persica Stokes.

On leaves :

Puccinia Pruni-spinosa DC., Synop. Method. Fung., p. 226, 1801.

Near Moshi, 10.5.27, G.B.W. 866.

Ricinus communis L.

On leaves :

Cercosporina ricinella (Sacc. & Berl.) Speg. Ann. Mus. Nac.

Buenos Aires, xx, p. 429, 1910.

Mwika, 16.5.27, G.B.W. 952.

Ovulariopsis sp.

Kilosa, 18.9.27, G.B.W. 1190.

Melampsorella Ricini (Biv. Bern.) de Toni, in Saccardo, Syll. VII, p. 596, 1888.

Mgeta, Uluguru Mountains, 27.9.29, G.B.W. 1345.

Rosa sp.

On leaves :

Sphaerotheca Humuli (DC.) Burr., Bull. Illinois Stat. Laborat. of Nat. Hist.

Near Arusha, 22.6.27, G.B.W. 1124.

On twigs :

Gloeosporium sp.

Morogoro, 29.8.28, G.B.W. 1295.

Pestalozzia versicolor Speg., Michelia i, p. 479, 1879.

Morogoro, 29.8.28, G.B.W. 1293.

Saccharum officinarum L.

On leaves :

Cercospora longipes Butl., Mem. Dept. Agric. India, Bot. Ser. I, 3, p. 44, 1906.

Mkiuni, Uluguru Mountains, 21.8.28, G.B.W. 1287.

Mosaic. (East Afr. Agr. Res. Stat., Amani, 1st Ann. Rpt. 1928-29).

Sansevieria sp.

On leaves :

Leptosphaeria sp.

S. Pare Mountains, Dec. 1929, G.B.W. 1327.

Solanum Melongena L.

On leaves :

Alternaria sp. (not *A. Solani*).

Near Moshi, 21.4.27, G.B.W. 797.

S. tuberosum L.

On leaves :

Alternaria Solani (E. & M.) J. & G., Vermont Agr. Exp. Stat. Bull. 72, p. 25, 1899.
Mwika, 16.9.27, G.B.W. 953.

Sorghum vulgare Pers.

On leaves :

Puccinia purpurea Cooke, Grevillea, v, p. 15, 1876.
Near Arusha, 18.6.27, G.B.W. 1160.
Darluca filum (Biv.) Cast., Catal. Plantes Marseille, Suppl., p. 53, 1851. On *P. purpurea*.
G.B.W. 1160 (see above).

On heads :

Acrothecium lunatum Wakker, Ziekten van het Suikerriet, p. 196, 1898.
Morogoro, 7.6.28, G.B.W. 1231 (5).
Alternaria tenuis Nees (group), loc. cit.
Morogoro, 7.6.28, G.B.W. 1232.
Choanephora Cucurbitarum (Berk. & Rav.) Thaxter, in Rhodora v, p. 97, 1903.
Morogoro, 7.6.28, G.B.W. 1231 (4).
Fusarium sp.
Morogoro, 7.6.28, G.B.W. 1231 (a).
Gibberella moniliformis Wineland.
Morogoro, 7.6.28, G.B.W. 1231 (1).
Phoma insidiosa Tassi, Bull. Lab. Bot. R. Univ. Siena, i, p. 8, 1897.
Morogoro, 7.6.28, G.B.W. 1233.
Rhinotrichum cucumerinum Berk. & Curt., Grevillea, iii, p. 109, 1875.
Morogoro, 7.6.28, G.B.W. 1231 (b).
Trichothecium roseum (Pers.) Link, Observ. Mycol. i, p. 16, 1809.
Morogoro, 7.6.28, G.B.W. 1228.

In grains :

Sorosporium Reilianum (Kuehn) McAlp., Smuts of Australia, p. 181, 1910.
Moshi, 10.5.27, G.B.W. 864.
Sphacelotheca cruenta (Kuehn) Potter, Phytopathology, ii, p. 98, 1912.
Kilosa, 16.9.27, G.B.W. 1180 ; Kilosa, 17.9.27, G.B.W. 1205.
S. Sorghi (Link.) Clint., Journ. of Mycol. viii, p. 140, 1902
Kimamba, 23.9.27, G.B.W. 1191 ; Morogoro, 18.6.28, G.B.W. 1246.

Thea sinensis L.

On leaves :

Colletotrichum Camelliae Masee, Kew Bull. 1899, p. 91.
Amani, Oct. 1930, H.H.S.

Scabbed leaf (physiological, fide Petch) Amani, Oct. 1930, H.H.S.

Roots :

"*Armillaria mellea* disease."
Ambangulu, Jan. 1930, H.H.S.

Triticum vulgare Vill.

On leaves :

Puccinia graminis Pers., Disp. Meth., p. 29, 1797.
Singida, 9.8.28, G.B.W. 1281.

Tropaeolum majus L.

On leaves :

Oidiopsis taurica (Lév.) Salm., loc. cit.
Morogoro, 8.10.29, G.B.W. 1346.

Vangueria acutiloba Robyns.

On leaves :

Hemileia Woodii Kalchbr. & Cooke, affn., Grevillea ix, p. 22, 1880.
Marangu, 14.5.27, G.B.W. 930.

Vigna unguiculata Walp. (V. Catjang Walp. ; V. sinensis Endl.).

On leaves :

Cercospora cruenta Sacc., Michelia, ii, p. 144, 1880.
Kirua Rombo, near Moshi, 27.5.27, G.B.W. 1032.

In seeds :

Nematospora Coryli Pegl., loc. cit.
Morogoro, 29.7.30, G.B.W. 1402.

Washingtonia filifera H. Wendl.

On leaves :

Diplodia epicocos Cooke, loc. cit.
Morogoro, 28.8.28, G.B.W. 1288.
Pestalozzia versicolor Speg., loc. cit.
Morogoro, 28.8.28, G.B.W. 1294.
Phoma palmicola Winter, Grevillea xv, p. 92, 1887.
Morogoro, 28.8.28, G.B.W. 1290.

Zea Mays L.

On leaves :

Puccinia Maydis Bérang., Atti Riun. sc. Ital., Milano, vi, p. 475, 1844.
Near Moshi, 12.5.27, G.B.W. 938 ; near Moshi, 14.5.27, G.B.W. 946.
Sclerospora sp.
Near Muhesa, May-June 1928, H.H.S.
Streak (virus).
Prevalent near coast, also at Amani, Arusha, Makuyini, Pare Mountains, 1930, H.H.S.

Zinnia sp.

On branches :

Oidium sp.

Morogoro, 8.10.29, G.B.W. 1347.

IV.—ENTANDROPHRAGMA CYLINDRICUM.

A. C. HOYLE.

The tree producing "West African Cedar" or "Penkwa," now known as *Entandrophragma cylindricum* Sprague, was first described in 1908 as *Pseudocedrela cylindrica* Sprague (*Kew Bull.* 1908 : 257), and was transferred to the genus *Entandrophragma* in 1910 (*Kew Bull.* 1910 : 180).

The original type-specimens (Thompson No. 16 ex Gold Coast), have been examined and compared with the figure in Thompson's Report on Forests of the Gold Coast, Pl. 10 (Colonial Reports—Miscellaneous No. 66, 1910). The fruits in the original collection, bearing this number, included a mixture, comprising young fruits correctly associated with the leaves, together with the larger central columnar axes of two fruits which are those of another species, probably *E. macrophyllum* A. Chev. Possibly these axes were picked up under the same tree, and were assumed—in the absence of direct evidence—to represent the mature stage of the same species. This mixture of specimens, for which the collector was responsible, resulted in a confusion in the original description and figure of the fruit, both types being shown on the same plate, and the larger of them being described. The fruit figured on the left of the illustration cited is not that of *E. cylindricum*. For this reason, and as the original description did not include the flowers, which are now available in quantity, it seems desirable to redescribe the species. The material from which the new description is drawn includes young branchlets, young and old leaves, showing a wide variation in the shape and size of the leaflets, and inflorescences, as well as numerous fruits collected by Mr. J. D. Kennedy, of the Nigerian Forest Service, at Sapoba, Nigeria, and field notes kindly supplied by him. Another number of Mr. Thompson's (No. 34, in Herb. Kew) includes a pure collection of the young fruits.

***Entandrophragma cylindricum* Sprague.** — *Pseudocedrela cylindrica* Sprague in *Kew Bull.* 1908 : 257, partly; *E. rufa* A. Chev. *Veg. Ut. Afr. Trop. Franç.* 5 : 201 (1909) (Meliaceae). Near *E. excelsum* Sprague, but differing in its usually much smaller leaflets, which are prominently reticulate above, and in its almost perfectly cylindrical fruit.

A large tree. *Branchlets* acutely angular or ribbed, at first greyish or brown-tomentellous, later puberulous, with ribs decurrent from the bases of the leaves; terminal bud acuminate, densely brown-tomentellous. *Leaves* usually 6-9-jugate, 30-40 cm. long, but on certain branchlets (probably those producing young leaves

late in the season) the leaves may be only 3-5-jugate and 13-25 cm. long; rhachis ferruginous-tomentellous in the lower part, where it is flattened on the upper side and more or less winged, minutely puberulous in the upper part and terete; leaflets 1.5-3.5 cm. distant, with petiolules 1-3 mm. long, the lower leaflets ovate to ovate-oblong, the upper oblong to oblong-lanceolate, more or less unequal-sided, larger on the upper side, 4.5-14 cm. long, 2.5-4 cm. broad, base more or less inequilateral, cuneate to broadly rounded, apex shortly and obtusely, rarely acutely, acuminate, or occasionally obtusely apiculate, glabrous except for occasional tufts of hair in the axils of the nerves, more or less shining above and closely reticulate with prominent veinlets, the midrib and lateral nerves prominent below with veinlets less conspicuous than on the upper side; lateral nerves 7-11 on each side of the midrib, obliquely ascending, branching and arching at about 0.75-1 cm. from the margin. *Panicles* axillary, lax, up to about 30 cm. long and 12 cm. broad, slender for the genus, the rhachis slender and ribbed, more or less fulvous-puberulous, lateral branchlets few and slender, up to 10 cm. long, bearing numerous short 2-10-flowered cymes, lower part of rhachis and branchlets naked; bracts and bracteoles minute, caducous; flowers small for the genus, appearing star-like when open, globose in bud, up to 7 mm. across when fully expanded; pedicels slender, 1.5-2 mm. long, tomentellous, jointed about the middle or near the base; calyx cupular and open in bud, puberulous outside, less than 1 mm. long, with 5 minute teeth, later spreading and splitting irregularly into 3-5 lobes; petals imbricate, about 3 mm. long and 1.5 mm. broad, oblong-ovate from a broad sessile base, obtuse (often apparently acuminate owing to the revolute margins), tomentellous outside; staminal tube depressed globose, 1.25 mm. across, minutely adnate to the inconspicuous disc; anthers exerted well beyond the teeth of the tube, narrowly deltoid, apex truncate or emarginate, base sub-sagittate, basifixed on very short filaments which arise from the inner faces of the teeth of the tube; disc fused with the base of the ovary, pubescent; ovary ovoid, fleshy, 5-locular, stigma subsessile, ovoid-capitate, papillose, obscurely 4-5-costate, ovules 4-5 in each loculus, pendulous from the axis. Mature *capsule* pendulous, almost perfectly cylindrical, rounded at the base, obtuse or rounded at the apex, 12-14 cm. long, valves irregularly lenticellate outside, about 2.5 cm. broad about the middle, 2.5-3 mm. thick at the edges (with more or less of a ridge down the centre outside when young, which later becomes obscure or absent), shining light yellow, streaked and mottled with brown inside, distinctly showing the impressions of the seeds; central column yellow, broader towards the base where it is distinctly pentagonal, the septa becoming very prominent towards the apex, the axis between them strongly indented with the impressions of the seeds. *Seeds* 3-6 per loculus, attached distinctly to right and left of the centre of each face of the axis, rectangular, convex on the inner

face, concave on the outer, 1-1.5 cm. long, up to 1.6 cm. broad, with an oblong wing 6-9 cm. long and up to 2 cm. broad, both seed and wing coloured brown, the topmost seed usually only 7 mm. below the apex of the central column. Dehiscence is from the apex, the valves recurring from this end first, but later becoming free at the base also.

TROPICAL AFRICA: Gold Coast, near Mansu and Supom, *H. N. Thompson* 16, in part: type! *Thompson* 34. Ahiraso, *Chipp* 122, Popokyeré, *Chipp* 200. S. Fomang Sec. Reserve, *C. Vigne* 1925. Ivory Coast: Agbo, *Chevalier* 16166, Guidéko, *Chevalier* 16390, between Guidéko and Soubré, *Chevalier* 19082. S. Nigera: Sapoba, *Kennedy* 315, 316, 317, 318, 1163, 1184, 1212, 1221.

V.—THE OCCURRENCE OF THE GENUS ACERATIUM (ELAEOPARACEAE) IN AUSTRALIA. C. T. WHITE.

The genus *Aceratium*, originally proposed by A. P. De Candolle (DC. Prodr. i. 519: 1824), was revived by Schlechter in Lauterbach's "Beiträge Zur Flora von Papuasien V." (Engl. Bot. Jahrb. liv. 100; 1916) who pointed out the very natural characters of the group, viz. opposite leaves, inflorescence shortened almost into an umbel, the pubescent or pilose edges of the petals and the fibrous mesocarp of the drupe. He listed twelve species, ten in New Guinea and one each in Amboina and the New Hebrides respectively. The occurrence of the genus in North-eastern Australia was therefore only to be expected.

Aceratium concinnum C. T. White comb. nov. *Elaeocarpus concinnum* S. Moore in Journ. Bot. lv. 303 (1917). *Aristotelia pubescens* C. T. White in Queensl. Dept. Agric. Bot. Bull. xx. 5 (1918).

North Queensland: Kuranda, *L. S. Gibbs*, 6332; Johnstone River, *H. G. Ladbroke*.

Aceratium Doggrellii C. T. White sp. nov.

Arbor circiter 25 m. alta, cortice griseo, ramulis pubescentibus. *Folia* opposita, petiolis 0.8-1 cm. longis pubescentibus; laminae 4.5-6.5 cm. longae, 1.5-2 cm. latae, elliptico-lanceolatae, basi cuneatae, apice acuminatae, margine minute denticulatae, supra glabrae, subtus pubescentes. *Racemi* axillares, breves, 0.5-1 cm. longi, rhachide et pedicellis dense ferrugineo-pubescentibus, pedicellis 0.8 cm. longis. *Sepala* late linearia, 1 cm. longa, utrinque dense pubescentia, intus prominenter 3-costata. *Petala* 1.5 cm. longa, apice obtuse 3-dentata, parte inferiore margine et intus in medio dense pilosa. *Filamenta* gracillima, circiter 6 mm. longa, apicem versus puberula, antheris puberulis 3 mm. longis apice breviter setiferis. *Ovarium* et styli pars inferior dense strigoso-pilosi.

North Queensland: State Forest Reserve 185, Danbulla (Atherton Tableland), flowering specimens, October 1929, *R. H. Doggrell*, A.22.

Tree about 80 ft. high (50 ft. bole); crown fairly dense, bark light grey; flowers white.

Type in the Queensland Herbarium, Brisbane—syntype material deposited in the Kew Herbarium.

Aceratium ferrugineum C. T. White sp. nov.

Arbor 16 m. alta, ramulis dense ferrugineo-pubescentibus. *Folia* petiolata, petiolis 1.5 cm. longis dense et molliter pubescentibus; laminae 7.5-13.5 cm. longae, 4.5-5 cm. latae, ellipticae vel obovatae, obtusae vel obtuse acuminatae, supra costa media excepta glabrae, subtus ferrugineo-pubescentes, margine denticulatae. *Racemi* breves, rhachide et pedicellis dense ferrugineo-pubescentibus, pedicellis 0.8-1 cm. longis. *Sepala* linearia, 1 cm. longa, utrinque dense pubescentia. *Petala* 1.5 cm. longa, apice 3-dentata, margine et in media parte inferiore dense pilosa. *Filamenta* gracillima, 5 mm. longa, antheris puberulis 4 mm. longis apice breviter setiferis. *Gynoecium* dense strigoso-hirsutum. *Drupa* ovoidea, circiter 3 cm. longa, tenuiter pilosa.

North Queensland: Mount Spurgeon, overhanging watercourses near the top of the mountain, old flowers and ripe fruits, February 1923, *A. L. Marrotsy* 33.

Tree about 50 ft. high, with long drooping limbs; fruit red and gold.

Type in the Queensland Herbarium, Brisbane—syntype material deposited in the Kew Herbarium.

Unfortunately the specimens are very fragmentary, having been collected and badly prepared during a very hot wet season; all parts, however, are present and allow a fairly satisfactory description to be drawn up.

VI.—MISCELLANEOUS NOTES.

MR. G. E. BODKIN.—We learn that Mr. G. E. Bodkin, B.A., Dip. Agric. Camb., Entomologist, Palestine Department of Agriculture and Forests, has been appointed Director of Agriculture, Mauritius.

Royal Horticultural Society Honours to Kewites.—Mr. W. Dallimore, Keeper of the Museums, has been awarded the Victoria Medal of Honour. It will be remembered that Mr. C. H. Curtis, Editor of the Gardeners' Chronicle, received the V. M. H. last year.

Since the institution of the Associateship of Honour in 1930, the following Kewites, past and present, have been awarded this distinction:—

In 1930, among the first thirty Associates were Mr. G. H. Banks, Curator of the Glasgow Botanic Gardens; Mr. E. W. Cooper, Foreman, Messrs. Sutton & Sons, St. Albans; Mr. J. Coutts, Assistant Curator, Royal Gardens, Kew; Mr. J. J. Gutteridge, Chief Superintendent and Curator of Parks and Gardens, Liverpool; Mr. Walter Irving, late Assistant Curator, Royal Gardens, Kew; and Mr. H. W. Page, gardener to Miss Moore, Bourton-on-the-Water.

In 1931, Mr. D. Bliss, Superintendent of Public Parks, Swansea ; Mr. T. W. Brown, Ministry of Agriculture, Egypt ; and Mr. C. Wakely, Horticultural Lecturer, Chelmsford.

In 1932, Mr. J. W. Besant, Keeper of Botanic Gardens, Glasnevin ; Mr. A. Hosking, late of the John Innes Horticultural Institution ; Mr. J. Jones, late of the Dominica Botanic Gardens ; Mr. G. T. Lane, late Curator of the Royal Botanic Gardens, Calcutta ; Mr. E. P. Long, Superintendent of the Viceregal Gardens, New Delhi ; Mr. T. D. Maitland, Superintendent of the Botanic Gardens, Victoria, British Cameroons ; Mr. J. W. Matthews, Curator of the Botanic Gardens, Kirstenbosch, South Africa ; Mr. W. Taylor, Curator of the Royal Gardens, Kew ; and Mr. R. O. Williams, Assistant Botanist, Trinidad.

Dr. O. Stapf has been awarded a Veitch Memorial Medal on the completion of the " Index Londinensis " up to the year 1920.

Curtis's Botanical Magazine Dedications, 1827-1927.*—

Mr. Cuthbertson is much to be congratulated on having conceived and carried out the idea of producing a volume of portraits and biographical notices of the botanists, horticulturists and plant-collectors to whom volumes of the Botanical Magazine have been dedicated during the hundred years 1827 to 1927. The compilation is due mainly to Mr. E. Nelmes, Assistant Botanist at Kew, and will form a valuable work of reference for every botanical institution and, indeed, for the libraries of all who are interested in Horticulture.

This volume is particularly fitting in carrying the history of Horticulture to the year 1927, since all subsequent volumes of the Botanical Magazine will contain portraits of those to whom they are dedicated and there will thus be a complete record of portraits and biographical notices from the year 1827, which will be of the greatest value. The portraits have been gathered from many sources, often with considerable difficulty, and fortunately the Royal Horticultural Society has had the advantage of being able to make use of nearly sixty portraits preserved in the Kew collection of Portraits of Botanists. Though the Kew collection is always available for inspection, it is of very great value to have this fuller series of portraits reproduced in this volume, so that they can be more generally consulted. The volume appropriately commences with a portrait of William Curtis, the founder of the Botanical Magazine (1746-1799), together with a good account of his life and activities. The biographical notices are very well written and embody the principal points of interest in connection with the horticultural and botanical interests of the subjects of the various portraits.

In looking through the pages one comes across the faces of many familiar and well-known botanical friends, and also of many others,

*Portraits and biographical notices compiled by Ernest Nelmes and William Cuthbertson, V.M.H. Published for the Royal Horticultural Society, London, by Bernard Quaritch, Ltd. Price 30s.

who might easily have been forgotten had not this timely and welcome volume been produced to remind us of the great services they rendered in their time to the gardening fraternity.

Our best thanks are due to Mr. Cuthbertson for having undertaken the responsibility for the preparatory work and for all the labour that it has involved. The Botanical Magazine has been much enhanced by this interesting record of its past history and we hope it will also be very materially assisted by Mr. Cuthbertson's generosity in having arranged to place to the credit of the Botanical Magazine Account of the Royal Horticultural Society the sum which accrues from the sale of this interesting achievement.

Handbook of Coniferae.*—It is gratifying to see that the work of Messrs. Dallimore and Jackson on the Coniferae has been appreciated so much as already to have reached a second edition. For everyday use it is certainly the best book on that family that has ever been published in the English language. Gordon's " Pinetum," first issued in 1858, was a creditable work ; it held the field for a good many years and ran to three editions, the last dated 1880. It was followed in 1881 by Veitch's " Manual of Coniferae," which had not much botanical value but was highly appreciated by people interested more especially in the history, cultivation and uses of Conifers. M. T. Masters did a good deal of work on the family, which was published at intervals, mostly in " The Gardeners' Chronicle," but he did not live to produce a comprehensive and detailed study of the whole family. The first man to tackle thoroughly the problems of the identification of conifers was the late Augustine Henry, and the result of his labours, as given to the world in " The Trees of Great Britain and Ireland," has very much simplified the task of those who are following him.

The great value of the present work is that it is practically an encyclopedia of the Yew and Conifer families. There is, we suppose, no species of Taxad or Conifer, tropical or temperate, which does not receive some notice, however brief it may be. The more important species receive very full treatment ; *Pinus Laricio*, for instance, has five-and-a-half pages devoted to it ; the Sitka Spruce and Douglas Fir nearly as much. A Key is provided for the identification of the larger and more important genera ; this is followed by a detailed description of the species in alphabetical order accompanied by a full account of their history, their qualities as garden or park trees, their economic value in forestry and the characteristics and uses of their timber.

The chief new feature in this second edition is an appendix giving a descriptive list of species, varieties and hybrids published since the date of the first, and of others found to have been omitted. A welcome emendation is that of putting the name of the genus at the

*By W. Dallimore and A. B. Jackson. Second Edition. Edwin Arnold & Co., London, 1931, pp. xiv+582+8, Plates xxxi, Figs. 119. Price Two Guineas.

top of the right-hand page. Although the arrangement is alphabetical this greatly facilitates reference to a particular species.

As a book, the first edition had one serious defect. It was so loosely and weakly bound that a volume in constant use soon began to show signs of disintegration. That, however, was the fault of the publishers or the binders, not of the authors. It is to be hoped that this new edition will prove to have been produced in a fashion worthy of its admirable qualities.

The origin of *Spartina Townsendii*.—The interest of botanists in the so-called "rice grass" of the mud flats of the Sussex, Hampshire, and Dorset coasts has been periodically renewed by publications dealing with its rapid spread on our south coast and on the opposite coast of France or with its economic value as a mud-binder. The earliest known collection of *S. Townsendii* was at Hythe on the edge of Southampton Water in 1870, but the plant was not named as a distinct species till 1881. The origin of *S. Townsendii* has been a matter of some doubt. Foucard (1894) suggested it was of hybrid origin, the putative parents being *S. alterniflora* (♀) and *S. stricta* (♂). Stapf (1908), after extensive studies, considered this explanation the most plausible of those then suggested and after further investigations in 1926 (*Bot. Mag.* t. 9125, 1927) he was still fully convinced as to its hybrid origin.

While morphological, historical, and biological facts pointed strongly to a hybrid origin for *S. Townsendii*, there remained the objection that the plant is fertile and breeds (relatively) true to type. It is, therefore, a matter of considerable importance that Dr. C. L. Huskins (late of the John Innes Horticultural Institution, Merton, and now of the Department of Botany, McGill University, Montreal) has, by cytological examination of *S. Townsendii*, *S. alterniflora*, and *S. stricta*, been able to support the theory of hybrid origin of "rice-grass" in a most convincing manner and to explain satisfactorily its fertility and non-segregation.

Huskins has shown [*Genetica* xii. 531. 1930 (1931)], that the somatic chromosome number of *S. Townsendii* is 126, by far the highest number yet recorded in the *Gramineae*, that of *S. alterniflora* 70, and that of *S. stricta* 56. The cytology is thus in favour of *S. Townsendii* having arisen as a sequence of interspecific hybridization followed by chromosome doubling. In modern cytological terms it is "an allopolyploid derived from the doubling of the chromosome number in the original hybrid plant." The true-breeding of *S. Townsendii* is possible because at gamete formation the chromosome complex can form bivalents, which result in a normal reduction of chromosome number and the production of fertile gametes. The increased number of chromosomes and, probably of still greater importance, the maintenance of full hybrid vigour in successive generations, accounts for the ecological success of the species.

S. Townsendii answers to every known test for a species and must be considered as the most clear-cut example we have at present of the evolutionary significance of allopolyploidy following hybridization in plants. Huskins makes the useful suggestion that by crossing *Spartina Michauxiana* with other species it might be possible to obtain a freshwater equivalent of *S. Townsendii*. W. B. T.

***Cheilanthes Belangeri* C. Chr. (*Pellaea cambodiensis* Baker).**—This plant was described in *Ann. Bot.* v. 213 (1891), from very poor material collected by Godefroy-Lebeuf in Cambodia. In 1910 Col. R. H. Beddome published a note on this species in the *Gardeners' Chronicle*, xlvii. 34, having identified certain specimens collected by J. H. Lace in Upper Burma with the Cambodian plant. In this note attention was drawn to certain curious bulbils which were found on the under surface of the fronds of the Burmese specimens. No such structures can be seen on the type specimen in the Kew Herbarium.

Dr. Christensen, when identifying a Lushai specimen as *Pellaea cambodiensis* a year or two ago suggested that the plant was merely a form of *Cheilanthes Belangeri* (Bory) C. Chr. (*C. varians* Hk.), which it closely resembled. The plant certainly possesses the discontinuous type of sorus found in *Cheilanthes* and cannot therefore be retained under *Pellaea*. Following up Dr. Christensen's suggestion, a critical examination of the Kew material of *Cheilanthes Belangeri* was carried out and revealed the significant fact that out of 29 sheets in the herbarium, 21 possessed bulbils exactly similar to those found in the Lace specimens. Two of these specimens in fact, Lobb 391 from Moulmein and Cuming 408 from Luzon, were quoted by Hooker in *Spec. Fil.* ii. 89 (1858) below his description of *Cheilanthes varians* Hk.

The bulbils appear to have been noticed as far back as 1868 by C. B. Clarke, who collected a specimen of *Cheilanthes Belangeri* in Dhamroy Dacca (no. 7687) and noted on the label, "With the same monstrosity (?) which occurs in the Cachar specimens." Here he was probably referring to a sheet in *Herb. Kew* collected by R. L. Keenan in Cachar which also possesses bulbils.

Since the bulbils on many of the Kew specimens are very few in number and become very easily detached in the dried condition, it is possible that the specimens without these structures may have possessed them in the living state. The bulbils become, therefore, a useful specific character of *Cheilanthes Belangeri*. Dr. Christensen has recently presented to Kew a duplicate specimen of this species collected by Pételot in Cambodia (no. 219), the type locality of *Pellaea cambodiensis* Bak. The specimen sent possesses no bulbils, but the portion retained by Dr. Christensen is said to show a few small ones.

From an examination of all the Kew material it became clear that fronds possessing a comparatively large number of bulbils never

show an abundance of sporangia. Also, from the fact that very young fronds frequently showed a rich development of bulbils, whereas older fronds on the same plant were almost without them, it seemed possible that the bulbils were a juvenile phenomenon in the main and were developed before the sporangia.

In addition to a great number of bulbil-bearing specimens from various parts of India collected by C. B. Clarke, R. H. Beddome, R. L. Keenan, Hooker & Thomson, Parish, Simons, Craib and Gamble, there are also sheets of this plant from Siam collected by Fleet-Surgeon C. G. Matthews, Dr. Kerr and Dr. E. Smith.

Dr. Christensen's original suggestion was that *Pellaea cambodiensis* might be regarded as a bulbiferous condition of *Cheilanthes Belangeri*, but from the evidence obtained it seems quite certain that the condition is a normal one in *C. Belangeri*. *Pellaea cambodiensis* becomes therefore a synonym.

Aspidium sparsiflorum (Hk.) Diels is another plant which sometimes develops on the fronds bulbils of a type similar to those in *Cheilanthes Belangeri*. In this case they arise towards the base of the pinnules—the frond being a simply pinnate one. They are much larger, however, being up to almost a centimetre in length though otherwise identical in appearance.

F. B.

GEORGE MICHAEL RYAN.—It is with great regret that we learn of the death of Mr. G. M. Ryan, I.F.S. Retd., F.L.S., in London on the 15th January.

Ryan was appointed to the Indian Forest Service in the Presidency of Bombay in 1882 and retired after a long period of distinguished service in 1914. A man of wide interests, he took up keenly the self-imposed task of bringing the then little-known minor products of the forests into commercial use and did much pioneer work to that end. He wrote, over a period of years, several papers on the subject of river-training, with particular reference to the Indus, a river he had considerable opportunity to observe when serving in Sind. He was elected a Fellow of the Linnean Society in 1902. After his retirement he was active in the furtherance of arboriculture and the protection of trees in England. In this connection he became associated with the National Trust and was instrumental in securing the preservation of several old trees with historical associations in various parts of the country. For a few years he was closely connected with Kew, as Temporary Technical Assistant in the Herbarium and as Official Guide in the Gardens. Of kindly disposition, he made many friends by whom his loss will be much regretted.

C. E. C. F.

BULLETIN OF MISCELLANEOUS INFORMATION No. 2 1932 ROYAL BOTANIC GARDENS, KEW

VII.—THE KOENIG COLLECTION IN THE LUND HERBARIUM.

A. G. Retzius in his *Observationes Botanicae*, published at Leipzig in 6 parts between 1779 and 1791, quotes a number of specimens which he had received from Dr. F. G. Koenig. Koenig was attached to the Danish Medical Mission at Tranquebar in South India from 1768 to 1774 and was subsequently employed by the East India Company in Madras, where he was associated with his friend Dr. W. Roxburg; he died in India on the 26th June, 1785.

By the courtesy of the late Dr. Th. C. E. Fries, 346 of the specimens attributed to Koenig were picked out of the general herbarium at Lund and sent on loan to Kew. They have proved invaluable in the preparation of the concluding parts of the Flora of the Presidency of Madras.

These sheets do not bear precise evidence that they are those quoted by Retzius, but a comparison with the descriptions, the inscription of Koenig's name, and occasional indication of locality, leave no room for doubt that most of them are the actual specimens received by Retzius from Koenig and that they served for the corresponding descriptions in his work. It follows that several are the type specimens of the species concerned.

It would appear that the existence, or at least the location, of these specimens was unknown to many authors, for some of the names are entirely omitted from such works as the Flora of British India and C. B. Clarke's ms. monograph of the *Cyperaceae*. In some cases the examination of the specimens indicates that the conception arrived at from the descriptions was erroneous—e.g. that of *Cyperus flavidus*. In view of these facts, it has been deemed advisable to publish the appended list of the specimens in the collection. The list gives the correct botanical names according to modern practice as well as the inscriptions actually on the sheets. It will be found that several nomenclatural changes are involved and some well-known specific names lapse into synonymy.

The sheets on which the specimens are mounted are mostly uniform. The paper is whitish, rough, 12½ by 8½ inches. A few sheets are smaller and appear to belong to Acharius' herbarium, and one or two are on a bluish paper. These points are indicated in the list. The inscriptions are in ink (a few that are pencilled are obviously of later date and are usually ignored) and appear usually on the

back of the mounting paper itself; occasionally the writing is at the foot on the front and in a few cases it is on a gummed-on label.

Usually no locality is given and it must be presumed that the information quoted by Retzius was supplied separately by Koenig. This refers also in a few instances to items of the descriptions which could not have been ascertained from the specimens. I have not been able to procure evidence of this presumption, but it is supported by one letter from Koenig to Retzius concerning Koenig's own descriptions of Monocotyledons, of which the specimens are not included in the collection under review.

When a sheet represents one of Retzius' own species, the specific name is given on the back followed, usually, by the letter "N" evidently standing for "Nobis"; thus *Cyperus exaltatus* N. In such cases the derivation from Koenig is acknowledged by the inscription of his name, in full or shortened and variously spelled, i.e. "Koenig," "König," "Koen," or "Kön." The writing is not always the same, nor is it always of the same date, corrected identification or notes being put in subsequently, e.g. a reference to the Transactions of the Linnean Society of 1802. A few of the sheets cannot be connected with Koenig in any way, and may or may not have been obtained from him.

Sometimes a more or less full description, which tallies with that given in the *Observationes*, is inscribed and occasionally a few words on the habitat, e.g. "ad pedes montium raro."

On one or two sheets there are names which do not appear to have been published, e.g. *Tamarix coromandeliana*.

Thirty-three of the specimens referred to by Retzius as received from Koenig have not been traced: these are shown in the second list.

The determinations of most of the specimens of the *Gramineae* were made by Mr. C. E. Hubbard and these are indicated in the list as well as a few *Rutaceae* identified by Dr. T. Tanaka; the Cryptogams were determined by Mr. F. Ballard, who consulted Dr. C. Christensen and Mr. R. C. Ching. All the remainder were determined by myself, some of the *Cyperaceae* being further scrutinised by Dr. G. Kükenthal.

In the list the type specimens are shown in thicker type. In the notes appended to the individual species I have indicated specimens which I consider are duplicates of those sent to Linnaeus, father and son, to Vahl, and to Rottboell, and on which these authors founded some of their new species.

As all the plants concerned occur in India or Ceylon, when the name adopted differs from that given in the Flora of British India, the latter has been added in brackets to facilitate reference.

In a few instances the change of name involved by this investigation has already been discussed in the *Kew Bulletin* in connection with the Flora of the Presidency of Madras; in those cases the page in the *Kew Bulletin* is cited.

The order adopted for the Phanerogams is that of the Genera Plantarum of Bentham and Hooker, with slight modifications.

The letters N.R. indicate that the specimen in question was not referred to in Retzius' *Observationes*.

The serial numbers are inserted for convenience of reference to this paper.

Retzius' *Observationes* appeared in six parts, published in the following years: fasc. i. in 1779; ii. in 1781; iii. in 1783; iv. in 1786; v. in 1789; vi. in 1791. C. E. C. FISCHER.

(The phrases between inverted commas are transcripts of the information on the sheets, and are mostly given exactly as written. Similarly the names which appeared in Retzius are given just as they were published. Hence there are certain apparent inconsistencies in spelling, which have been left unaltered.)

MENISPERMACEAE.

1. *Tiliacora acuminata* (Lam.) Miers (*T. racemosa* Coleb., F.B.I.)
"Smilax zeylanica Kön."
N.R.

CAPPARIDACEAE.

2. *Cleome tenella* Linn. f.
"Cleome tenella. Kön."
Presumably the type of the description in Retz. Obs. iv. 28.
3. *Cadaba fruticosa* (Linn.) Druce (*C. indica* Lam. F.B.I.)
"Cleome fruticosa. König."
N.R.

CARYOPHYLLACEAE.

4. *Polycarpon prostratum* (Forsk.) Pax (*P. Loeflingiae* Benth. & Hook f., F.B.I.)
"Pharnaceum depressum. Löfvingia indica. Corolla calyce brevior purpurea. Hab. in agris oryzaceis König"
The type of *Loeflingia indica* Retz. Obs. iv. 8.
5. *Polycarpon prostratum* Pax
"Pharnaceum depressum Koenig. Stagna tempore calido exarida"

PORTULACACEAE.

6. *Portulaca quadrifida* Linn.
"Portulaca quadrifida. Kön."
N.R.

TAMARICACEAE.

7. *Tamarix gallica* Linn.
"Tamarix Coromandeliana Kön."
N.R.

DIPTEROCARPACEAE.

8. *Vateria copallifera* (Retz.) C. E. C. Fischer, n. comb. (*V. acuminata* Heyne, F.B.I.)
"Elaeocarpus copalliferus Willd. Sp. Pl. 2. p. 1170, 5 arb. certe. Retz. Obs. Vateria indica Linn. Dietr.
Tiliaceae-Elaeocarpeae: 11(xi)1.
Tiliaceae E. . Kön." (partly defaced)
The type sheet, described as *Elaeocarpus copalliferus* Retz. Obs. iv. 27.

MALVACEAE.

9. *Sida pilosa* Retz. (*S. humilis* Willd. var. *veronicifolia* Lam., F.B.I.)
"Melochia pyramidata ex fig. cit. Sida pilosa Ns. cordifolia Linné
Malvinda altiss: &c. Burm. Zail: T. 69. f.l.
König Tranqueb."
The type sheet of *Sida pilosa* Retz. Obs. i. 23, which antedates *S. veronicifolia* Lam. by 5 years.

10. *Sida acuta* Burm. (*S. carpinifolia* Linn., F.B.I.)
" *Sida lanceolata*. König."
Type of *Sida lanceolata* Retz. Obs. iv. 28.
11. *Sida rhomboidea* Roxb. (*S. rhombifolia* Lam. var. *rhomboidea* Mast., F.B.I.)
" *Sida*. König "
N.R.
- STERCULIACEAE.
12. *Waltheria indica* Linn.
" *Waltheria indica*. König "
N.R.
13. *Abroma angustum* (Linn.) Linn. f.
" *Abroma Wehleri* N."
Type of *Abroma Wehleri* Retz. Obs. v. 27.
- TILIACEAE.
14. *Corchorus trilocularis* Linn."
" *Corchorus*. König "
N.R.
- ELAEOCARPACEAE.
15. *Elaeocarpus serratus* Linn.
" *Elaeocarpus serrata*. Kön."
Possibly the specimen referred to in Retz. Obs. iv. 27.
16. *Elaeocarpus* sp. (not *serratus* Linn.)
" *E. serratus* India " Mus. Achar.
This sheet has a small twig with 8 leaves and several spikes of flowers.
It is not matched in Herb. Kew among Indian species. There is nothing
to connect it with Koenig.
- GERANIACEAE.
17. *Biophytum sensitivum* (Linn.) DC.
" *Oxalis sensitiva*. Kön."
N.R.
18. *Impatiens oppositifolia* Linn.
" *Impatiens rosmarinifolia*. Kön."
Presumably the type sheet of *Impatiens rosmarinifolia* Retz. Obs. v. 29.
19. *Impatiens oppositifolia* Linn.
" *Impatiens*. Koen."
A sheet with 3 plants.
20. *Impatiens latifolia* Linn.
" *Impatiens latifolia*. Kön."
N.R.
- RUTACEAE.
21. *Toddalia asiatica* (Linn.) Lam. var. *gracilis* Gamble (*T. aculeata* Pers. in
part., F.B.I.) " *Paulinia asiatica*. Kön."
N.R.
22. *Triphasia trifolia* (Burm. f.) P. Wils. det. T. Tanaka (*T. trifoliata* DC.,
F.B.I.) " *Triphasia trifoliata* ad Retzium misit König
Limonia trifolia."
N.R.
23. *Pleiospermum alatum* (W. & A.) Swingle, det. T. Tanaka (*Limonia alata*
W. & A., F.B.I.)
" *Aurantiaecae* Endl. *Triphasia trifoliata* DC.
Limonia trifoliata Linn.
Mantiss. Jacq. ic.
Citrus trifoliata Linn. Thunb.
Willd. 6 certe
Aegle sepiaria
Limonia spec. Kön.
Ind. orient."
N.R.

24. *Atalantia monophylla* (Linn.) Corr.
" *Turraea virens*. Kön."
Probably the basis for the short description under *Turraea virens* L.
in Retz. Obs. iv. 25.
25. *Feronia limonia* (Linn.) Swingle (*F. Elephantum* Corr., F.B.I.)
" *Limonia acidissima*. Elephant apples Angl. Balangas lusitanor.
Wlangai Tamulorum. *Crataeva* species Kön."
Quoted under *Limonia acidissima* L. in Retz. Obs. iv. 26.
- BURSERACEAE.
26. *Canarium zeylanicum* (Retz.) Bl.
" *Amyris elemifera*. Polygama hexandra. Kackune Gaht. Kön."
The type sheet of *Amyris zeylanica* Retz. Obs. iv. 25.
- CELASTRACEAE.
27. *Elaeodendron glaucum* (Rottb.) Pers.
" *Elaeodendron glaucum* Pers. Genus novum Arbor pentandr: mono-
gyn. Fl. infero, Corolla pentapetala, stylo
conico; Bacca drupacea Nux semibiloc:
Coromandel & Ceylon. *Schrebera albens*"
Type sheet of the description of *Schrebera albens* Retz. Obs. vi. 25.
- RHAMNACEAE.
28. *Zizyphus Oenoplia* (Linn.) Mill.
" *Rhamnus Oenoplia* Koenig in nemorosis; colitur in hortis Larva Atlas
in hac, in Terminalia, Jambolifera nun-
quam in hesperidi Citri, Auran."
Quoted under *Rhamnus Oenoplia* Linn. in Retz. Obs. ii. 11.
29. *Zizyphus xylopyrus* (Retz.) Willd.
" *Rhamnus Xylopyrus* Koenig
Hab. in desertis ad pedes montium
Arbor vix homine altior
Fructus ceraso magni major durus insipidus sub adstringens.
Nux inaequalis satis magna"
The type sheet, described as *Rhamnus Xylopyrus* Retz. Obs. ii. 11.
Koenig is not referred to in the text but a comparison of the specimen
with the description seems to show conclusively that this specimen was
employed.
- VITACEAE.
30. *Cissus vitiginea* Linn. (*Vitis Linnaei* Wall., F.B.I.)
" *Vitis indica* Koen. in nemorosis vulgatiss. Cirrhi caduci relictia parte
dimidia fructifera "
N.R.
31. *Cayratia pedata* (Lam.) Gagnep. (*Vitis pedata* Vahl, F.B.I.)
" *Cissus pedata* Willd. Lam. Willd. Sp. Pl. 2. p. 659. 18. *Cissus hepta-*
phylla Retz. Obs. *Sambucus canadensis*
Burm. non Linn.
Patria: India orient."
The type sheet of *Cissus heptaphylla* Retz. Obs. v. 22.
- *32. *Leea macrophylla* Roxb. ?
" *Aralia Lappaefolia* N."
- *33. *Leea macrophylla* Roxb. ?
" *Aralia Lappaefolia* N."
*Each of these sheets has a single leaf, very much smaller in the first
than in the second, with a small inflorescence. They are insufficient for
determination with certitude. They form the basis for the description
of *Aralia lappaefolia* Retz. Obs. vi. 27.
- SAPINDACEAE.
34. *Sapindus laurifolius* Vahl (*S. trifolius* Hiern, non Linn., in part, F.B.I.)
" *Sapindus trifoliata* Kön."
N.R.

ANACARDIACEAE.

35. *Semecarpus Anacardium* Linn. f.
"Melanthera. Anacardium Verum Koenig"
N.R.
It is probably a duplicate of Koenig's specimen referred to in Linn. f.'s description.

PAPILIONACEAE.

36. *Crotalaria sericea* Retz.
"Crotalaria sericea N."
The type of the description in Retz. Obs. v. 26.
37. *Crotalaria juncea* Linn.
"Crotalaria linifolia L. Koenig"
First written "juncea," which was struck out.
This is evidently the specimen correctly referred to *Crotalaria juncea* Linn. in Retz. Obs. ii. 21, and incorrectly to *C. linifolia* Linn. f. in Retz. Obs. v. 26.
The pods are ferruginous velvety.
38. *Psoralea corylifolia* Linn.
"Psoralea corylifolia Koenig"
N.R.
39. *Indigofera linifolia* (Linn. f.) Retz.
Mus. Achar. "Ind. or. I. linifolia"
Referred to in Retz. Obs. iv. 29.
40. *Indigofera linifolia* Retz.
"Indigofera linifolia. H. Hafn."
Evidently from Hort. Hafniensis and possibly not connected with Koenig. Neither sheet appears to have been used for the description of *I. linifolia* in Retz. Obs. vi. 33, nor for the drawing, t. 3. Both are mere scraps.
41. *Indigofera enneaphylla* Linn.
"Indigofera enneaphylla. Kön. Pluk. t. 166. f. 2."
This must be the specimen referred to in Retz. Obs. iv. 29.
42. *Indigofera pentaphylla* Linn.
"Indigofera fragrans. Kön."
Type of *Indigofera fragrans* Retz. Obs. iv. 29.
43. *Tephrosia purpurea* (Linn.) Pers.
"Galega fruticosa. Kön."
N.R.
44. *Tephrosia purpurea* Pers.
"König"
N.R.
45. *Sesbania aegyptiaca* Pers.
"Aeschynomene. Kön."
N.R.
46. *Sesbania aegyptiaca* Pers.
"Aeschynomene Sesban. floribus atropurpureis esculentis Kön."
Probably the basis of remarks under *Aeschynomene Sesban* L. in Retz. Obs. vi. 33.
47. *Sesbania procumbens* (Roxb.) W. & A.
"Aeschynomene Sesban. Koenig."
N.R.
48. *Zornia conjugata* (Willd.) Sm. (*Z. diphylla* Pers. var. *zeylonensis* Baker, F.B.I.)
"Zornia diphylla haud" and on label pasted on front
N.R.
"Hedysarum diphyllum Kg"

49. *Stylosanthes fruticosa* (Retz.) Alston (*S. mucronata* Willd., F.B.I.)
"Hedysarum hamatum. Arachis fruticosa. Trifol. procumbens fl. Zeyl. 553.
Burm. Zeyl. t. 106 f. 2. sec. König.
Tranquebar Kön."
A later hand has written above the other inscriptions "Stylosanthes mucronata Willd."
This and the next are clearly the specimens quoted under *Arachis fruticosa* Retz. Obs. v. 26, and therefore form the types.
50. *Stylosanthes fruticosa* Alston
"Hedysarum hamatum? Arachis fruticosa.
Trifol. procumbens Fl. Zeyl. 553.
Burm. Zeylon. t. 106 f. 2
Hab. in locis aridis Tranqueb. König"
51. *Stylosanthes fruticosa* Alston
On small label pasted in front
"Hedysar. hamatum pedunculus superus tubulosus est in Arachide"
52. *Urvia lagopodioides* (Linn.) Desv. (*U. lagopoides* DC., F.B.I.)
"Hedysarum Lagopus? K."
N.R.
53. *Eleptis sororia* (Linn.) DC.
"Hedysarum sororium. König. Hallia sororia Pers."
N.R.
54. *Alysicarpus bupleurifolius* (Linn.) DC.
"Hedysarum gramineum N. Kön." and on label attached by a pin
"Alysicarpus bupleurifolius DC."
The type of *Hedysarum gramineum* Retz. Obs. v. 26.
55. *Desmodium biarticulatum* (Linn.) Benth.
"Hedysarum biarticulatum. König"
N.R.
56. *Desmodium triflorum* (Linn.) DC.
"Hedysarum triflorum Koen."
N.R.
57. *Desmodium triflorum* DC.
"Koenig"
N.R.
58. *Rhynchosia rufescens* (Willd.) DC.
"König"
N.R.
59. *Flemingia lineata* (Linn.) Roxb.
"Hedysarum lineatum. König"
N.R.
60. *Flemingia lineata* Roxb.
"Hedysarum. Kön."
N.R.
61. *Pterocarpus santalinus* Linn. f.
"Santalum rubrum officinarum König
Stam: filam. 9 distinctis, Cor. papilionacea crispata, flava."
N.R.
62. *Pongamia pinnata* (Linn.) Merr. (*P. glabra* Vent., F.B.I.)
"Dalbergia arborea Willd. Sp. Pl. 3. 902. 3.
Cal. patenti-campanulatus, truncatus, dentibus 4 vix manifestis.
Vex. subrotundum alis & carina vix longius, extus hirtum, flavum
Alae lanceolatae obtusae medio carinae quasi adglutinatae, rubrae.

Carina falcata versus apicem hirta, longitudine fere alarum, undique dehiscens.
Filamenta 10, omnia connata in vaginam dimidio suo superiore latere fissam.
Antherae fere sagittatae basi setas nonnullas emittunt.
Germen pilosum, compressum.
Stylus adscendens. *Stigma* simplex acutum.
 Pongam seu Minari Rheed. H. Mal. vi. p. 5. t. 3.
 Funis convolutus? Rumph. v. t. 37. f. l. vel malaparius ib. iii. t. 117. sed in utraque figura racemi ramosi. König."

- N.R.
 63. *Derris scandens* (Roxb.) Benth.
 " *Dalbergia lanceolaria*. Glycine. König "
 N.R.
 64. *Sophora tomentosa* Linn.
 " *Sophora tomentosa*. tayanpa Zeilon. König "
 N.R.

CAESALPINIACEAE.

65. *Cassia Fistula* Linn.
 " *Cassia fistula*. Kön."
 N.R.
 66. *Cassia occidentalis* Linn.
 " *Cassia*. König "
 N.R.
 67. *Cassia pumila* Lam.
 " *Aeschynomene*. Kön."
 N.R.

MIMOSACEAE.

68. *Entada scandens* Linn.
 " *Mimosa scandens*. Kön."
 N.R.
 69. *Acacia planifrons* W. & A.
 " *Mimosa frons latiss.* Kön."
 N.R.
 70. *Acacia arabica* (Lam.) Willd.
 " *Mimosa nilotica*. König. 86. *Acacia Arabica* Willd."
 N.R.

SAXIFRAGACEAE.

71. *Vahlia digyna* (Retz.) O. Ktze. (*V. viscosa* Roxb., F.B.I.)
 " *Oldenlandia digyna*.
Cal. 5-fid. tubo globoso
Cor. marcescens.
Caps. e calyce sub-2-locul.
Sem. scobiform.
 5 dr 2 gyn. flore supero 5 pet. Koen."
 The type specimen, described as *Oldenlandia digyna* Retz. Obs. iv. 23.
 72. *Vahlia pentandra* (Retz.) C. E. C. Fischer, n. comb. (*V. oldenlandioides* Roxb., F.B.I.)
 " *Oldenlandia pentandra*. Koenig "
 The type specimen described as *Oldenlandia pentandra* Retz. Obs. iv. 22.
 The description is misleading as regards the pistil, there are 2 distinct styles. The specific epithet *pentandra* is the earliest and must be adopted.

DROSERACEAE.

73. *Drosera indica* Linn.
 " *Drosera indica*. Kön."
 N.R.

COMBRETACEAE.

74. *Anogeissus latifolia* Wall. and *Combretum ovalifolium* Roxb.
 " *Terminalia*. videtur *Belericia* vel proxima. König "
 This sheet is a mixture of a small spray of flowers of *Anogeissus latifolia* Wall. and 3 separate small leaves of *Combretum ovalifolium* Roxb.
 75. *Terminalia Chebula* Retz.
 " *Terminalia Chebula*. Kön."
 The type specimen, described in Retz. Obs. v. 31.

MYRTACEAE.

76. *Syzygium zeylanicum* (Linn.) DC. (*Eugenia zeylanica* Wight, F.B.I.)
 " *Myrtus Zeylanica*. Kön."
 N.R.

MELASTOMACEAE.

77. *Memecylon grande* Retz.
 " *Memecylon grande*. Kön."
 The type specimen, described in Retz. Obs. iv. 26.

LYTHRACEAE.

78. *Rotala leptopetala* (Bl.) Koehne (*Ammannia pentandra* Roxb. in part., F.B.I.)
 " *Indica* W.
Peplis zeylanica. Kön."
 N.R.
 79. *Pemphis acidula* Forst.
 " *Lythrum fruticosum*. videtur *Pemphis acidula* Forst. vel *Mangium Porcellanicum* Rumph. Kön."
 N.R.

SAMYDACEAE.

80. *Casearia tomentosa* Roxb.
 " *Samyda octandra* Kön. *Casearia glomerata* videtur. Tsierou Kanelli Rheed.
 P.v. t. 50? "
 N.R.

FICOIDACEAE.

81. *Mollugo Cerviana* (Linn.) Ser.
 " *Pharnaceum Cerviana*. Koenig. in aridis "
 N.R.
 82. *Mollugo disticha* (Linn.) Ser.
 " *Pharnaceum distichum*. König "
 N.R.
 83. *Mollugo disticha* Ser.
 " *Pharnaceum mollugo* ! König "
 N.R.

RUBIACEAE.

84. *Hedyotis fruticosa* Linn.
 " *Hedyotis fruticosa*. Kön."
 N.R.
 85. *Oldenlandia trinervia* Retz.
 " *Oldenlandia trinervia*. Kön."
 Presumably the type sheet of the description in Retz. Obs. iv. 23.
 86. *Oldenlandia biflora* Linn.
 " *Oldenlandia paniculata*. Kön."
 N.R.

87. *Timonius Jambosella* (Gaertn.) Thw.
 "Fuchsia Kön." and on label pinned on :
 "Cal. inferus, campanulatus, quadridentatus, coriaceus, utrinque hirtus
 Cor. infundubuliformis, supera, coriacea, extus flava, hirta.
 Tubo brevi
 Limbo quadrifido, laciniis lanceolatis obtusis.
 Stam. 4. filamentis brevissimis supra tubum limbo adnatis
 Antherae longae, lineares, erectae in medio circiter filamento impositae.
 Germen superum, c. calyce connatum.
 Stylus longitudine dupla calycis
 Stigma 4 gon : ? cum acumine "
- N.R.
88. *Randia dumetorum* (Gaertn.) Lam.
 "Heynhold :
Randia dumetorum Lam. Heynh.
 — spinosa Blume
Canthium coronatum Lam. *Gardenia dumetorum* Koen. Retz. Obs. 2.
Ceriscus malabaricus Gaertn.
Gardenia dumetorum Retz. Willd. Sp. Pl. 1. p. 1229, 13.
 — spinosa Linn. fil.
Posoqueria dumetorum Roxb.
 Patria : India orientalis in spinetis "
 The type of *Gardenia dumetorum* Retz. Obs. ii. 14.
89. *Randia uliginosa* (Retz.) DC.
 "Gardenia uliginosa. Frutex ramis majoribus obsolete 4-angulis, ramulis decussatis patentissimis folio brevioribus apice clavatis, spinis quaternis radiatis.
 In terra Cataccensi subarborea "
- The sheet holds one very short piece of twig with one complete leaf, another leaf with a piece missing and scraps of two others, all small. There are no spines. There are also three flowers separately pasted on. It is doubtful whether this is the specimen quoted under *Gardenia uliginosa* Retz. Obs. ii. 14.
90. *Ixora Thwaitesii* Hook. f.
 "Ixora alba. König "
 N.R.
91. *Serissa foetida* (Linn. f.) Lam.
 "Manteesia Kaempferi König Amoen. p. 780.
Lycium Japanicum Thunb. Indicum N.
 quod de odore refert Kaempfer falsum est Thunb. & de arbore Batavis Strunthout valet "
 The type of *Lycium indicum* Retz. Obs. ii. 12. The species is not indigenous in India but has been grown in gardens for very many years.
92. ?
 "Rauvolfia nitida König "
 N.R. I have not been able to determine this plant even generically—the buds are very young.
- COMPOSITAE.
93. *Grangea maderaspatana* (Linn.) Poir.
 "Artemisia littoralis N. Kön."
 Type specimen of *Artemisia littoralis* Retz. Obs. v. 28.
94. *Blumea Wightiana* DC.
 "Baccharis Dioscoridis Königii non Linnei."
 N.R.

95. *Epaltes divaricata* (Linn.) Cass.
 "Ethulia divaricata. König "
 N.R.
96. *Wedelia calendulacea* (Linn.) Less.
 "Verbesina inula. Kön."
 N.R.
97. *Spilanthes Acmeila* (Linn.) Murr.
 "Verbesina Acmeila. Kön."
 N.R.
- PLUMBAGINACEAE.
98. *Plumbago zeylanica* Linn.
 "Plumbago Zeylanica. Koen. in nemorosis "
 N.R.
- SAPOTACEAE.
99. *Mimusops hexandra* Roxb.
 "Tabernaemontana citrifolia ? Koen. in sylvis.
 Zeylonische Rosinen Busch ? Kalepale Tamulis "
 N.R.
- EBENACEAE.
100. *Maba buxifolia* (Rottb.) Pers. var. *microphylla* Thw.
 "Ehretia ? Zeylonae in sylvis vulgatiss. flores nundum vidit König "
 N.R.
101. *Diospyros peregrina* (Gaertn.) Gürke (*D. Embryopteris* Pers., F.B.I.)
 "Diospyros Kön. fructus Diospyros "
 N.R.
 Only a fruit cut in two on the sheet.
- OLEACEAE.
102. *Jasminum pubescens* (Retz.) Willd.
 "Nyctanthes pubescens N." and in another hand
 "Jasminum Pubescens V."
 The type, described as *Nyctanthes pubescens* Retz. Obs. v. 9.
103. *Jasminum scandens* (Retz.) Vahl
 "Nyctanthes scandens "
 The type, described as *Nyctanthes scandens* Retz. Obs. v. 9.
104. *Jasminum angustifolium* (Linn.) Willd.
 "Nyctanthes viminea N." and in other hands
 "Jasminum angustifolium V."
 "Nyctanthes biflora "
 The type of *Nyctanthes viminea* Retz. Obs. v. 9.
- SALVADORACEAE.
105. *Salvadora persica* Linn.
 "Embelia Grossularia Retz. Obs." and in another hand "Salvadora persica W. Sp. p. 695" and in front the words "a Retzio "
 Probably the type of *Embelia Grossularia* Retz. Obs. iv. 24, with additional information from Koenig. On a much larger sheet.
- APOCYNACEAE.
106. *Cerbera manghas* Linn.
 "Cerbera manghas Koen. ad littora maris "
 N.R.
107. *Hunteria zeylanica* (Retz.) Gardn. ex Thw. (*H. corymbosa* Roxb., F.B.I.)
 "Cameraria Zeylanica. Fl. Zeyl. 404. Kön."
 The twig referred to under *Cameraria zeylanica* Retz. Obs. iv. 24.
108. *Nerium odoratum* Soland.
 "Nerium oleander Koen."
 N.R.

ASCLEPIADACEAE.

109. *Gymnema sylvestre* (Retz.) R. Br.
"Periploca sylvestris Kön." and in another hand "Gymnema sylvestre Br."
On front: "Ind. Orient."
The type, described as *Periploca sylvestris* Retz. Obs. ii. 15.
110. *Cynanchum tunicatum* (Retz.) Alston (*C. pauciflorum* R. Br., F.B.I.)
"Periploca tunicata Koen."
The type, described as *Periploca tunicata* Retz. Obs. ii. 15.
111. *Leptadenia reticulata* (Retz.) W. & A.
"Cynanchum reticulatum Koen. an Apocyn. reticul. Burm."
The type, described as *Cynanchum reticulatum* Retz. Obs. ii. 15.
112. *Marsdenia volubilis* (Linn. f.) T. Cooke (*Dregea volubilis* Benth., F.B.I.)
"Asclepias viridiflora. Wata kaka Codd. Rheed. Fl. Mal. Kön."
and in another hand: "Hoya viridiflora Br."
Possibly a duplicate of the specimen sent to Linn. f. and described as *Asclepias volubilis* Linn. f. Suppl. 170.

LOGANIACEAE.

113. *Strychnos potatorum* Linn. f.
"Strychnos Potatorum, Tetan. Kottae Koenig. Hab. ad pedes montium raro. Colitur in hortis ob odorem florum fragrantiss. Fructus nuci Vomica simill. sed minor."
Presumably the type of the description of *Strychnos Tetankotta* Retz. Obs. ii. 12 and possibly duplicate of *S. potatorum* Linn. f. Suppl. 148.
114. *Strychnos Nux-vomica* (Retz.) Linn.
"Fam. Contortae-Apocynae: 5. 1.
Strychnos nux vomica Willd. Sp. Pl. p. 1052.
1. L. Heynh.
"Obs. Koenig adscripsit
"Lignum Colubrinum
"Nux Vomica ut lubet
"in viciniis montium Palliacattensium vulgatiss. in Zeylona copiosae
Fam. Loganiaceae Endl."
N.R.

GENTIANACEAE.

115. *Enicostemma verticillatum* (Linn.) Engl. (*E. littoralis* Bl., F.B.I.)
"Exacum verticillatum Willd.? Gentiana verticillata β Koen."
The specimen quoted under *Gentiana verticillaris* Linn. in Retz. Obs. ii. 15.
116. *Enicostemma verticillatum* Engl.
"Exacum hyssopifolium. Gentiana verticillata α N. Koen."
The specimen quoted under *Gentiana verticillaris* Linn. α in Retz. Obs. ii. 15.
117. *Exacum bicolor* Roxb.
"Chironia trinervia. Kön."
N.R.
118. *Canscora heteroclita* (Linn.) Gilg (*C. sessiliflora* R. & S., F.B.I.)
"Exacum heteroclitum, Gentiana heteroclita Koenig. in graminosis"
N.R.

BORAGINACEAE.

119. *Heliotropium supinum* Linn. var. *malabaricum* C. B. Clarke
"Heliotropium malabaricum Burm. Kön."
Type of *Heliotropium malabaricum* Retz. Obs. iv. 24.
120. *Heliotropium ovalifolium* Forsk.
"Heliotropium Coromandelianum Koen."
Type of *Heliotropium Coromandelianum* Retz. Obs. ii. 9.

121. *Heliotropium ovalifolium* Forsk.
"Heliotropium Coromandelianum Retz. Obs. sec. spec. Retz."
in pencil "Coromandel. vel nova species. ex Swartz"
Perhaps sent by Swartz. The specimen, a single very small plant, is mounted on slightly larger-sized blue-tinted paper.
122. *Heliotropium scabrum* Retz.
"Heliotropium marifolium N. supinum? Koen."
Presumably the type of *H. marifolium* Retz. Obs. ii. 8, which has been united by Gamble (Fl. Pres. Mad. 897) with *H. scabrum* Retz. Obs. ii. 8, the type of which has not been found in this collection.

CONVOLVULACEAE.

123. *Cressa cretica* Linn.
"Cressa indica Retz. Obs. 4. Willd. Sp. Pl. 1. p. 1320. 2.
Convolvulaceae: 5. 2. Heynh. Koen.
Patria: India."
The type of *Cressa indica* Retz. Obs. iv. 24.
124. *Jacquemontia paniculata* (Burm. f.) Hallier. f. (*Convolvulus parviflorus* Vahl, F.B.I.)
"Ipomea paniculata Burm. Kön."
N.R.
125. *Quamoclit pennata* (Lam.) Boj. (*Ipomoea Quamoclit* Linn., F.B.I.)
"Ipomoea Quamoclit. Koen."
N.R.
126. *Ipomoea coptica* (Linn.) Roth (*I. dissecta* Willd., F.B.I.)
"Convolvulus copticus Koenig. in graminosis subaridis"
The specimen quoted under *Convolvulus copticus* Linn. in Retz. Obs. ii. 11.
127. *Ipomoea obscura* (Linn.) Ker-Gawl.
"Convolvulus gemellus Koen. ruderata et margines hortor. Floret ante merid. ad horam 12."
N.R.
128. *Ipomoea rugosa* (Rottl.) Choisy (*I. Beladamboe* Roem. & Sch., F.B.I.)
"Convolvulus muricatus Koen. Loca arida sabulosa. Cor. albae. haec rubus prope Madras lecta"
N.R.
129. *Ipomoea Pes-caprae* (Linn.) Roth (*I. biloba* Forsk., F.B.I.)
"Convolvulus Pes Caprae. Koen. in arena"
N.R.

SOLANACEAE.

130. *Solanum pubescens* Willd.
"Solanum verbascifolium Koenig. in hortis solo argilloso, raro."
N.R.
131. *Capsicum frutescens* Linn.
"Capsicum frutescens Koenig. in sylvis Johanna spont. praefertur pro annuo in confectione Atsia."
N.R.
132. *Capsicum annuum* Linn.
"Capsicum grossum Koen. in hortis colitur. minus ardens reliquis. ex ejus capsula Atsias praeparatur."
N.R.
133. *Datura fastuosa* Linn.
"Datura Tatula. Koenig"
N.R.
134. *Datura fastuosa* Linn.
"Datura ferox? Kön."
N.R.

SCROPHULARIACEAE.

135. *Lindenbergia ruderalis* (Retz.) J. O. Voigt (*L. urticaefolia* Lehm. ex Link & Otto, F.B.I.)
"Stemodia ruderalis N. flores aurei proxima Ghonakola Herm. M. Zeyl."
Type, described as *Stemodia ruderalis* Retz. Obs. v. 25.
136. *Limnophila sessilis* (Benth.) C. E. C. Fischer, n. comb. (*Limnophila conferta* Benth., F.B.I.)
"Rhinanthus indicus Kön."
N.R. The new combination is based on *Stemodia sessilis* Benth. in Bot. Reg. xvii. sub t. 1470, sp. 8 (1832).
137. *Limnophila indica* (Linn.) Druce (*L. gratioloides* R. Br., F.B.I.)
"Rhinanthus indicus var. Kön."
N.R.
138. *Artanema longifolium* (Linn.) Vatke (*A. sesamoides* Benth., F.B.I.)
"Sesamum javanicum Burm. Kön."
Presumably the specimen on which remarks under *Sesamum javanicum* Burm. in Retz. Obs. iv. 28 were based.
139. *Ilysanthes oppositifolia* (Retz.) Urb. (*Bonnaya oppositifolia* Spreng., F.B.I.)
"Gratiola (hyssopioides) stricta habitat in agris Oryzaceis & humidiusculis. viget tempore pluvioso"
and by other hands: "Gratiola oppositifolia Retz. Willd. Sp. Pl. 1. 105. 13. Grat. serrata Roxb."
"Gratiola oppositifolia Willd. Retz. Obs. fasc. 4. p. 8. Manu Retzii, qui dedit 1808 Patria: Tranquebar"
Without doubt the type, described as *Gratiola oppositifolia* Retz. Obs. iv. 8.
140. *Ilysanthes parviflora* (Roxb.) Benth.
"Rhinanthus indicus Kön."
N.R.
141. *Ilysanthes veronicifolia* (Retz.) Urb. (*Bonnaya veronicifolia* Spreng., F.B.I.)
"Gratiola veronicaefolia. Kön."
Type, described as *Gratiola veronicaefolia* Retz. Obs. iv. 8.
142. *Ilysanthes veronicifolia* Urb.
"Gratiola grandiflora Königii. Hab. prope Tranquebar Madras, Siam & Malacca solo humido fertili"
The type of *Gratiola grandiflora* Retz. Obs. iv. 8, which Gamble (Fl. Pres. Mad. 962) unites with *Ilysanthes veronicifolia* Urb.
143. *Microcarpaea minima* (Retz.) Merr. (*M. muscosa* R. Br., F.B.I.)
"Paederota minima Kön."
The type, described as *Paederota minima* Retz. Obs. v. 10.
144. *Striga asiatica* (Linn.) O. Ktze. (*S. euphrasioides* Benth., F.B.I.)
"Buchnera asiatica. Tottea. Königii"
N.R.

BIGNONIACEAE.

145. *Oroxylum indicum* (Linn.) Vent.
"Bignonia indica. Kön."
N.R.
146. *Stereospermum chelonoides* (Linn. f.) Haines
"Bignonia Chelonoides. Kön."
Probably a duplicate of the type of *Bignonia Chelonoides* Linn. f. Suppl. 282, where the derivation from Koenig is acknowledged.

PEDALIACEAE.

147. *Sesamum indicum* Linn.
"Bignoniaceae Endl. Sesamum luteum Willd. Sp. Pl. 3. p. 358. 2. Kön."
Presumably the specimen quoted under *Sesamum luteum* Retz. Obs. vi. 31.
148. *Sesamum prostratum* Retz.
"Sesamum prostratum. Koen."
Type, described in Retz. Obs. iv. 28.

ACANTHACEAE.

149. *Thunbergia fragrans* Roxb.
"planta scandens. Cal. 10 fid. dentib. acutis pilosis
Cor. tubus basi parum curvus, demum crassior.
In another hand : Stam. 4. antheris sagitt. Roxburgia Kön.
"Thunbergia fragrans." an Thunbergia sp. Kön."
N.R.
150. *Elytraria acaulis* (Linn. f.) Lindau (*E. crenata* Vahl, F.B.I.)
On label pasted in front : On back in a later hand :
"Justicia acaulis Elytraria crenata"
Scriptsit Lindén. König."
This and the next are possibly duplicates of the type of *Justicia acaulis* Linn. f. Suppl. 84; derivation from Koenig is acknowledged. They are also used under *J. acaulis* L. Suppl. in Retz. Obs. iv. 7.
151. *Elytraria acaulis* Lindau
On front "In locis aridis, ad vias publicas"
and on back, in same hand : "Elytraria. Justicia acaulis"
N.R.
152. *Dyschoriste madurensis* (Burm. f.) O. Ktze. (*Calophanes littoralis* T. And., F.B.I.)
"Ruellia ? Justicia madurensis Burm. König."
N.R. Probably a duplicate of the type of *Ruellia littoralis* Linn. f. Suppl. 289, where derivation from Koenig is acknowledged.
153. *Micranthus dorsiflorus* (Retz.) C. E. C. Fischer, n. comb. (*Phaylopsis parviflora* Willd., F.B.I.)
"Ruellia dorsiflora N. Decumbens. Flores albi noctu odori."
The type, described as *Ruellia dorsiflora* Retz. Obs. vi. 31.
154. *Blepharis repens* (Vahl) Roth (*B. molluginifolia* Pers., F.B.I.)
"Acanthus repens. König."
N.R.
155. *Barleria longiflora* Linn. f.
"Barleria longiflora König."
N.R. Probably a duplicate of the type sheet, since Linn. f. in Suppl. 290 acknowledges receipt from Koenig.
156. *Barleria lanceata* (Forsk.) C. Chr. (*B. noctiflora* Linn. f., F.B.I.)
"Barleria noctiflora. Caules sesquipedales fruticulosi, orbiculariter diffusi, ramosissimi.
Spinæ geminae oppositae, basi ramosae.
Folia ovato-lanceolata, acuminata, pilosa spinis breviora.
Crescit in aridis, solo duro ad Tanschaur, Madras Naguhr copiose Kön."
N.R. Probably a duplicate of the type of Linn. f.'s description in Suppl. 220, where acknowledgment to Koenig is made.
Tanschaur = Tanjore.
157. *Lepidagathis fasciculata* (Retz.) Nees
"Ruellia fasciculata. Caule repente, ramis erectis : Foliis lanceolato-ovatis, dentatis : Floribus terminalibus fasciculatis : Bracteis involu- cratis.

- An *Ruellia alternata*. Burm. Flora ind. habitat in nemorosis, in vicinia Thermarum Trinquemallensium " Type, described as *Ruellia fasciculata* Retz. Obs. iv. 28. Trinquemallensium refers to Trincomalee.
158. *Andrographis paniculata* (Burm. f.) Nees
" *Justicia latebrosa*. In latebrosis intra spinetas absconditas. König " N.R.
159. *Justicia tranquebarensis* Linn. f.
" *Justicia Tranquebarensis* " and in another hand : " König in india legit et determinavit " N.R. Probably a duplicate of the type, as derivation from Koenig is admitted in Linn. f. Suppl. 85.
- VERBENACEAE.
160. *Holmskioldia sanguinea* Retz.
" *Holmskioldia* " Presumably the type of the description in Retz. Obs. vi. 31, but there is nothing to connect it with Koenig.
161. *Callicarpa macrophylla* Vahl.
" *Callicarpa macrophylla*. Fomes tomentosa Koenig. " N.R. Perhaps a duplicate of the type specimen, as Vahl refers to Koenig as the collector.
162. *Avicennia officinalis* Linn.
" *Avicennia tomentosa*. *Bontia germinans*. König. " N.R.
- LABIATAE.
163. *Geniosporum tenuiflorum* (Linn.) Merr. (*G. prostratum* Benth., F.B.I.)
" *Ocimum menthoides*. König. " N.R.
164. *Geniosporum tenuiflorum* Merr.
" *Ocimum menthoides*. König. " N.R.
165. *Moschosma polystachyum* (Linn.) Benth.
" *Mentha perilloides*? *Spica secunda* Kön. " N.R.
- AMARANTHACEAE.
166. *Nothosaerva brachiata* (Linn.) Wight
" *Illecebrum* L. *Achyranthes brachiata*. Koenig. in agris oryzaceis " N.R.
167. *Aerva lanata* (Linn.) Juss.
" *Illecebrum* L. *Achyranthes lanata*. Koenig. in aridis petrosis " Quoted under *Illecebrum lanatum* Linn. in Retz. Obs. ii. 13.
- POLYGONACEAE.
168. *Polygonum plebejum* R. Br.
" *Polygonum ciliare* König " N.R.
169. *Polygonum barbatum* Linn.
" *Polygonum barbatum*. König. " Probably the specimen referred to under *Polygonum barbatum* L. " e Malabar " in Retz. Obs. iv. 25.
- ARISTOLOCHIACEAE.
170. *Aristolochia bracteata* Retz.
" *Aristolochia bracteata*. König. " The type, described in Retz. Obs. v. 29.
171. *Aristolochia indica* Linn.
" *Aristolochia indica*. König " N.R.

PIPERACEAE.

172. *Piper longum* Linn.
" *Piper longum*. pl. monoica Kön. " Referred to under *Piper longum* L. in Retz. Obs. vi. 19.

LAURACEAE.

173. *Cinnamomum zeylanicum* Bl.
" *Laurus Cassia*. Kön. " N.R.
174. *Litsea glutinosa* (Lour.) C. B. Robins. (*Litsaea sebifera* Pers., F.B.I.)
" *Laurus involucrata* N. " Type of *Laurus involucrata* Retz. Obs. vi. 27.

LORANTHACEAE.

175. *Loranthus longiflorus* Desr.
" *Loranthus Loniceroides* K. L. Koenigii Ag. " N.R.

EUPHORBIACEAE.

176. *Euphorbia rosea* Retz.
" *Euphorbia rosea*. Kön. " The type, described in Retz. Obs. iv. 26.
177. *Euphorbia rosea*. Retz.
" *Euphorbia polygonoides*. Kön. " N.R.
178. *Phyllanthus Urinaria* Linn.
" *Phyllanthus Urinaria*. König. " N.R.
179. *Phyllanthus simplex* Retz.
" *Phyllanthus simplex* König. " The type, described in Retz. Obs. v. 29.
180. *Phyllanthus Niruri* Linn.
" *Phyllanthus Niruri*. Kön. " N.R.
181. *Phyllanthus Niruri* Linn.
" *Phyllanthus maderaspatensis*. König. " N.R.
182. *Glochidion stellatum* (Retz.) Bedd. (*G. rigidum* Muell.-Arg., F.B.I.)
" *Phyllanthus stellatus*. Kön. " The type, described as *Phyllanthus stellata* Retz. Obs. v. 29.
183. *Breynia Vitis-idaea* (Burm.) C. E. C. Fischer, n. comb. (*Breynia rhamnoides* Muell.-Arg., F.B.I.)
" *Phyllanthus rhamnoides*. *Rhamnus vitis idaea* Burm. König. " Type of *Phyllanthus rhamnoides* Retz. Obs. v. 30.
184. *Antidesma acidum* Retz. (*A. diandrum* Roth., F.B.I.)
" Fam. Antidesmeae Endl. *Antidesma acidum* ♀ Retz. Obs. v. p. 30 certe. Willd. Sp. iv. 763. 5. Dietr. Syn. Patr. : Ind. orient. " The type, described as *Antidesma acida* Retz. Obs. v. 30.
185. *Acalypha fruticosa* Forsk.
" *Acalypha betulina*. Frutex vix altitudine humana, graveolens aromaticus. medicina Indior. Kön. " Type of *Acalypha betulina* Retz. Obs. v. 30.
186. *Mallotus philippinensis* (Lam.) Muell.-Arg.
" *Croton*. Caps. coccinea, sericeo toment. Hamparandale Cingal. Kön. " Probably the type of *Croton punctatum* Retz. Obs. v. 30. The specimen has leaves and fruit and no flowers, which fits in with the description.
187. *Tragia involucrata* Linn.
" *Tragia involucrata*. König. " N.R.

188. *Sebastiania Chamaelea* (Linn.) Muell.-Arg.
" *Tragia Chamaelea* ? Kön.
N.R.

ULMACEAE.

189. *Trema orientalis* (Linn.) Bl.
" *Celtis orientalis*. Kön."
The specimen referred to under *Celtis orientalis* L. in Retz. Obs. vi. 34.

MORACEAE.

190. *Streblus asper* Lour.
" *Trophis aspera*. Cudranus amboin : Rumph V. p. 25. t. 15. f. l. 2
dioica sed Cudrani Rumph. sunt spinosi
Flor. 12. 13. sessiles.
Cal. 0.
Cor. 4 pet. C. ad basin usque 4 fidi petalis
lanceolatis membranaceis
Stam. 4. filamentis corolla longior : antheris
reniformibus
Pistilli rudimentum oblongum tomentosum.
Styl. & Stigm : 0 "
Type of *Trophis aspera* Retz. Obs. V. 30.

URTICACEAE.

191. *Pouzolzia indica* (Linn.) Gaud.
" *Urtica alienata*. Kön."
N.R.

BURMANNIACEAE.

192. *Burmannia disticha* Linn.
" *Burmannia disticha*, an biflora. Kön."
N.R.
193. *Burmannia caelestis* D. Don
" *Burmannia monantha*. Kön."
N.R.

ZINGIBERACEAE.

194. *Curcuma angustifolia* Roxb.
" *Curcuma globosa* Koen. Hab. in nemorosis prope Midnapaur.
Radices inter optima remedia incolarum.
Colore subcitrino. Pulcherrima spica comosa "
N.R.
195. *Costus speciosus* (Retz.) Sm.
" *Hellenia grandiflora* N. Hb. Spiralis Rumphii. monandria
Banksea speciosa Kön. Costus arab. Sw.
Jacqu. speciosus Smith."
Type of *Banksea speciosa* Retz. Obs. iii. 75, changed to *Hellenia grandiflora* Retz. Obs. vi. 18.
196. *Alpinia Allughas* (Retz.) Rosc.
" *Heritiera Allughas* Retz. Obs. vi."
The type, described as *Heritiera Allughas* Retz. Obs. vi. 17 & t. 1.

HAEMODORACEAE.

197. *Peliosanthes neilgherrensis* Wight.
" *Orchis Amb.* major radice digit. p. 116 Rumph. vi. t. 54. f. l. Sp. 2 ?
Hexandra 1-gyn. Baccae 5 ad 9 distinctae
ovatae, laeves, nitidissime coeruleae. Sem.
magnum subnidelans corneum albicans.
an ex genere Palmarum König. Dracaena
species ? "
N.R.

LILIACEAE.

198. *Gloriosa superba* Linn.
" *Gloriosa superba*. König."
N.B.
199. *Anthericum ramosum* Linn.
" *Anthericum ramosum*. K."
N.R. Possibly not a Koenig specimen, and if from India, then from a garden.

COMMELINACEAE.

200. *Aneilema vaginatum* (Linn.) R. Br.
" *Commelina vaginata*. Kön."
N.R. Possibly a duplicate of the type of *Commelina vaginata* Linn. Mant. 177.

ARACEAE.

201. *Cryptocoryne spiralis* (Retz.) Fisch.
" *Arum spirale* N. Tranqueb."
The type, described as *Arum spirale* Retz. Obs. i. 30.
202. *Rhaphidophora lacinata* (Burm. f.) Merr. (*R. pertusa* Schott)
" *Calla. Polypodium lacinatum* Burm. Kön."
N.R.

APONOGETONACEAE.

203. *Aponogeton natans* (Linn.) Engl. & Kr. (*A. monostachyon* Linn., F.B.I.)
" *Aponogeton* spec. ignota. Saururi Sp. nov. Kön. spatha persistens "
N.R.

CYPERACEAE.

204. *Kyllinga monocephala* Rottb.
" *Cyperus monostachyos* ? *Cyperus* (monostachyos) culmo triquetro
nudo, spica simplici ovata terminali :
squamis mucronatis Lin. Mant. pl. 2. p. 180.
n. 24.
Habitat in India orientali. Koenig. Nova
hac specie me ditavit Dnus : Mag : Lindwall."
N.R.
205. *Pycnus sanguinolentus* (Vahl) Nees
" *Cyperus cruentus* N."
Type of *Cyperus cruentus* Retz. Obs. v. 13, non Rottb.
206. *Pycnus pumilus* (Linn.) Domin (*P. nitens* Nees, F.B.I.)
" *Cyperus cruentus* N."
Type of *Cyperus nitens* Retz. Obs. v. 13, non Rottb.
207. *Pycnus pumilus* Domin
" *Cyperus pygmaeus* N. Koenig."
Type of *Cyperus pygmaeus* Retz. Obs. iv. 9.
208. *Pycnus globosus* (All.) Reichb. (*P. capillaris* Nees var. *nilagiricus* C. B. Cl., F.B.I.)
" *Cyperus flavidus* N."
Type of *Cyperus flavidus* Retz. Obs. v. 13, non auct. Vide K.B. 1931, 262.
209. *Pycnus odoratus* (Linn.) Reichb. (*P. polystachyos* Beauv., F.B.I.)
" *Cyperus polystachyos*. Kön."
N.R. Perhaps a duplicate of the type of *Cyperus polystachyos* Rottb. Descr. & Ic. 39.
210. *Juncellus laevigatus* (Linn.) C. B. Clarke
" *Cyperus mucronatus* N."
Type of *Cyperus mucronatus* Retz. Obs. v. 10.
211. *Cyperus castaneus* Willd.
" *Cyperus squarrosus* Fr. R. König."
N.R.
212. *Cyperus tenuispicus* Steud. (*C. flavidus* C. B. Clarke, F.B.I., non Retz.)
" *Cyperus Haspan*. König."
N.R. Perhaps a duplicate of one of the specimens quoted under *Cyperus Haspan* in Rottb. Descr. & Ic. 36.

213. *Cyperus niveus* Retz.
"Cyperus niveus N."
Type, described in Retz. Obs. v. 12.
214. *Cyperus leucocephalus* Retz.
"Cyperus leucocephalus N."
Type, described in Retz. Obs. v. 11.
215. *Cyperus arenarius* Retz.
"Cyperus arenarius. Kön."
Type, described in Retz. Obs. iv. 9.
216. *Cyperus compressus* Linn.
"Cyperus compressus. Kön."
Referred to in Retz. Obs. iv. 11 as pentaphyllous, with long leaves.
217. *Cyperus Iria* Linn.
"Cyperus Santonici Fr. R. König."
N.R. Probably a duplicate of the type of *Cyperus Santonici* Rottb. Descr. & Ic. 41.
218. *Cyperus distans* Linn. f.
"Cyperus elatus Fr. R. distans L. König."
N.R.
219. *Cyperus bulbosus* Vahl.
"Cyperus Jemini. Kön."
Quoted under *C. Jemini* Retz. Obs. iv. 11.
220. *Cyperus corymbosus* Rottb.
"Cyperus diphyllus N."
Type of *C. diphyllus* Retz. Obs. v. 11.
221. *Cyperus longus* Linn. subspecies *mitis* Steud. det. G. Kükenthal.
"Cyperus tenuiflorus. Kön."
N.R.
222. *Cyperus rotundus* Linn. var. *tuberosus* (Rottb.) Kük. det. G. Kükenthal
"Cyperus Pangorei. Kön."
Type of *C. Pangorei* Retz. Obs. iv. 10, non Rottb.
223. *Cyperus stoloniferus* Retz.
"Cyperus stoloniferus N. König."
The type, described in Retz. Obs. iv. 10.
224. *Cyperus stoloniferus* Retz.
"Cyperus rotundus. Kön."
N.R.
225. *Cyperus imbricatus* Retz. (*C. radiatus* Vahl, F.B.I.)
"Cyperus imbricatus N."
The type, described in Retz. Obs. v. 11. Vide K.B. 1931, 262.
226. *Cyperus exaltatus* Retz.
"Cyperus exaltatus N."
The type, described in Retz. Obs. v. 11.
227. *Cyperus exaltatus* Retz.
"Cyperus racemosus N."
Type of *C. racemosus* Retz. Obs. vi. 20.
228. *Cyperus exaltatus* Retz.
"Cyperus canaliculatus"
The specific name first written was "alopecuroides" which is struck out.
Type of *C. canaliculatus* Retz. Obs. vi. 20.
229. *Mariscus dubius* (Rottb.) Kük. (*M. Dregeanus* Kunth, F.B.I.)
"Schoenus Bobartiae König."
Type of *Schoenus Bobartiae* Retz. Obs. iv. 9 and perhaps a duplicate of the type of *Cyperus dubius* Rottb. Descr. & Ic. 20. For name *Mariscus dubius* see K.B. 1931, 263.
230. *Mariscus paniceus* (Rottb.) Vahl
"Kyllingia Panicea Fr. Rottb. ic. t. iv. f.1. Scirpus cyperoides König."
N.R. Perhaps a duplicate of the type of *Kyllingia panicea* Rottb. Descr. & Ic., who acknowledges receipt from König.
231. *Mariscus cyperinus* (Retz.) Vahl
"Kyllingia cyperina N."
The type, described as *Kyllingia cyperina* Retz. Obs. vi. 21.
232. *Eleocharis atropurpurea* (Retz.) Kunth
"Isoplepis atropurpurea"
Probably the type, described as *Scirpus atropurpureus* Retz. Obs. v. 14.
233. *Eleocharis Chaetaria* Roem. & Sch.
"Eleocharis setacea"
Probably the type, described as *Cyperus setaceus* Retz. Obs. v. 10.
234. *Fimbristylis nutans* (Retz.) Vahl
"Scirpus nutans K. Scirpus nutans, Culmo nudo, stricto, anguloso. Spica terminali solitar. nutanti habitat in uliginosis Malacca."
The type, described as *Scirpus nutans* Retz. Obs. iv. 12.
235. *Fimbristylis polytrichoides* (Retz.) R. Br.
"Scirpus Polytrichoides. Kön."
The type, described as *Scirpus Polytrichoides* Retz. Obs. iv. 11.
236. *Fimbristylis schoenoides* (Retz.) Vahl
"Scirpus schoenoides"
The type, described as *Scirpus Schoenoides* Retz. Obs. v. 14.
237. *Fimbristylis dipsacea* Benth.
"Scirpus dipsaceus var. maj. Kön."
N.R.
238. *Fimbristylis annua* (All.) Roem. & Sch. var. *diphylla* Kükenthal (F. *diphylla* Vahl, F.B.I.)
"Scirpus dichotomus α Kön."
Quoted under *Scirpus dichotomus* L. β in Retz. Obs. iv. 12.
239. *Fimbristylis annua* R. & S. var. *diphylla* Kük.
"Scirpus dichotomus β. Kön."
Quoted under *Scirpus dichotomus* L. in Retz. Obs. iv. 12.
240. *Fimbristylis annua* R. & S. var. *diphylla* Kük.
"Scirpus diphyllus N."
Quoted under *Scirpus diphyllus* Retz. Obs. v. 15.
241. *Fimbristylis dichotoma* (Linn.) Vahl
"Scirpus (pallidus K.) aestivalis 1nd. vix Scirpus"
Type of *Scirpus aestivalis* Retz. Obs. iv. 12. Vide K.B. 1931, 264.
242. *Fimbristylis ferruginea* (Linn.) Vahl
"Scirpus arvensis König."
Type of *Scirpus arvensis* Retz. Obs. iv. 11.
243. *Fimbristylis spathacea* Roth
"Scirpus glomeratus. Kön."
Type of *Scirpus glomeratus* Retz. Obs. iv. 11.
244. *Fimbristylis argentea* (Rottb.) Vahl
"Scirpus argenteus K. monandr. similis monandro Rottb. ut illum esse credas"
N.R.
245. *Fimbristylis argentea* Vahl
"Fimbrist. argentea K." and in pencil on front "Scirpus monander"
N.R. Probably a duplicate of the type of *Scirpus monander* Rottb. Descr. & Ic. 50.
246. *Fimbristylis argentea* Vahl
"Fimbristylis argentea. Kön."
N.R.
247. *Fimbristylis globulosa* (Retz.) Kunth
"Scirpus globosus N."
The type, described as *Scirpus globulosus* Retz. Obs. vi. 19.
248. *Fimbristylis complanata* (Retz.) Link
"Scirpus complanatus N."
The type, described as *Scirpus complanatus* Retz. Obs. v. 14.

249. *Fimbristylis nigrobrunnea* Thw.
"20 *Fimbristylis diphylla*. *Scirpus diphyllus* Retz. herb."
N.R.
250. *Fimbristylis triflora* (Linn.) K. Sch. (*F. tristachya* Thw., F.B.I.)
"Schoenus cyperoides. Kön."
Type of *Schoenus cyperoides* Retz. Obs. iv. 8, and probably a duplicate of the type sent to Linnaeus by Koenig.
251. *Bulbostylis barbata* (Rottb.) C. B. Clarke.
"Scirpus barbatus"
Possibly the basis of the remarks under *Scirpus barbatus* in Retz. Obs. vi. 20, but there is nothing to indicate connection with Koenig.
252. *Scirpus supinus* Linn.
"Scirpus lateralis N."
Type of *Scirpus lateralis* Retz. Obs. iv. 12.
253. *Scirpus grossus* Linn. f.
"Scirpus grossus. Kön."
Quoted under *S. grossus* Linn. f. Suppl. 104 in Retz. Obs. v. 15 and perhaps a duplicate of the type.
254. *Scirpus squarrosus* Linn.
"Scirpus squarrosus. Kön."
N.R. Possibly a duplicate of the type specimen and also of the specimen quoted under *S. squarrosus* in Rottb. Descr. & Ic. 50.
255. *Fuirena ciliaris* (Linn.) Roxb. (*F. glomerata* Lam., F.B.I.)
"Scirpus ciliaris 5 *Fuirena Glomerata* Vahl. *Scirpus ciliaris* Rottb. p. 55 t. 17. f. 1.
a *Scirpo Uncinato vix distincta*"
Probably a duplicate of the specimen quoted under *Scirpus ciliaris* Rottb. Descr. & Ic. 55, and of the type, which is acknowledged as received from Koenig.
256. *Hypolytrum anomalum* (Retz.) Domin (*Hypolytrum latifolium* L. C. Rich., F.B.I.)
"Scirpus anomalus"
Type of *Scirpus anomalus* Retz. Obs. v. 15, but apparently not a Koenig specimen.
257. *Lepironia articulata* (Retz.) Domin (*L. mucronata* L. C. Rich., F.B.I.)
"Restio articulatus. Kön."
The type, described as *Restio articulatus* Retz. Obs. iv. 14.
258. *Diplacrum caricinum* R. Br.
"Carex prostrata. Kön."
N.R.
259. *Scleria lithosperma* (Linn.) Sw.
"Scleria tenuis. Kön."
Type of *Scleria tenuis* Retz. Obs. iv. 13.
260. *Scleria poaeformis* Retz. (*S. oryzoides* Presl, F.B.I.)
Synops. v. p. 254. No. 66.
Ind. Orient. Kön."
The type, described as *Scleria poaeformis* Retz. Obs. iv. 13. Vide K.B. 1931, 265.
- GRAMINEAE.
261. *Digitaria puberula* Link (*Paspalum Royleanum* Nees, F.B.I.)
"Agrostis pilosa N. Kön."
Type of *Agrostis pilosa* Retz. Obs. vi. 22.
262. *Digitaria longiflora* (Retz.) Pers., det. C. E. H. (*Paspalum longiflorum* Retz., F.B.I.)
"Mus. Achar." On front "Coromandelia. P. longiflorum"
The type (?) described as *Paspalum longiflorum* Retz. Obs. iv. 15.
263. *Digitaria longiflora* Pers. det. C. E. H.
"Miliun setaceum. Kön."
N.R.
264. *Eriochloa punctata* (Linn.) Hamilt., det. C. E. H.
"Panicum. Miliun punctatum L. Koen."
N.R.
265. *Eriochloa procera* (Retz.) C. E. Hubbard, det. C. E. H. (*Agrostis procera* Retz. and *E. polystachya* H. B. & K., F.B.I.)
"Agrostis procera. Kön."
The type, described as *Agrostis procera* Retz. Obs. iv. 19. For n. comb. see Kew Bull. 1930, 256.
266. *Isachne australis* R. Br.
"Panicum violaceum Rottleri. Koen."
N.R.
267. *Paspalidium flavidum* (Retz.) Stapf (*Panicum flavidum* Retz., F.B.I.)
"Panicum flavidum N."
The type, described as *Panicum flavidum* Retz. Obs. iv. 15.
268. *Paspalidium flavidum* Stapf.
"Panicum flavidum S. V. Zeyl. Kön."
Possibly the basis of the remarks on *P. brizoides* at the foot of description of the last named.
269. *Paspalidium geminatum* (Forsk.) Stapf, det. C. E. H. (*Panicum paspaloides* Pers., F.B.I.) "Panicum fluitans N. König."
Type of *Panicum fluitans* Retz. Obs. iii. 8.
270. *Eriochloa Crus-galli* (Linn.) Beauv. (*Panicum Crus-galli* Linn., F.B.I.).
"Panicum Crus Corvi. König"
N.R.
271. *Echinochloa Crus-galli* Beauv., the long-awned form.
"Panicum hispidulum N."
Type of *Panicum hispidulum* Retz. Obs. v. 18.
272. *Echinochloa stagnina* (Retz.) Beauv. (*Panicum Crus-galli* Linn., F.B.I.).
"Panicum stagninum N."
The type, described as *Panicum stagninum* Retz. Obs. v. 17.
273. *Echinochloa stagnina* Beauv.
"Panicum Crus Corvi. P. pictum K."
N.R.
274. *Urochloa reptans* (Linn.) Stapf, det. C. E. H. (*Panicum prostratum* Beauv., F.B.I.)
"Panicum umbrosum. Kön."
Type of *Panicum umbrosum* Retz. Obs. iv. 16.
275. *Bracharia remota* (Retz.) Haines, det. C. E. H. (*Panicum remotum* Retz., F.B.I.)
"Panicum remotum. Kön."
The type, described as *Panicum remotum* Retz. Obs. iv. 16.
276. *Sacciolepis indica* (Linn.) Chase, det. C. E. H. (*Panicum indicum* Linn., F.B.I.)
"Panicum indicum. König"
Quoted under *Panicum indicum* in Retz. Obs. iii. 9.
277. *Panicum miliaceum* Linn.
"Panicum miliaceum L. Kön."
Does not appear to have been used in the description of *Panicum miliaceum* in Retz. Obs. i. 11.
278. *Panicum psilopodium* Trin., det. C. E. H.
"Panicum flexuosum var. glabra. Kön."
Quoted under *Panicum flexuosum* in Retz. Obs. iv. 16.
279. *Panicum repens* Linn., det. C. E. H.
"Panicum Ischaemoides Kön."
Type of *Panicum ischaemoides* Retz. Obs. iv. 17.
280. *Panicum antidotale* Retz., det. C. E. H.
"Panicum antidotale. Kön."
The type described in Retz. Obs. iv. 17.

281. *Cyrtococcum radicans* (Retz.) Stapf
"Panicum muricatum. Kön."
Type of *Panicum muricatum* Retz. Obs. iv. 18, which is probably an abnormal form of *P. radicans* Retz. l.c., the type of which is not in the collection.
282. *Cyrtococcum trigonum* (Retz.) A. Camus, det. C. E. H. (*Panicum trigonum* Retz., F.B.I.)
"Panicum trigonum N. König"
The type, described as *Panicum trigonum* Retz. Obs. iii. 9.
283. *Alloteropsis cimicina* (Linn.) Stapf, det. C. E. H. (*Axonopus cimicinus* Beauv., F.B.I.)
"Panicum cimicinum König. Milium cimicinum L."
Quoted under *Panicum cimicinum* in Retz. Obs. iii. 9.
284. *Oplismenus compositus* (Linn.) Beauv.
"Panicum lanceolatum N."
Type of *Panicum lanceolatum* Retz. Obs. v. 17.
285. *Oplismenus Burmannii* (Retz.) Beauv., det. C. E. H.
"Panicum Burmanni N. König"
Type of *Panicum Burmanni* Retz. Obs. iii. 10.
286. *Leersia hexandra* Sw., det. C. E. H.
"Pharus ciliatus N." *Panicula coarctata*, rara, polygama.
Flor. corolla destituti
Calycinae valvulae cymbiformes compressae, ciliatae
Pedunc. simplices
Hab. ad margines stagnorum"
Type of *Pharus ciliatus* Retz. Obs. v. 23.
287. *Trachys muricata* (Linn.) Steud., det. C. E. H. (*Trachys mucronata* Pers., F.B.I.)
"Panicum squarrosus. Kön."
Type of *Panicum squarrosus* Retz. Obs. v. 15.
288. *Zoysia matrella* (Linn.) Merr. (*Zoysia pungens* Willd., F.B.I.)
"Mus. Achar." On front: "India orient. Koenig. M. Maritimum"
N.R.
289. *Dimeria avenacea* (Retz.) C. E. C. Fischer, n. comb. (*D. pusilla* Thw. var. *pallida* Thw., F.B.I.)
"Anthoxanthum avenaceum N. indicum König"
The type, described as *Anthoxanthum avenaceum* Retz. Obs. iii. 8.
290. *Imperata cylindrica* (Linn.) Beauv. var. *Koenigii* Dur. & Schz., det. C. E. H. (*I. arundinacea* Cyr., F.B.I.)
"Saccharum Koenigii N." and on front "Hb. Retz."
Quoted under *Saccharum Koenigii* Retz. Obs. v. 16.
291. *Saccharum arundinaceum* Retz., det. C. E. H.
"Saccharum arundinaceum N. Arundo indica König
folia fasciculata. Pee Carumbo"
The type, described in Retz. Obs. iv. 16.
292. *Saccharum bengalense* Retz. (*S. arundinaceum* Retz. in part, F.B.I.)
"Arundo bengalensis N. Kön."
The type, described in Retz. Obs. v. 16.
293. *Pollinidium binatum* (Retz.) C. E. Hubbard, n. comb., det. C. E. H. (*Ischaemum angustifolium* Hack., F.B.I.)
"Andropogon binatum N. Agrostis villosa Kön."
and at foot in front "Hb. Retz."
The type, described as *Andropogon binatum* Retz. Obs. v. 21.
294. *Ischaemum muticum* Linn.
"Ischaemum muticum. Koen."
A poor specimen, not specifically mentioned and doubtfully used for the description in Retz. Obs. vi. 34.
295. *Apluda mutica* Linn.
"Andropogon glaucum N." *Anthistiria glauca*. *Triandra digyna*"
and at foot in front "Hb. Retz."
Type of *Andropogon glaucum* Retz. Obs. vi. 34.
296. *Manisuris Myurus* Linn. (*Rottboellia Myurus* Benth., F.B.I.)
"Manisuris myurus. Kön."
N.R.
297. *Ophiurus exaltatus* (Linn.) O. Ktze., det. C. E. H. (*Ophiurus corymbosus* Gaertn. f., F.B.I.)
"Rottboellia punctata N. exaltata König"
Type of *Rottboellia punctata* Retz. Obs. iii. 12.
298. *Mnesithea laevis* (Retz.) Kunth, det. C. E. H. (*Rottboellia perforata* Roxb., F.B.I.)
"Rottboellia laevis"
The type, described as *Rottboellia laevis* Retz. Obs. iii. 11.
299. *Vetiveria zizanioides* (Linn.) Nash, det. C. E. H. (*Andropogon squarrosus* Linn. f., F.B.I.)
"Andropogon muricatum N. Tamulis Woetiwar. Radices ab indigenis usitatissimae ob odorem gratum dum eum aliquantulo aquae fort. irroretur. Ex his flabella praeprimis* parantur & cum pennis Pavonum ad marginem ornantur König"
Type of *Andropogon muricatum* Retz. Obs. iii. 43. *In the text in Retz. Obs. this word appears as "praecipue."
300. *Vetiveria zizanioides* Nash, det. C. E. H.
"Andropogon muricatum N. squarrosus L. König"
Probably a duplicate of the type of *Andropogon squarrosus* Linn. f. Suppl. 4. 33 which was supplied by Koenig.
301. *Dichanthium caricosum* (Linn.) Camus, det. C. E. H. (*Andropogon caricosus* Linn., F.B.I.)
"Andropogon serratum N. Holcus setaceus Kön."
Type of *Andropogon serratum* Retz. Obs. v. 21.
302. *Aristida setacea* Retz., det. C. E. H.
"Aristida arundinacea. Kön."
The type, described in Retz. Obs. iv. 22.
303. *Aristida hystrix* Linn. f., det. C. E. H.
"Aristida squarrosa K. Hystrix L."
Probably a duplicate of the specimen described in Linn. f. Suppl. 113, Koenig being acknowledged as the finder.
304. *Sporobolus diander* (Retz.) Beauv., det. C. E. H.
"Cinna diandra N."
The type, described as *Agrostis diandra* Retz. v. 19.
305. *Sporobolus tremulus* (Willd.) Kunth, det. C. E. H.
"Agrostis Matrella. Kön."
N.R.
306. *Sporobolus coromandelianus* (Retz.) Kunth, det. C. E. H.
"Agrostis coromandeliana. Kön."
The type, described as *Agrostis coromandeliana* Retz. Obs. iv. 19.
307. *Cynodon dactylon* (Linn.) Pers., det. C. E. H.
"Agrostis linearis. Panicum Dactylon L. ex sententia Lambert Transact. Linn. v. 7. p. 309. Kön."
Type of *Agrostis linearis* Retz. Obs. iv. 19.
308. *Cynodon dactylon* Pers., det. C. E. H.
"Panicum lineare. Koenig"
Quoted under *Panicum lineare* Retz. Obs. iii. 10.
309. *Eleusine indica* (Linn.) Gaertn., det. C. E. H.
"Cynosurus indicus. Kön."
N.R.

310. *Eleusine indica* Gaertn., det. C. E. H.
"Panicum. Kön."
N.R.
311. *Eleusine coracana* (Linn.) Gaertn., det. C. E. H.
"Cynosurus coracanus. Kön."
N.R.
312. *Leptochloa filiformis* (Pers.) Roem. & Sch.
"Poa chinensis. K."
N.R. under *Poa chinensis* Retz. Obs. iii. 11 & v. 19.
313. *Leptochloa chinensis* (Linn.) Nees
"Poa malabarica. Kön."
Type of *Poa malabarica* Retz. Obs. v. 19, non Linn.
314. *Arundo Donax* Linn., det. C. E. H.
"Arundo bifaria. Kön."
Type of *Arundo bifaria* Retz. Obs. iv. 21.
315. *Phragmites karka* (Retz.) Trin., det. C. E. H.
"Arundo karka König Panic. secunda nutans"
The type, described as *Arundo karka* Retz. Obs. iv. 21.
316. *Eragrostis ciliaris* (Sw.) Link
"Poa amboinica. Kön."
Quoted under *Poa amboinica* L. in Retz. Obs. iv. 20.
317. *Eragrostis tenella* (Linn.) R. & S., det. C. E. H.
"Poa ciliaris. Kön."
N.R.
318. *Eragrostis tenella* R. & S., det. C. E. H.
"Poa plumosa. Kön."
Type of *Poa plumosa* Retz. Obs. iv. 20.
319. *Eragrostis viscosa* (Retz.) Trin., det. C. E. H. (*E. tenella* R. & S.
var. *viscosa* Stapf, F.B.I.)
"Poa viscosa. Kön."
The type, described as *Poa viscosa* Retz. Obs. iv. 20.
320. *Eragrostis japonica* (Thunb.) Trin., det. C. E. H. (*Eragrostis interrupta*
Beauv., F.B.I.)
"Poa biflora N."
Type of *Poa biflora* Retz. Obs. v. 19.
321. *Eragrostis unioloides* (Retz.) Nees, det. C. E. H. (*E. amabilis* W.
& A., F.B.I.)
"Poa unioloides N."
The type, described as *Poa unioloides* Retz. Obs. v. 19.
322. *Eragrostis nutans* (Retz.) Nees, det. C. E. H. (*E. stenophylla* Hochst.,
F.B.I.)
"Poa nutans. Kön."
The type, described as *Poa nutans* Retz. Obs. iv. 19.
323. *Eragrostis cilianensis* (All.) Link (*E. major* Host., F.B.I.)
"Poa amabilis König. Similis Eragrostidi sed axillae pedunculorum
nigro notatae"
N.R.
324. *Eragrostis minor* Host
"Poa Eragrostis Kön."
N.R.
325. *Eragrostis pilosa* (Linn.) Beauv., det. C. E. H.
"Poa amabilis Kön."
N.R.
326. *Desmostachya bipinnata* (Linn.) Stapf, det. C. E. H. (*Eragrostis*
cynosuroides Beauv., F.B.I.)
"Poa cynosuroides. Kön."
Type of *Poa cynosuroides* Retz. Obs. iv. 20.
327. *Diplachne fusca* (Linn.) Beauv., det. C. E. H.
"Festuca indica. Kön."
Type of *Festuca indica* Retz. Obs. iv. 21.

328. *Diplachne fusca* Beauv., det. C. E. H.
"Poa contracta N. König."
Type of *Poa contracta* Retz. Obs. iii. 11.
329. ?
"Panicum dimidiatum Retz. Obs. 6. pag. 23, et Willd. Sp. Pl. 1. p. 339.
19. Linn. System. verum.
Patria: India."
There is nothing to connect this sheet with Koenig. I have not been
able to determine it. It appears to be abnormal, the inflorescence is
defective. It is not *Panicum dimidiatum* as described in Retz. Obs. vi.
23.
- PTERIDOPHYTA.
330. *Dryopteris* cf. *papilio* (Hope) C. Chr.
"Polypodium. Kön."
N.R.
331. *Dryopteris prolifera* (Retz.) C. Chr.
On attached label "Polypodium proliferum Kön."
The type, described as *Hemionitis prolifera* Retz. Obs. vi. 38.
332. *Aspidium pteroides* (Retz.) Ballard n. comb.
"Polypodium marginale. Kön."
The type, described as *Polypodium pteroides* Retz. Obs. vi. 39.
Retz. type of his *Polypodium pteroides* is evidently an *Aspidium*,
section *Pleocnemia*, and the name *Aspidium pteroides* (Retz.) Ballard
is therefore proposed for it. The *Dryopteris* generally known as
"*Dryopteris pteroides* (Retz.) O. Ktze." thus requires a new name, and
Swartz's epithet *obtusata* must be adopted. The species therefore
becomes *Dryopteris obtusata* (Sw., *Aspidium*) Ballard, n. comb.—F.B.
333. *Quercifilix zeylanicus* (Houtt.) Copeland
"Onoclea quercifolia Willd. Acrostichum quercifolium Willd.
Osmunda trifida Jacq. Coll. 3. p. 281. t. 20.
f. 3. Kön."
Specimen quoted under *Acrostichum quercifolium* Retz. Obs. vi. 39.
334. *Diplazium esculentum* (Retz.) Sw.
"Asplenium esculentum. Hemionitis Kön."
The type, described as *Hemionitis esculenta* Retz. Obs. vi. 38.
335. *Asplenium adiantoides* (Linn.) C. Chr.
"Asplenium falcatum N. Trichomanes adianth. L. Kön."
Type of *Asplenium falcatum* Retz. Obs. vi. 37, non Lam.
336. *Asplenium nidus* Linn.
"Asplenium nidus. Kön."
N.R.
337. *Cheilanthes tenuifolia* (Burm.) Sw.
"Cheilanthes microphylla? Acrostichum tenue Kön.
Rumph. T. vi. p. 77. t. 34. f. 2. Dryopteris
campestris
Hab. in nemorosis Siam. Midnapour,
Tschandrancona ad sepulcra sinensium
Malaccas."
Type of *Acrostichum tenue* Retz. Obs. vi. 39.
338. *Adiantum caudatum* Linn.
"Adiantum caudatum W. Kön."
N.R.
339. *Pteris quadriaurita* Retz.
"Pteris quadriaurita. Kön."
The type of the species, described in Retz. Obs. vi. 38.
340. *Pteris vittata* Linn.
"Pteris vittata. Kön."
N.R.
341. *Ophioglossum parvifolium* Hook. & Grev.
"Ophioglossum (indicum) nudicaule. Kön."
N.R.

342. *Ophioglossum pendulum* Linn.
"Ophioglossum pendulum. Koen."
N.R.
343. *Azolla pinnata* R. Br.
"Azolla. Lemna deltoidea Koen."
N.R.
344. *Marsilea minuta* Linn.
"Marsilea minuta. Kön."
N.R.
345. *Selaginella ciliaris* (Retz.) Spring
"Lycopodium ciliare. Kön."
The type, described as *Lycopodium ciliare* Retz. Obs. v. 32.
346. *Isoetes coromandeliana* Linn. f.
"Isoetes coromandeliana L., indica Kön.
Folia stricta, erecta, basi subvaginantia,
triquetra, laevia.
Hab. in humidiusculis solo arenoso."
- N.R. Probably a duplicate of the type which Linn. f. received from Koenig.

SPECIES MENTIONED IN RETZ. OBS. BUT NOT FOUND IN COLLECTION.

Name and page in Retz. Obs.		Probable correct name.
1 Menispermum Cocculus	vi. 34	Anamirta Cocculus W. & A.
2 Capparis horrida	v. 4	Capparis horrida Linn. f.
3 Mangifera pinnata	v. 4	Spondias Mangifera Willd.
4 Aeschynomene cannabina	v. 26	Sesbania aculeata Pers. var. cannabina Bak.
5 Zinnia bidens	v. 28	Glossogyne pinnatifida DC.
6 Diospyros Ebenaster	v. 31	Diospyros glaberrima Linn. f.
7 Diospyros Ebenum	v. 31	Diospyros Ebenum Linn. f.
8 Myrtus laurinus	iv. 26	Symplocos spicata Roxb.
9 Vinca parviflora	ii. 14	Vinca pusilla Murr.
10 Cynanchum cordifolia	ii. 15	Daemia extensa R. Br.
11 Periploca emetica	ii. 14	Secamone emetica R. Br.
12 Strychnos colubrina	ii. 12	Strychnos colubrina Linn.
13 Justicia parviflora	v. 9	Rungia parviflora Nees
14 Achyranthes echinata	ii. 12	Pupalia lappacea Miq.
15 Celosia polygonoides	ii. 12	Celosia polygonoides Retz.
16 Celosia margaritacea	ii. 27	Celosia cristata Linn.
17 Celosia comosa	vi. 26	Celosia argentea Linn.
18 Celosia baccata	v. 23	Deeringia celosioides R. Br.
19 Celosia Monsonia	ii. 13	Aerva Monsonia Mart.
20 Nepenthes distillatoria	v. 7	Nepenthes distillatoria Linn.
21 Cyperus Luzulae	iv. 11	Cyperus sp.
22 Scirpus pilosus	vi. 19	Fuirena glomerata Lam.
23 Scirpus caribaeus	iv. 12	?
24 Aegilops muricata	ii. 27	Eremochloa muricata Hack.
25 Aristida depressa	iv. 22	Aristida adscensionis Linn.
26 Arundo bengalensis	v. 20	Arundo Donax Linn.
27 Andropogon incurvatum	v. 21	Dichanthium caricosum Stapf vel Lophopogon sp.
28 Milium ramosum	vi. 22	Eriochloa procera C. E. Hubbard.
29 Panicum setigerum	iv. 15	Urochloa setigera Stapf.
30 Bambos arundinacea	v. 30	Bambusa arundinacea Willd.
31 Embelia Burmanni	iv. 23	?
32 Clavaria bifida	v. 32	?
33 Fucus zeylanicus	vi. 40	?

VIII.—NEW SPECIES OF NOTOTRICHE FROM BOLIVIA. ARTHUR W. HILL.

Dr. Erik Asplund, during his expedition to the Andes of Bolivia ten years ago, made a very interesting collection of several species of *Nototriche*, which he has kindly sent to me for determination. Four of them prove to be undescribed species and the descriptions are appended; there are also two well-marked varietal forms of species I have previously described* which appear worthy of being given a varietal name.

Careful examination of Dr. Asplund's specimens has revealed the fact that at the base of the calyx there are always five nectaries, composed of short papillae forming circular patches round about the vascular bundles running to the apex of each of the calyx lobes. These nectaries had previously been noticed and figured only in *N. obtusa* and *N. congesta* (2), but probably they are to be found in almost all the species.

The play on leaf form exhibited by this genus, as mentioned in the paper presented to the Linnean Society, is very remarkable. Among the species collected by Dr. Asplund two with much dissected leaves are worthy of notice. In both, the laminae of the small leaves, often not more than 6 mm. broad, are divided up into 9 to 11 lobes and these each bear 1 to 3 pairs of lobuli.

In some of the species, such as *N. ulophylla*, *N. obcuneata* and *N. pulvilla* (see figs. in Trans. Linn. Soc. vii.), the lateral lobuli are short and are bent over at right-angles to the main lobe on which they are borne, while in others, such as *N. turritella* and *N. pedatiloba*, the lobuli are as long as the lobes and, like them, are vertical and finger-like, and are closely webbed together by the stellate hairs, which may cover both their upper and lower surfaces. In several species, especially in the four new species described below, the lobes and lobuli are somewhat fleshy and the lobuli are erect and arranged like fingers closely pressed together, while in other species, such as *N. parviflora* and *N. dissecta*, the lobes and lobuli are herbaceous, thin and more elongated. The carpels are evidently of considerable value for distinguishing between the closely-allied species, since the length of the beak and the nature of the hairs afford useful diagnostic characters. It is unfortunate that in several cases no mature fruits have been collected. The character of the indumentum on the lamina and elsewhere is important and very

* (1) Note on the genus *Nototriche* Turcz., with an amended diagnosis and descriptions of new species. A. W. Hill in Engl. Bot. Jahrb., xxxvii, Heft. 4, 1906, pp. 575-587.

(2) A revision of the genus *Nototriche* Turcz. A. W. Hill in Trans. Linn. Soc. London, Ser. ii., vii, part 12, July 1909, pp. 201-266, with plates 27-30.

(3) *Nototriche holoserica* A. W. Hill in Kew Bull. 1927, p. 248.

(4) New species of *Nototriche* from Chile with notes on *Malvastrum*. A. W. Hill in Kew Bull. 1928, pp. 17-21, with text figs.

See also *Malvaceae* by E. Ulbrich in Beit. zur Flora von Bolivia in Engl. Bot. Jahrb. Sonderabdruck aus Band 49 Heft. 1. (1912) p. 208.

difficult to describe. In all cases the hairs are stellate; sometimes the arms of the hairs are long and silky, while in other cases they are so short that the tomentum resembles a fine plush-like felt. The type of hair is characteristic for each species and under a high magnification it would no doubt be possible to draw up a series of different forms characteristic for the respective species to which they belong.

A list of the other species of *Nototriche* collected by Dr. Asplund is appended at the end of this account.

Nototriche leucosphaera A. W. Hill; species *N. Azorella* A. W. Hill, *N. congestae* A. W. Hill et *N. turritella* A. W. Hill affinis, ab illis staminum columna quam corolla brevior, ab hac pulvillis minoribus, foliorum lobulis paucioribus praecipue differt.

Fruticulus caespitosus; pulvilli ramosi, dense albo-tomentosi, 4-6 cm. diametro; caudex subterraneus, lignosus, ramosus. *Folia* arcte aggregata; petiolus 4.5-6 mm. longus; stipulae petiolo adnatae et cum eo quasi vaginam membranaceam circiter 2 mm. latam formantes, parte libera membranacea lanceolata subacuta 2 mm. longa uti vagina utrinque glabra marginibus stellato-hirsuta; lamina ambitu semicircularis, 2.5 mm. longa, 4.5-5 mm. lata, circiter 7-fida, supra dense albo-stellato-pubescent, infra sparse pubescens, lobis 1.75 mm. longis iterum lobulatis, lobulis obovatis obtusis, cunctis 17-21 sursum spectantibus ut digitis compressis fasciatim dispositis. *Flores* prope medium petiolum siti. *Calyx* campanulatus, 4-4.5 mm. longus; tubus extra paullum hirsutus, intus glaber, basi nectariis 5 papillosis instructus; lobi 2 mm. longi, dense stellato-pubescentes. *Corolla* albo-violacea, 8-9 mm. longa; petala obovata, basi in tubum 2 mm. longum coalita. *Stamina* in caput compactum aggregata, quam petala breviora. *Carpella* immatura 1-1.5 mm. longa, minute birostrata, dense hirsuta.

BOLIVIA. Dep. La Paz: Prov. Pacajes; station General Campero, 4000 m., *E. Asplund* 2782 (type), 2783 (5.iii.1921).

Nototriche coactilis A. W. Hill; species *N. Orbignyanae* A. W. Hill affinis, sed lobis et lobulis laminae brevioribus arcte aggregatis haud laciniatis, calycis segmentis brevioribus, corolla minore differt.

Fruticulus caespitosus, pulvinatus; pulvini circiter 6 cm. diametro; caudex subterraneus, crassus, lignosus. *Folia* dense congesta, cinerea; petiolus 2 cm. longus; stipulae petiolo ultra medium adnatae et cum eo quasi vaginam 3 mm. latam carnosulam formantes, utrinque et marginibus pilis longe stellatis instructae, parte libera lineari-obtusa 8 mm. longa, facie in apice et dorso longe hirsuta; lamina ambitu subrotunda, 7-8 mm. longa, 1-1.5 cm. lata, utrinque dense stellato-tomentosa, circiter 9-fida, lobis obovatis obtusis 5.5 mm. longis, singulis 3-5-lobulatis, lobulis obovatis erectis conjuncte compressis quam lobis brevioribus. *Flores* prope apicem vaginae siti. *Calyx* supra medium 5-lobus, 7-9 mm. longus, extra ubique stellato-tomentosus, intus basi nectariis 5 papillosis

instructus; lobi 3-4 mm. longi, triangulari-subacuti. *Corolla* 7.5-9 mm. longa; petala obovata, retusa, basi in tubum 2.5 mm. longum coalita. *Carpella* (fere matura) 4-4.5 mm. longa, birostrata, rostris 1.5 mm. longis, dorso stellato-pilosa.

BOLIVIA. Dep. Oruro: Prov. Abaroa; Challapata, 4700 m., *E. Asplund* 3347 (1.iv.1921).

Nototriche nivea A. W. Hill; species *N. pedatilobae* A. W. Hill affinis, sed vagina angustiore, lamina et calyce ubique pubescentibus praecipue differt.

Fruticulus caespitosus; pulvilli incani; caudex lignosus. *Folia* arcte aggregata, incano-niveo-pubescentia; petiolus 8-9 mm. longus; supra vaginam ubique pubescens; stipulae glabrae, petiolo ultra medium adnatae, et cum eo quasi vaginam membranaceam 3 mm. latam formantes, parte libera membranacea oblonga obtusa vel truncata 5 mm. longa 2 mm. lata, vagina et stipulis dorso et marginibus pilis stellatis minutis dense instructis, vagina supra prope basin leviter pubescente; lamina ambitu semicircularis, flabellatim 9-10-fida, 3-4 mm. longa, 7-8 mm. lata, ubique dense incano-stellato-pubescent, segmentis 2.5 mm. longis, lobis et lobulis obovatis obtusis in fasciculos compressis digitiformibus sursum porrectis ope pilorum colligatis. *Flores* petiolo prope basin insidentes. *Calyx* campanulatus, 9 mm. longus, extra ubique incano-pubescent, intus basi nectariis 5 papillosis instructus; lobi triangulari-subacuti, 2.5 mm. longi. *Corolla* albo-violacea, 1.3-1.4 cm. longa; petala obovata, emarginata, basi in tubum 5 mm. longum coalita. *Carpella* 4.5 mm. longa, birostrata, dorso longe stellato-tomentosa, rostris 1.75 mm. longis.

BOLIVIA. Dep. Oruro: Prov. Carangas; Sajama, 4500 m., *E. Asplund* 3965 (11.v.1921).

Nototriche violacea A. W. Hill; species *N. sajimensi* A. W. Hill affinis, sed foliis dorso hirsutis, lobulis subcarnosulis aequilongis, calyce brevior, petalis obovatis obtusis praecipue differt.

Fruticulus caespitosus, pulvinatus; pulvini 2-3 cm. diametro, incani; caudex subterraneus, lignosus, ramosus. *Folia* congesta, apice ramorum rosulata; petiolus circiter 9 mm. longus; stipulae ultra medium petiolum adnatae et cum eo quasi vaginam membranaceam 7 mm. longam 3 mm. latam formantes, parte libera membranacea lineari-lanceolata acuta 4.5 mm. longa, 1.25 mm. lata uti vagina utrinque glabra, marginibus pilis paucis longe stellatis instructis; lamina ambitu semicircularis, 4 mm. longa, 6 mm. lata, 9-lobata, utrinque pilis longe stellatis instructa apicibus loborum et lobulorum glabris exceptis; lobi et lobuli digitiformes, anguste obovati, obtusi, subcarnosuli; lobi singuli lobulis 2 lobos aequantibus circiter 2.5 mm. longis instructi, ope pilorum intertextorum colligati. *Flores* prope apicem vaginae siti. *Calyx* 6 mm. longus; tubus glaber, basi nectariis 5 instructus; lobi 3 mm. longi, triangulari-acuti, extra et marginibus pilis longe stellatis instructi. *Corolla*

violacea, 1.1 cm. longa; petala late obovata, basi in tubum 2.5 mm. longum coalita. *Carpella* (immatura) 1.5 mm. longa, vix rostrata, dorso pilis sericeis 2 mm. longis instructa.

BOLIVIA. Dep. La Paz: Prov. Ingavi, Guaqui, hills south of the railway, 4400 m., *E. Asplund* 2373 (4.ii.1921).

Nototriche obcuneata A. W. Hill, var. **cinerea** A. W. Hill, var. nov.; a typo differt pilis stellatis aliquanto majoribus, etiam in pagina inferiore foliorum praesentibus, corolla minore (circiter 1.6 cm. tantum longa). Tota planta ob tomentum densum pilorum longe stellatorum cinerea.

BOLIVIA. Dept. Oruro: Prov. Carangas; Sajama, 4800 m., *E. Asplund* 3898, type (10.v.1921). Dep. La Paz: Prov. Ingavi; Miriquiri, 4820 m., *E. Asplund* 2868 (10.iii.1921).

Nototriche anthemidifolia A. W. Hill, var. **sericea** A. W. Hill, var. nov.; foliorum tomento subtiliore, lamina aliquanto brevior et latiore, subtus tomento griseo et pilis longis sericeis induta, segmentis angustioribus brevioribus a typo praecipue differt. Ut in typo, nectaria 5 basi calycis adsunt.

BOLIVIA. Dep. Oruro: Prov. Carangas; Sajama, 4500 m., *E. Asplund* 3881 (10.v.1921).

OTHER SPECIES OF NOTOTRICHE FROM BOLIVIA COLLECTED BY DR. ASPLUND.

The specimens are preserved at Uppsala and Stockholm, and in nearly every case duplicates have been very kindly presented to Kew.

Nototriche acuminata A. W. Hill. Dep. La Paz: Prov. Pacajes; near Corocoro, 4300 m., No. 3992; 4400 m., No. 4463.

N. anthemidifolia A. W. Hill. Prov. Pacajes; Charaña, 4050 m., No. 2662; Dep. Oruro: Prov. Abaroa; Challapata, 4500 m., No. 3315.

N. argyllioides A. W. Hill. Prov. Pacajes; Charaña, 4050 m. No. 2694.

N. flabellata A. W. Hill. Dep. La Paz: Prov. Murillo; Incachaca, 4500 m., No. 3426.

N. longirostris A. W. Hill. Incachaca, 4200 m., No. 1891.

N. obcuneata A. W. Hill. Prov. Murillo; Pampa Tholoco, 4500 m., No. 1976; La Cumbre, 4700 m., No. 3848.

N. aff. obcuneata A. W. Hill. Prov. Abaroa; Challapata, 4700 m., No. 3333.

N. pedicularifolia A. W. Hill. Dep. Oruro: Prov. Carangas; Sagama, 4200 m., No. 3989.

N. purpurascens A. W. Hill. Prov. Murillo; Pampa Tholoco, 4500 m., No. 1942; Prov. Pacajes; near Corocoro, 4500 m., No. 2471.

N. sajamensis A. W. Hill. Prov. Carangas; Sajama, 4500 m., No. 4462.

IX.—CONTRIBUTIONS TO THE FLORA OF TROPICAL AMERICA: X.* T. A. SPRAGUE AND N. Y. SANDWITH.

NEW AND NOTEWORTHY BIGNONIACEAE FROM BRITISH GUIANA, MAINLY COLLECTED BY THE OXFORD UNIVERSITY EXPEDITION, 1929.

The identification of Bignoniaceae from tropical America is attended with unusual difficulties. Without a special knowledge of the group, the most experienced taxonomist will often fail to name correctly even the genus to which a particular plant belongs, unless both flowers and fruit are represented in the material. The latest complete account of the family is that given by A. P. De Candolle in 1845 (DC. Prodr. ix. 142-248), which naturally is now quite out of date. One species, now known as *Paragonia pyramidata* (Rich.) Bur., actually appeared in the Prodr. as seven separate species, assigned to three different genera. Altogether, *P. pyramidata* now has fourteen synonyms, and has been referred to seven separate genera (vide Hook. Ic. Pl. t. 2771).

In 1863, Seemann (Journ. Bot. 1863, i. 18, 87, 225, 257) undertook a revision of the Bignoniaceae, but never completed it, probably owing to the appearance of another work on the same subject. This was Bureau's Monographie des Bignoniacées (1864), of which only the general part and the Atlas appeared. Bureau, who evidently had a very extensive knowledge of the group, subsequently published revisions of the genera *Tynnanthus* and *Lundia*, a paper on the value of anatomical characters in the family, and an account of the Bignoniaceae of central Brazil, but he unfortunately never gave any revision of the family as a whole.

Bentham (Benth. et Hook. f. Gen. Pl. ii. 1027: 1876) recognised 53 genera of Bignoniaceae. Most of these are well defined, but under the name *Bignonia* he included a large number of genera all belonging to the tribe Bignonieae, but otherwise of the most diverse affinities. His genus *Tecoma* also included numerous genera now recognised as distinct. This defect was remedied by Baillon (Hist. Pl. x. 1-58: 1891), who gave a valuable general account of the family with technical descriptions of 97 genera. This furnished the basis for K. Schumann's systematic arrangement of the genera, which is much easier to use, being accompanied by an analytical key. Schumann recognised 100 genera, only three more than Baillon (Engl. & Prantl, Nat. Pflanzenfam. iv. 3b, 213-250: 1894).

The account of the Bignoniaceae given by Schumann in Martius, Flora Brasiliensis, vol. viii. pars 2 (1896-97) is the most comprehensive modern revision of the American species. It is mainly confined, however, to those of Brazil and Guiana, and its value is greatly impaired by the fact that type-specimens in the Paris Herbarium and that of De Candolle were not seen by Schumann. Apart from these limitations it is a valuable piece of pioneer work,

*Continued from K.B. 1932, p. 28.

and is indispensable to the student of tropical American Bignoniaceae. The treatment of the Guiana species is not altogether satisfactory, many of them having been described from inadequate material, and some having been assigned to the wrong genera, with the result that they could not be identified without examination of the type material. Thus *Tanaecium ovatum* Bur. et K. Schum. and *Memora consanguinea* Bur. et K. Schum., both described in Flora Brasiliensis, now prove to be one and the same species of *Memora*. The assignment of species to *Pithecoctenium* and "*Distictis*" (*Distictella*) is unsatisfactory, owing to neglect of anatomical characters actually given in the introduction. All these circumstances combine to make the description of new American species of Bignoniaceae a venturesome proceeding. We may mention that, as the result of examination of types in various Herbaria, only one out of four supposed new species survives in the present paper.

Two new genera, *Pseudopaegma* and *Roentgenia*, proposed by Urban (Ber. Deutsch. Bot. Ges. xxxiv. 739, 747: 1916), are here accepted, and *Pachyptera* DC. is restored to generic rank. *Anemopaegma microcalyx* may eventually have to be removed from *Anemopaegma*, which at present includes several rather different morphological types.

Many of the difficulties connected with the classification of the British Guiana Bignoniaceae are dealt with below, and it should soon be possible to supply a complete descriptive account of the species hitherto recorded from the Colony.

The preparation of the present paper has been rendered possible only by the generous loan of type material from the Herbaria at Berlin, Brussels and Göttingen.

Arrabidaea candicans (Rich.) DC. in DC. Prodr. ix. 185 (1845).—*Bignonia candicans* Rich. in Act. Soc. Hist. Nat. Paris, 1792, 110.

Essequibo River: Moraballi Creek, fl. Sept., *Sandwith* 325. Bush-rope in wallaba forest, to which it appeared to be confined; leaflets white beneath; corolla reddish-mauve.

Distr. Northern South America.

Adenocalymma inundatum Mart. ex DC. in DC. Prodr. ix. 201 (1845), var. **surinamense** Bur. et K. Schum. in Mart. Fl. Bras. viii. pars 2, 94 (1896).

Essequibo River; Moraballi Creek, fl. Nov., *Sandwith* 607. A bush-rope in mixed forest, with bright yellow flowers. Other collections from the Colony are *Jenman* 1154 and 5284 (Essequibo River), *Jenman* 691 (Mazaruni River), *Jenman* 3966 (Canje River), *Jenman* 75 (Corentyne River) and *im Thurn* (Cabalebo River).

The following specimens have been seen from Surinam: Marawyne, *Wullschlaegel* 11 (typus in Herb. Brux.); Para, *Wullschlaegel* 1513 (Herb. Brux.); banks of the Surinam River, *Kegel* 1195 (Herb. Goetting.); banks of River Cassepoerekreek, *Kegel* 1167 (Herb. Goetting.).

Martius' type specimen of the species has not been seen. He described the corolla as glabrous, and Bureau and K. Schumann wrote "corolla extus glabra"; but the flowers of the Guiana variety have a very distinct indumentum on the outer surface.

Pachyptera foveolata DC. in DC. Prodr. ix. 175 (1845); Bur. Monogr. Bignon., Atlas, 6, t. 4 (1864), forma calyce brevior, ore recto truncato vel subtruncato, ovulis paucioribus recedens. Descriptio ex speciminibus in Guiana Britannica lectis confecta.

Frutex scandens; ramuli annotini subteretes, circiter 4 mm. diametro, conspicue costati, glabrati, sub nodis glandulis numerosis patelliformibus in foveolis suberoso-marginatis insigniter immersis ornati, hornotini compressi, 2.5–3.5 mm. lati, faciebus medio excavatis, puberuli. *Folia* 3-foliolata; petiolus 3.5–5 cm. longus, indumento ramulorum, supra applanatus vel late excavatus, apice in facie superiore sub junctione petiolulorum glandulis numerosis immersis eis ramulorum similibus ornatus; petioluli indumento simili, terminalis 2.6–4.2 cm. longus, laterales 1.2–1.5 cm. longi; foliola subaequalia, ovata, apice longe acutissime acuminata, basi leviter cordata, 14–18 cm. longa, 7–9.5 cm. lata, chartacea, supra subopaca, costa minutissime puberula excepta glabra, subtilissime sed haud conspicue reticulata, subtus costa nervisque lateralibus similiter indutis exceptis glabra sed glandulis patelliformibus hic illic praecipue in areis inter nervos laterales conspersa, necnon satis copiose minute impresso-punctata, similiter vel paullo laxius reticulata; nervi laterales utrinque 8–10, patulo-ascendentes, satis longe a margine anastomosantes. *Inflorescentiae* ramulos axillares annotinos 2–4 cm. longos defoliatos vel ramulos hornotinos foliatis terminantes, simpliciter racemosae, pauciflorae, dense puberulae; rhachis 0.6–1 cm. longa, consociibus glandularum notata; bractae basales 5 mm. longae, apice trifidae, ceterae subulato-lanceolatae, ad 1.5 mm. longae; pedicelli 5–8 mm. longi, bracteolis minutis. *Calyx* anguste campanulatus, 7.5 mm. longus, ore truncato minute denticulato 5–6 mm. diametro, extra minutissime puberulus et juxta medium glandulis longitudinaliter seriatis patelliformibus immersis ornatus. *Corolla* lactea, anguste infundibularis, 6.5 cm. longa, tubo usque circiter 2.5 cm. supra basin cylindrico, deinde ampliato et sub lobis (applanato) ad 1.2 cm. lato, extra basi excepta minute puberulo, limbo 2.7 cm. lato; lobi obovato-oblongi, apice plus minusve rotundati usque truncato-emarginati, 8–10 mm. longi, 8–9 mm. lati, utrinque papilloso-puberuli, extra etiam inferne serie singula utroque latere venae mediae glandularum patelliformium notati. *Stamina* circiter 3 cm. supra basin corollae tubi inserta, anteriora (longiora) 2 cm., lateralia (breviora) 1.5 cm. longa; filamentorum partes corollae tubo adnatae infra insertionem circiter per 1.3 cm. pilis albis nigro-capitatis dense villosae, praecipue inferne; antherarum thecae sursum semicirculariter inflexae semicirculo 2 mm. diametro, densissime longe albo-villosae. *Staminodium* haud visum sed ut videtur 2 mm. infra insertionem staminum insertum.

Discus pulvinaris, 1.5 mm. altus. *Ovarium* compressum, valde 4-costatum costis medianis et lateralibus, ambitu elliptico-oblongum, 3 mm. longum, dense acute ferrugineo-papillatum; stylus circiter 4.3 cm. longus. *Ovula* 13 pro loculo, 2-seriata seriebus singulis 6-7-ovulatis.—*Adenocalymma foveolatum* K. Schum. in Engl. & Prantl, Pflanzenfam. iv. 3b, 214 (1894); Bur. et K. Schum. in Mart. Fl. Bras. viii. pars 2, 109 (1896); Urb. in Ber. Deutsch. Bot. Ges. xxxiv. 738 (1916); Standley in Contrib. U.S. Nat. Herb. xxvii. 340 (1928). *Bignonia cherere* Aubl. Hist. Pl. Guiane, t. 260?, non descr. *Adenocalymma stridula* Miers in Ann. & Mag. Nat. Hist. ser. 3, vii. 392 (1861), *quoad specimen* in Mus. Brit. *A. brachybotrys* DC. in DC. Prodr. ix. 202 (1845).

BRITISH GUIANA. Essequibo River, Moraballi Creek, fl. Nov., *Sandwith* 617. Climber among low trees on creek bank. Corolla milk-white. Anthers whitish-woolly.

An extremely interesting species morphologically, characterised by groups of sunk plate-shaped glands not only on the flattened sides of the nodes, where similar groups of glands frequently occur in species of *Adenocalymma*, *Saldanhaea* and *Cuspidaria*, but also on the upper surface of the petiole at its apex, as was noted by De Candolle (l.c.), and on the exterior of the corolla-lobes. *P. foveolata* differs from all known species of *Adenocalymma* in having densely villous anthers, a character shared with all the species of *Lundia*, and shown to a lesser extent by *Cuspidaria pterocarpa* (Cham.) DC.

The genus *Pachyptera* DC. in DC. Prodr. ix. 175 (1845) was based on two new species, *P. puberula* DC. (*Bignonia pachyptera* DC. in Ann. Sc. Nat. sér. 2, xi. 286: 1839, nomen) and *P. foveolata* DC.; the generic characters were mainly derived from the capsule and seeds, which were unknown in the remaining four species assigned to *Pachyptera* by De Candolle. The "historic" type of *Pachyptera* is *P. puberula*, which was mentioned without description by De Candolle in 1839 under the name *Bignonia pachyptera*, as representing the second of six groups of species which he considered should be separated from the genus *Bignonia*. De Candolle's generic description of *Pachyptera*, however, was evidently based mainly on *P. foveolata* since it mentions that the marginal nerves of the capsule separate from the valves and septum, forming a replum, and that the seeds are inserted at the sides of the septum, characters taken from *P. foveolata*. Hence that species should be accepted as the type of the generic name *Pachyptera*.

Schumann transferred *P. foveolata* to the genus *Adenocalymma* in 1894, and two years later treated *Pachyptera* as a section of *Adenocalymma* distinguished by its villous anthers, and the groups of plate-shaped glands outside the corolla-lobes. In 1916 Urban (l.c.) pointed out that the pollen of *A. foveolatum* differed from that of *Adenocalymma* in being 3-grooved. We have therefore no hesitation in accepting *Pachyptera* as an independent genus. We were at first inclined to treat the British Guiana material as representing a

separate species, distinguished by the considerably shorter symmetrically truncate calyx and the smaller number of ovules (13 in each loculus, compared with 21 figured for *A. foveolatum*) as well as by the puberulous branchlets and petioles. Fendler's no. 206 from Chagres, Isthmus of Panama, however, though agreeing well with the description of *A. foveolatum* as regards the long oblique-mouthed and shallowly lobed calyx, has densely puberulous petioles and 15 ovules in each loculus; and Weir's no. 72 from the Rio Magdalena, Colombia, which has truncate calyces resembling those of *Sandwith's* no. 617 but slightly longer, also has densely puberulous petioles and about 15 ovules, and furthermore has a greater development of pilosity on the lower surface of the leaflets than in the other material, even the finest veinlets being distinctly though minutely pilose. In the circumstances it seems best to assign the whole of the material provisionally to the same species.

According to Standley, l.c., the flowers of *P. foveolata* are pale purple; Weir describes them as crimson or deep orange; Jobert as red; Sagot and Richard as white; and the British Guiana plant described above had milk-white flowers. Bureau and K. Schumann give "Cipo de Canoa" as a vernacular name of *A. foveolatum* (presumably at Pará). They give the same vernacular name under *Memora consanguinea* (l.c. 267).

The distribution of *P. foveolata* (sensu lato), so far as we have been able to ascertain it, is as follows:

PANAMA. Chagres, *Fendler* 206.

COLOMBIA. Rio Magdalena, *Weir* 72.

BRITISH GUIANA. Moraballi Creek, Essequibo River, *Sandwith* 617.

SURINAM. *Wulfschlaegel* 332 (Herb. Berol.); *Wulfschlaegel* 1514, ex Bur. et K. Schum., l.c.

FRENCH GUIANA. Mana, *Mélinon* 125 (Herb. Paris.), *Sagot* 883 partim, et sine numero (Herb. Paris.). Maroni, *Mélinon* 205 (Herb. Paris.). Ile Portal, *Sagot* (Herb. Paris.). "In Lucis insula," *Richard* (Herb. Paris.). Without locality, *Aublet* (Mus. Brit.); *Poiteau*, ex DC., l.c.; *Perrottet* (Herb. Paris., type of *Adenocalymma brachybotrys* DC.); *Mélinon* 64 (Herb. Paris.).

BRAZIL. Santarem, *Jobert* 857 (Herb. Paris.). Pará, *Sieber* ex Bur. et K. Schum., l.c.

Mélinon's no. 64 bears a capsule 10.5 cm. long by 2.6 cm. wide, very minutely pubescent, with a raised longitudinal central costa, attenuate and apiculate for about 7 mm. at the apex; seeds 2.2 cm. long, 3.6 cm. wide including the thickened wings.

Aublet described *Bignonia kerere* as having yellow flowers, hairy filaments, a compressed ovoid capsule, and seeds with a membranous wing, characters which definitely exclude *Pachyptera foveolata*. The fruit and seed of *B. kerere* are figured in *Aubl. Hist.* t. 263, fig. 1-4.

Anemopaegma robustum Bur. et K. Schum. in Mart. Fl. Bras. viii. pars 2, 123 (1896).—*Bignonia robusta* Klotzsch in Rich. Schomburgk, Reisen, iii. 969 (1848), nomen.

BRITISH GUIANA. Banks of the Essequibo River, fl. Jan., *Rich. Schomburgk* 355 (typus in Herb. Berol.). Bartica, fl. yellow-white, April, *Jenman* 3632.

The fruit has not hitherto been described. One on Jenman's gathering is ellipsoid, suddenly narrowed at both ends, about 9 cm. long, 5 cm. wide, 3.5 cm. thick, very minutely velvety-pubescent.

Anemopaegma Parkeri *Sprague* in Bull. Herb. Boiss. sér. 2, vi. 375 (1906).

Essequibo River: Moraballi Creek, fl. Sept., *Sandwith* 345. Bush-rope in mixed forest; calyx inconspicuously lobed; corolla creamy-white.

Distr. Surinam, Brazil (Pará, *Spruce* 1130).

Anemopaegma surinamense *Sprague* in Bull. Herb. Boiss. sér. 2, vi. 374 (1906).

Mazaruni River, fl. Sept., *Jenman* 797: a bush-rope.

Distr. Surinam, French Guiana (*Mélinon* in Herb. Paris.).

Anemopaegma microcalyx (G. F. W. Mey.) *Bur. et K. Schum.* in Mart. Fl. Bras. viii. pars 2, 134 (1896); ovario sessili basi haud contracto, disco minimo pedimentiformi a congeneribus distinctum. Descriptio emendata ac ampliata e speciminibus demerarensibus confecta.

Frutex scandens. *Ramuli* hornotini subtetragoni, annotini subteretes, 4–5 mm. diametro, sed nodis valde expansi, irregulariter costati, cortice purpurascens glabro, consociibus glandularum patelliformium supra nodos sitis; ramuli hornotini 2–3.5 mm. diametro, glabri. *Folia* bifoliolata, cirrho apice trifurcato terminata; petiolus 3.5–6 cm. longus, purpurascens, juventute minute lepidotus, demum glaber; petioluli similes, 0.8–2.5 cm. longi; foliola elliptica vel late ovato-elliptica, apice breviter obtuse vel acute cuspidata, basi rotundata vel levissime cordata, 8–14 cm. longa, 5–9 cm. lata, tenuiter coriacea, opaca, supra glabrata, costa nervisque lateralibus leviter impressis, venulis inconspicuis, superficie rugosula, subtus minute inconspicue impresso-lepidota ceterum glabra, costa nervisque satis elevatis, tertiariis venulisque prominulis; nervi laterales utrinque 6–8, arcuato-ascendentes, procul a margine anastomosantes; cirrhi 12–18 cm. longi digitibus usque 7 mm. longis. *Thyrsi* axillares et terminales, 10–30 cm. longi; pedunculus 3–9 cm. longus, valde applanatus, costatus et striatus, sparse minute lepidotus; rhacheos similis internodia 3–10 cm. longa; cymarum lateralium inferiorum pedunculi 1.5–3.5 cm. longi; bracteae triangulari-lanceolatae, acutae, 0.75–1 mm. longae, extra lepidotae, lepidoto-ciliatae, deciduae; pedicelli 0.7–1.5 cm. longi (florum terminalium usque 2 cm. longi). *Calyx* breviter aperte cupularis, 4.5–5 mm. (siccitate 3–3.5 mm. tantum) longus, primo visu truncatus, revera inconspicue repando-lobatus lobis plerumque denticulatis extra lepidibus deterrentibus minute lepidotus, glandulis

patelliformibus impressis 1–3 infra singulos lobos, nervis mediis loborum superne extra leviter elevatis (sed in statu sicco haud cernendis). *Corolla* infundibularis, 6–10 cm. longa (statu sicco lobis inclusis), roseo-purpurea, extra superne glandulis patelliformibus impressis notata, tubi parte basali cylindrica circiter 5 mm. longa, limbo 4–8.5 cm. lato, lobis oblongo-obovatis 2–3.5 cm. longis, 2–3 cm. latis, extra minute lepidotis; lobi intus breviter villosi, ciliolati; tubus intus antice minute lepidotus, postice glaber. *Stamina* antica 1 cm. supra basin inserta, circiter 2 cm. longa, lateralia 0.7 cm. supra basin inserta, circiter 1.4 cm. longa; antherarum thecae divaricatae, singulae 3.5–4 mm. longae, connectivo truncato. *Staminodium* 1 mm. tantum supra basin insertum, 5 mm. longum. *Discus* brevissimus, pedimentiformis, 0.4 mm. altus, 0.4 mm. ultra basin ovarii horizontaliter productus. *Ovarium* ovoideo-oblongum, 3 mm. longum, densissime lepidotum; stylus circiter 3.2 cm. longus, inferne sparse lepidotus; ovula pro loculo quadriseriata, seriebus exterioribus interiores imbricantibus, singulis circiter 8-ovulatis. *Capsula* (ex exemplo cayennensi a Soubirou lecto descripta) linearis, 65 cm. longa, 1.5 cm. lata, applanata, nitida, glabra, linea longitudinali mediana obscura impressa.—*Bignonia microcalyx* G. F. W. Mey. Prim. Fl. Esseq. 211 (1818). *Anemopaegma cupulatum* *Bur. et K. Schum.* in Mart. Fl. Bras. viii. pars 2, 146 (1896), sed vix *Bignonia cupulata* Splitg.

BRITISH GUIANA. Without locality, *Herb. G. F. W. Meyer* (typus in Herb. Goetting.). Essequibo River: Moraballi Creek, a liane on low trees overhanging a creek, fl. pinkish-mauve, Nov., *Sandwith* 548. Essequibo River, fl. Sept., Oct., *Jenman* 1343. Kaieteur Falls, ann. 1872, *Appun* (Mus. Brit.). Corentyne River: Orealla, at river side, fl. Nov., *im Thurn*; Orealla, *Jenman* 10 (Herb. Paris.). Demerara, *Alexander Anderson*.

SURINAM. Without locality, *Wulfschlaegel* 1032 (Herb. Berol.); *Wulfschlaegel* 1336 (Herb. Paris.), distributed from the Brussels Herbarium as *Anemopaegma cupulatum*.

FRENCH GUIANA. St. Laurent, Maroni, fr. Oct. 1896, *Soubirou* (Herb. Paris.).

Distinguished from all species of *Anemopaegma* known to us by the ovary not being contracted at the base, the remarkably short disk, and the linear capsule. Probably represents a hitherto undescribed genus.

The above description, drawn up from the British Guiana material in the Kew Herbarium, differs in certain important details from the description of *A. microcalyx* given in Martius, Flora Brasiliensis. The ovules are *quadriseiate* in each loculus, as has been ascertained by dissection of flowers from different localities, and the disk is flattened and extremely short (not exceeding 0.4 mm. in height). Schumann described the ovules as *biseriate*, and the disk as *conical* and 2 mm. high. However, he cited only *Wulfschlaegel* 1032, which agrees essentially with our material, in particular in

having a flattened disk hardly 0.4 mm. high. As there was only one ovary available for examination we have not ventured to dissect it.

We have not seen *Wulfschlaegel* 59, the type of Bureau and K. Schumann's description of *Anemopaegma cupulatum*, but have no doubt as to the identity of the species, as their description agrees very well except for the statement that the ovules are *sexseriate*. On the other hand, as already indicated by Bureau and Schumann, it seems doubtful whether *Bignonia cupulata* Splitg. is conspecific. The leaves of that species are described as puberulous on the nerves beneath, the panicle as many-flowered with subpuberulous branches, the corolla as an inch long or longer, and ventricose in the middle, and the ovary as glabrous.

Pseudopaegma oligoneuron *Sprague et Sandwith*, sp. nov.; affine *P. jucundo* (Bur. et K. Schum.) Urb., a quo calyce brevidentato differt.

Frutex ope cirrhorum alte scandens. *Ramuli* annotini teretes, circiter 5 mm. diametro, subcinnamomei, cortice irregulariter longitudinaliter fissis inconspicue sed densiuscule pubescentibus; ramuli annotini teretes, sed infra nodos valde applanati, et ibidem glandulis numerosis patelliformibus ornati, costati, striati, densiuscule crispule pubescentes, 2.5–3 mm. diametro. *Folia* 2-foliolata, cirrho simplici vel furcato terminata; petiolus 3.5–7 cm. longus, indumento ramulorum; petioluli 1.5–2.5 cm. longi, pariter induti; foliola late ovata usque orbiculari-ovata, breviter acute vel obtuse acuminata vel cuspidata, basi late rotundata vel subtruncata, 9–12 cm. longa, 5.5–8.5 cm. lata, adulta tenuiter coriacea vel chartacea, supra nitidula interdum fere bullata, costa nervis usque quaternariis impressis sed in canaliculis propriis elevatis, subtiliter arcte reticulata rete elevato, nervis venulisque sparse puberulis, subtus nervis prominentibus rete venularum prominulo vel inconspicuo, crispule pilosula saltem nervis venulisque; nervi laterales utrinque 4–6, suprabasales valde obliqui. *Inflorescentiae* 3-multiflorae, axillares, pedunculatae, dense crispule pubescentes, 3-florae simpliciter cymosae, multiflorae corymboso-thyrsoideae 8–10 cm. diametro; pedunculus usque 3 cm. longus, ramis usque 2 cm. longis; bracteae thyrsi inferiores petiolatae, lanceolatae, acutae, in toto 1 cm. longae, superiores subulatae, 2–4 mm. longae; bracteolae minutae; pedicelli 3–10 mm. longi. *Calyx* breviter aperte campanulatus, 7 mm. longus dentibus exclusis, ore 1 cm. diametro, extra breviter appresse pubescens et superne infra lobos consociibus glandularum patelliformium parvarum ornatus, inconspicue lobatus, lobis breviter latissime depresso deltoideis conspicue crasse apiculatis, apiculis inclusis 1.5–2 mm. longis, apiculis ipsis 0.5–0.8 mm. longis. *Corolla* laete lutea, campanulato-infundibularis, 4–6.5 cm. longa, tubo 1–1.5 cm. supra basin constricto et prorsum curvato, parte basali subcylindrica sursum angustata, limbo 3.5–4 cm. lato; lobi suborbiculares, circiter 1.5 cm. diametro; corolla intus infra insertionem staminum cingulo breviter

villosa circiter 7 mm. longo instructa, ceterum glabra. *Stamina* glabra, anteriora (longiora) circiter 1.8 cm. supra basin corollae tubi inserta, vix ultra 2 cm. longa, lateralia 1.6 cm. supra basin inserta, 1.5 cm. longa; antherarum thecae arcuato-divaricatae, singulae 3–3.5 mm. longae. *Staminodium* 1.6 cm. supra basin insertum, circiter 6 mm. longum, glabrum. *Discus* pulvinatus, glaber, 2 mm. altus. *Ovarium* compressum, ambobus marginibus costatis, ellipsoideo-oblongum, 2.5 mm. longum, densissime lepidotum; stylus 2–2.5 cm. longus. *Ovula* circiter 6-seriata, seriebus mediis circiter 8-ovulatis.

BRITISH GUIANA. Upper Demerara River, fl. Sept., *Jenman* 4070 (typus). Essequibo River: Moraballi Creek, frequent in mora forest, fl. Oct., *Sandwith* 476. North-west District: Waini River, fl. April, *De La Cruz* 3784.

Clytostoma noterophilum (Mart.) Bur. et K. Schum. in Mart. Fl. Bras. viii. pars 2, 153 (1896).—*Bignonia noterophila* Mart. in DC. Prodr. ix. 148 (1845).

Essequibo River: Moraballi Creek, fl. Aug., *Sandwith* 71. Bush-rope; corolla pale purple, white within with purple stripes.

Distr. Venezuela (Cabuyaro, *Sprague* 159), Surinam, French Guiana, Brazil, Paraguay.

Apparently a very widely spread and variable species with polymorphic foliage.

Pithecoctenium granulosum (Bur. et K. Schum.) *Sprague et Sandwith*, comb. nov.—*Distictis granulosa* Bur. et K. Schum. in Mart. Fl. Bras. viii. pars 2, 179 (1896). *Distictella granulosa* Urb. in Fedde, Repert. xiv. 310 (1916). *Pithecoctenium Uleanum* Kraenzl. in Notizbl. Bot. Gart. Berlin, vi. 377 (1915). *Pithecoctenium granulosum* Klotzsch in Rich. Schomb. Reisen, iii. 1158 (1848), nomen.

BRITISH GUIANA. 3° 38' N. Lat., *Rich. Schomburgk* 400 (typus in Herb. Berol.). Without locality, *Rob. Schomburgk* 229 S (Herb. Kew.).

BRAZIL. Rio Branco: Capoeira da Serra de Carauma, *Ule* 7706 (Herb. Kew., typ. coll. *P. Uleani* Kraenzl.).

The chief differences between *Pithecoctenium* and *Distictella* lie in the fruit, and in the presence on the branchlets of *Pithecoctenium* of fibrous ribs which eventually become detached; these appear to be absent in *Distictella*. Such fibrous ribs are present in *Distictella granulosa* and we therefore transfer it to *Pithecoctenium*, although the fruits are not known.

Schumann himself noted that *Distictis granulosa* differed remarkably from all other species of *Distictis*, but unaccountably failed to observe that it was closely related to *Pithecoctenium stipulare* Mart. and *P. scabriusculum* Mart., which he retained doubtfully in *Pithecoctenium*. So close is the agreement between *P. stipulare* and *P. granulosum* that we were at first inclined to treat them as a single species. They appear to differ, however, in the following characters:

pseudostipules conspicuous, suborbicular and glabrate in *P. stipulare*, smaller, oblong or spatulate, and tomentellous in *P. granulosum*; calyx-teeth distinct in *P. stipulare*, minute in *P. granulosum*; pairs of gland-fields on the calyx short and relatively broad (more or less elliptic) in *P. stipulare*, longer and narrower (oblong) in *P. granulosum*. We therefore treat the two species provisionally as distinct.

Schumann described the ovules as 6-seriate in *P. stipulare* and 4-seriate in *P. granulosum*. In the single ovary of *P. stipulare* (Glaziov 8812) dissected by us, the ovules were 8-seriate, the middle series being 7-ovulate; in an old ovary of *P. granulosum* (Rich. Schomburgk 400), the ovules had already developed wings, and the number of series could not be ascertained exactly, but it was certainly not less than 6. There does not appear to be any appreciable difference between the shapes and sizes of the disk and ovary of *P. stipulare* and those of *P. granulosum*. The disk is 1.5–2 mm. high in both, and although the old ovary of *P. granulosum* is 5 mm. long, as compared with 3.5 mm. for the ovary of *P. stipulare*, this difference seems to be merely a matter of age.

Distictella Parkeri (DC) Sprague et Sandwith, comb. nov.—*Bignonia Parkeri* DC. in DC. Prodr. ix. 157 (1845). *Distictis guianensis* Bur. et K. Schum. in Mart. Fl. Bras. viii. pars 2, 177 (1896). *Distictella guianensis* Urb. in Fedde, Repert. xiv. 310 (1916). *Pithecoctenium guianense* Klotzsch in Rich. Schomb. Reisen, iii. 970 (1848), nomen.

BRITISH GUIANA. Without locality, *Parker* (typ. coll.); banks of Demerara River, fl. March, Rich. Schomburgk 1709 (typus *D. guianensis* in Herb. Berol.); Rockstone, fl. June, R. Ward 8831; Berbice River, fl. March, Jenman 1662; without locality, Hancock 92.

Distictella racemosa (Bur. et K. Schum.) Urb. in Fedde Repert. Sp. Nov. xiv. 310 (1916).—*Distictis racemosa* Bur. et K. Schum. in Mart. Fl. Bras. viii. pars 2, 179 (1896).

Essequibo River: on right bank near mouth of Moraballi Creek, fl. Nov., Max Nicholson in Sandwith 588. A climber with white flowers. Other collections from the Colony are: Jenman 2356 (Macouria River), Jenman 799, 801 (Mazaruni River), Jenman 17 and im Thurn (Corentyne River: Orealla).

Distr. Guiana, Brazil.

The leaves on the type-specimens of *Distictis racemosa* (Surinam, Wulfschlaegel 1033, and Pará, Martius in Herb. Brux.) are all in a juvenile and membranous condition but, allowing for this circumstance, seem to agree very well with those of the British Guiana material cited above, which are all fully developed and coriaceous. The calyces of the type-specimens are tubular-campanulate and 1.4 cm. long, while those of the British Guiana material are campanulate and 0.9–1.2 cm. long, but this is the only noteworthy difference observed. Until further and better-developed material is received

from Surinam or the Amazons, it seems undesirable to separate the British Guiana plant, even as a variety.

Roentgenia sordida (Bur. et K. Schum.) Sprague et Sandwith, comb. nov.; *R. bracteomanae* (K. Schum. ex Sprague) Urb., affinis, petiolis petiolulisque inflorescentiaeque rhachi dense puberulis vel tomentellis, foliis ovatis costa nervisque utrinque distincte puberulis, bracteis multo minoribus haud foliaceis, calyce brevior manifestius tuberculato differt.

Frutex alte scandens, ope cirrhorum late pervagans; ramuli subquadrati, hornotini leviter striati, cinnamomei, dense crispule puberuli vel tomentelli, annotini cinerei, glabrati. *Folia* 2-foliolata, nonnulla cirrho longo apice breviter trifurcata terminata, cirrhis tamen plerumque deciduis; petiolus 0.7–3.5 cm. longus, indumento ramulorum, cirrhi post lapsum infra in junctioe petiolulorum cicatrice magna patelliformi notatus; petioluli 0.5–1.6 cm. longi, pariter induti. *Foliola* ovata, apice obtusa, obtuse cuspidulata vel breviter acuminata, basi primo visu rotundata, saepius oblique levissime cordata, 6–14.5 (–18) cm. longa, 3–8 (–9) cm. lata, adulta rigide chartacea vel tenuiter coriacea, supra opaca, costa nervisque usque tertiariis impressis, venulis nullis cernendis, ubique sed inconspicue lepidota, lepidibus facile detersilibus, praeterea costa nervisque lateralibus puberulis, ceterum glabra, subtus nervis prominentibus rete venularum obscuro laxissimo, indumento simili; nervi laterales utrinque 7–8, satis longe a margine anastomosantes; prophylla ramulorum (pseudostipulae) foliacea, suborbicularia, breviter petiolata, siccitate nigrescentia, 5–7 mm. diametro. *Inflorescentiae* axillares atque terminales, pedunculatae, thyrsoidae, cymis lateralibus sessilibus 3-plurifloris, interdum in thyrsu foliatum compositum usque 25 cm. longum aggregatae; pedunculus 1.5–7 cm. longus; rhachis 2.5–5 cm. longa, ut pedunculus dense puberula necnon lepidota; bractae primariae incurvae, lineari-subulatae, 2.5–6 mm. longae, pariter indutae; pedicelli 3.5–7 mm. longi, lepidoti, tuberculati. *Alabastra* ovoidea, cuspidato-acuminata, siccitate nigrescentia, vernicosa, tuberculata. *Calyx* campanulatus, primo visu truncatus sed breviter irregulariter lobatus lobis plerumque apiculatis, 5.5–6.5 mm. longus, extra dense lepidotus, superne infra lobos glandulis pluribus patelliformibus immersis ornatus, densiuscule tuberculatus. *Corolla* alba, sinubus intus purpureo-maculatis, tubo intus cremeo purpureo-vittato, campanulato-infundibularis, 5–6 cm. longa, tubi parte basali cylindrica 6–8 mm. longa, limbo 3.5–4 cm. lato, lobis obovato-oblongis 1.5–2 cm. longis, extra dense stipitato-lepidota; lobi intus dense lepidoti, secus venas plus minusve albo-villosi; tubus intus antice sparsus lepidotus, postice subglaber, infra insertionem staminum villosus. *Stamina* circiter 9 mm. supra basin tubi inserta, antica 1.6 cm., postica 1 cm. longa; filamenta inferne albo-villosa; antherarum thecae subdivaricatae, eae staminum anticorum 3.5 mm., lateralium vix 3 mm. longae. *Staminodium* circiter 2 mm. longum, inferne villosum.

Discus nullus. *Ovarium* oblongum, indistincte subquadratum, levissime compressum, 4 mm. longum, 1.3 mm. et 1 mm. latum, densissime pallide fulvo-lepidotum; stylus circiter 2.5 cm. longus, inferne sparse lepidotus; ovula pro loculo 33–36, biseriata, seriebus singulis 16–18-ovulatis. *Capsula* (e *Benoist* 897 descripta), linearis, usque 34 cm. longa, 1.6–2 cm. lata, pallide brunnea, glabra. *Semina* 1.8 cm. longa, 5–6 cm. lata; embryo circiter 1 cm. diametro.—*Arrabidaea sordida* Bur. et K. Schum. in Mart. Fl. Bras. viii. pars 2, 30 (1896). *Bignonia sordida* Klotzsch in Rich. Schomburgk, Reisen, iii. 1158 (1848), nomen.

BRITISH GUIANA. Essequibo River: Moraballi Creek, bush-rope in morabukea forest, fl. Nov., *Sandwith* 577. Cuyuni River: near Tinamu Fall, fl. March, *Martyn* 289; Stop-off Fall, by riverside, fl. Feb., *Brinsley* in *Forestry Department* no. 2050. Corentyne River: Orealla, fl. Nov., *Jenman* 496, fl. Sept., *im Thurn*. Upper Rupununi River, fl. May, *Rich. Schomburgk* 1296 (typus in Herb. Berol.).

FRENCH GUIANA. Without locality, *Martin* (Mus. Brit.). St. Jean, fr. March, *Benoist* 897 (Herb. Paris.).

The corolla is white with a purple blotch at each sinus, and the tube is cream-coloured within with purple stripes.

This species was originally described from very inadequate material, the inflorescences being incomplete, and nearly all the bracts and bracteoles having fallen off.

R. sordida is closely allied to *R. bracteomana*, from which it seems to differ chiefly in the shape of the leaflets, and the inflorescence.

Roentgenia agrees with *Cydista* in the corolla and ovary being lepidote, and in the absence of a disk. The inflorescence, which is a thyrses with the lateral cymes sessile and contracted, with consequent aggregation of the bracts, gives it a peculiar facies. Sprague suggested in 1909 (Verh. Bot. Ver. Brandenburg, l. 127) that *Cydista bracteomana* might represent a new genus, and this was confirmed in 1916 by Urban (Ber. Deutsch. Bot. Ges. xxxiv. 748), who separated it as a new genus, *Roentgenia*, chiefly on account of the trifurcate tendrils and plurisulcate pollen-grains.

Memora bracteosa (DC.) Bur. ex K. Schum. in Engl. & Prantl, Nat. Pflanzenfam., iv. 3b, 226 (1894); Bur. et K. Schum. in Mart. Fl. Bras. viii. pars 2, 270 (1897). *Spathodea* ? *bracteosa* DC. in DC. Prodr. ix. 208 (1845), excl. syn.

Essequibo River: Moraballi Creek, fl. Oct., *Sandwith* 505. Bush-rope in mixed forest, only once seen. Corolla rich orange-yellow.

Distr. Guiana, Brazil. Apparently the first record from British Guiana.

The British Guiana specimens agree with a specimen collected by Poiteau in French Guiana named *Spathodea bracteosa* DC. by Bureau, and with *Sagot* 404, both of which are stated to have yellow flowers. De Candolle cited *Bignonia alba* Aubl. Hist. Pl. Guiane, ii. 365, iv. t.

266, as a synonym, but this was described by Aublet as white-flowered, possibly owing to confusion with some other species. In the circumstances we reject Aublet's epithet *alba*. De Candolle, relying on Aublet, stated that the flowers of *Spathodea bracteosa* were white.

Memora ovata (Bur. et K. Schum.) Sprague et Sandwith, comb. nov.—*Tanaecium ovatum* Bur. et K. Schum. in Mart. Fl. Bras. viii. pars 2, 187 (1896). *Spathodea ovata* Klotzsch in Rich. Schomburgk, Reisen, 1158 (1848), nomen. *Memora consanguinea* Bur. et K. Schum. l.c. 267 (1897). *Spathodea consanguinea* Klotzsch, l.c., nomen.

The type-specimens of *Tanaecium ovatum* (*Rich. Schomburgk* 499: Herb. Berol.) and *Memora consanguinea* (*id.* 537: Herb. Berol.) have been examined, and prove to represent one and the same species, which unquestionably belongs to the genus *Memora*. It is unfortunate that the two species were published in different years so that the specific epithet *ovata* has to take precedence over *consanguinea*, thus necessitating a new combination. The known distribution of this species is given below.

BRITISH GUIANA. Tacutu River, fl. April, *Rich. Schomburgk* 499 and 537 (Herb. Berol.); Quimatta, Rupununi River, fl. Oct., *Jenman* 5574; Camounie Creek, fl. April, *Jenman* 2031; Tinamu Fall, Cuyuni River, fl. March, *Martyn* 279; near Stop-off Fall, Cuyuni River, fl. March, *Brinsley* in *Forestry Department* no. 2044.

M. ovata is a riverside climber, with showy yellow or pale yellow flowers.

Jacaranda copaia (Aubl.) D. Don in Edinb. Phil. Journ. 1823, 267.—*Bignonia copaia* Aubl. Hist. Pl. Guiane, ii. 650, iv. t. 265 (1775).

Essequibo River: Moraballi Creek, fl. Sept., *Sandwith* 189. A large tree, 108 ft. high, 16 in. diam., with pale bluish-mauve flowers. Frequent in mixed forest and "low bush."

Vernacular name (Arawak), Futui.

Distr. Nicaragua, Panama, Northern South America.

Jacaranda rhombifolia G. F. W. Mey. Fl. Esseq. 213 (1818).—*Bignonia filicifolia* Anders. in Trans. Soc. Arts. xxv. 200 (1807), nomen. *Jacaranda filicifolia* D. Don, l.c. 266.

Essequibo River: in low bush on the sandy right bank at the first Falls, fl. Sept., *Sandwith* 219. A low tree with inflorescences borne on leafless branches. Flowers bluish-mauve.

Vernacular name (Arawak), Sand Trysil.

Distr. Guiana. Occurrence elsewhere in Northern South America uncertain.

Three other Bignoniaceae were collected during the Oxford University Expedition to British Guiana, namely, **Tabebuia serratifolia** (Vahl) Nichols. (vide Kew Bull. 1932, 26); **T. hypolepra** Sprague et Sandwith (l.c. 25); and **Schlegelia violacea** (Aubl.) Griseb. (l.c. 1930, 214).

X.—TROPICAL AFRICAN PLANTS: IX.*

Cadaba obovata Bruce, sp. nov. [Capparidaceae]; affinis *C. farinosae* Forsk., sed foliis majoribus obovatis chartaceis, floribus minoribus differt.

Frutex parvus; ramuli juniores leviter lepidoti, pilis sparsis strigosis conspicuis vestiti. *Folia* varia, majora late obovata, 3–5 cm. longa, 1.7–3.2 cm. lata, apice truncata, basi cuneata, minora oblongo-obovata, 1–3 cm. longa, 0.5–1 cm. lata, utrinque rotundata, minute mucronata, supra leviter lepidota, demum glabrescentia, infra glabra, nervis lateralibus utrinsecus circiter 4, petiolis circiter 2 mm. longis. *Inflorescentia* racemosa, circiter 3 cm. longa, pedicellis gracilibus 1.5 cm. longis. *Sepala* 4, oblonga, apice acuminata, mucronata, circiter 6 mm. longa. *Petala* 4, longissima, unguiculata, ungue circiter 9 mm. longo, limbo lineari-lanceolato 2 mm. longo. *Stamina* 4, filamentis 5 mm. longis, androphoro 4 mm. longo. *Ovarium* anguste oblongum, 2 mm. longum, gynophoro circiter 1 cm. longo. *Fructus* non visus.

TANGANYIKA TERRITORY: Upare district 2300 ft., *A. E. Haarer* 823.

This plant is characterized by the variation in leaf form; the larger leaves are broadly obovate and narrowed to the base, whilst the smaller ones are oblong-obovate and rounded at the base.

Crassula parvifolia Bruce, sp. nov. [Crassulaceae]; affinis *C. pentandrae* Schoenl., sed habitu majore crassiore, foliis minoribus obtusis vel subacutis, floribus pedicellatis differt.

Herba perennis, glabra, semi-prostrata, caulibus ramosis basi carnosus 5 mm. diametro, ramis erectis circiter 15 cm. longis, internodiis 2–3 mm. longis. *Folia* opposita, parva, crassa, basi cohaerentia, ovato-lanceolata, apice obtusa vel subacuta, 2–3 mm. longa. *Flores* flavo-virides, pentameri, pedicellati, in axillis inferioribus 3–4 in superioribus 1–2 dispositi. *Sepala* 5, lanceolata, acuta, basi cohaerentia, circiter 1 mm. longa. *Petala* 5, lanceolata, acuta, circiter 1.5 mm. longa. *Stamina* 5, petalis breviora. *Carpella* 5, disperma, circiter 1 mm. longa, stylis brevibus.

KENYA COLONY: Longonot, 9000 ft.; in volcanic soil on the inside edge of the crater; semi-prostrate herb, flowers yellowish green, *E. R. Napier* 221 (type).

This plant is characterized by its stout much branched stem and small leaves.

Dombeya emarginata Bruce, sp. nov. [Sterculiaceae]; affinis *D. pedunculatae* K. Schum., sed foliis majoribus emarginatis differt.

Frutex usque ad 3.3 m. altus; rami stellato-pubescentes. *Folia* ovato-rotundata, 3-lobata; lamina 5–9 cm. longa, 6–10 cm. lata, supra leviter infra dense stellato-pubescentia, apice emarginata, apiculata, basi anguste cordata, nervis circiter 7 infra prominentibus, margine

crenulata, petiolis 4.5–6 cm. longis pubescentibus. *Stipulae* lanceolatae, acuminatae, leviter pubescentes. *Inflorescentia* multiflora, longe pedunculata, pedunculo terete pubescente usque ad 13 cm. longo, pedicellis sub anthesin usque ad 2 cm. in fructu usque 3 cm. longis. *Bractae* ovato-lanceolatae, leviter pubescentes, deciduae. *Sepala*, persistentia, lanceolata, acuminata, extra stellato-pubescentia, intus glabra, circiter 1.3 cm. longa, demum reflexa. *Petala*, alba, late ovata nec obliqua, glabra, 1.6 cm. longa, 1.4 cm. lata, apice obtusa, decidua. *Stamina* 10, antheris anguste oblongis 5 mm. longis, filamentis brevibus tubo stamineo 2 mm. longo; staminodia 5, linearia, staminibus subaequalia. *Ovarium* pentamerum, tomentosum, ovulis pro loculo circiter 5, stylo glabro stigmatibus 5. *Capsula* pubescens, seminibus glabris 4 pro loculo.

UGANDA: Mubendi, 4500 ft., shrub up to 10 ft., flowers white, decorative, *Hargreaves* 2046 (type); *J. D. Snowden* 17; Mulange, 4000 ft., grasslands and savannah, 6 ft. high, flowers white, local, *R. A. Dummer* 4188; Mabira Forest, 3722 ft., in open parts of the forest and savannah and bush land, flowers white, *T. D. Maitland* 521; Mulanda Hill, near Kabulamuliro, flowers white, *T. D. Maitland* 96 AB.

Pavonia Rogersii N. E. Brown [Malvaceae]; affinis *P. clathratae* Mart., sed glanduloso-pubescent, foliis hastatis et carpellis triangularibus medio utrinque unidentatis nec alatis differt.

Herba elata, ramis petiolis pedicellis bracteisque pilis patentibus glanduliferis obtectis. *Folia* deflexa, hastata vel ovato-hastata, 1–3 cm. longa, basi 0.7–1.5 cm. lata, dentata, utrinque pilis simplicibus et stellatis conspersa; petioli 1–1.5 cm. longi. *Pedicelli* infra articulationem circa 1.5 cm. longi, demum 2.5–4 cm. longi. *Bractae* saepe 11, anguste lineares, 1.5–2 cm. longae, pilis longis et pilis glanduliferis obtectae. *Calyx* extra pubescens, intus glaber; tubus 2 mm. longus; lobi 5–6 mm. longi, lanceolati vel ovato-lanceolati, acuti. *Petala* obovata, 1.5 cm. longa, glabra, lutea. *Tubus stamineus* glaber. *Carpella* 6 mm. longa, 5 mm. lata, triangularia, angulis externis medio unidentatis, glabra.

RHODESIA: Without locality, *F. A. Rogers*, 13242.

Erythrina rotundato-obovata E. G. Baker, sp. nov. [Papilionaceae]; ad *E. indicam* Lam. accedens a qua foliolorum ambitu differt.

Arbor 9–10 m. alta, copiose ramosa, spinis magnis. *Folia* trifoliolata, foliolis terminalibus rotundato-obovatis vel transverse ellipticis 4–8 cm. longis 5–10 cm. latis superne glabris subtus pallidioribus pubescentibus, foliolis lateralibus ovalibus vel late ovalibus leviter inaequalateralibus 2–5.5 cm. longis 3–5.5 cm. latis, petiolis spinosis. *Flores* in racemis dispositi; pedunculi virgati, pubescentes, 25–30 cm. longi; pedicelli 8–12 mm. longi, pubescentes. *Calyx* spathaceus, 2.3–3.2 cm. longus, glaber vel subglaber, apice brevissime dentatus. *Petala* rubra. *Vexillum* oblongo-obovatum,

*Continued from *K.B.* 1931, p. 275.

plus minusve 5 cm. longum et 1.5-2 cm. latum. *Alae* oblique oblongae vel ovatae, 2-2.5 cm. longae et plus minusve 9 mm. latae. *Carina* naviculariformis, plus minusve 1.5 cm. longa et 9-10 mm. lata. *Stamina* 5-6 cm. longa. *Legumen* juvenile tomentosum, rectum, 9-10-spermum.

TANGANYIKA TERRITORY: S.W. Uмба Steppe; Kivingo, alt. 1500 ft., very scattered in *Acacia* desert-grass country on pale red soil, Dec., Greenway 1974 (type).

This plant is a close ally of *Erythrina indica* Lam., in the subgenus *Stenotropis* Hassk.

Indigofera tanganyikensis E. G. Baker, sp. nov. [Papilionaceae]; ad *I. suaveolentem* Jaub. et Spach. accedens sed foliolis 5-9, calycis dentibus glandulosis distinguitur.

Suffrutex erectus copiose ramosus, ramis teretibus pubescentibus. *Stipulae* minutae, lineares. *Folia* imparipinnata, 2-4-juga, cum impari foliolis parvis oblongo-obovatis 4-5 mm. longis et usque 2 mm. latis superne glabris subtus strigosis. *Pedunculi* graciles, plus minusve 1 cm. longi, ad apicem 1-3-flori. *Flores* parvi. *Calyx* brevis, strigosus, plus minusve 1 mm. longus, dentibus apice glandulosis. *Vexillum* obovatum, 4-5 mm. longum. *Carina* naviculariformis, 4-6 mm. longa. *Legumen* rectum, cylindricum, apice mucronatum, 1.2-1.8 cm. longum, demum glabrum, 7-10-spermum.

TANGANYIKA TERRITORY: Singida; alt. 5000 ft., March, B. D. Burtt, 1738 (type).

UGANDA: Common in sandy soil along the shores of Lake Victoria, alt 3700 ft.; a herb up to 1 ft. or more high, Mettam 296.

This is an ally of *Indigofera suaveolens* Jaub. et Spach., and is a member of the section *Dissitiflorae*. The distinguishing features are the 5-9 oblong-obovate leaflets, the short calyx with its teeth glandular at the apex, the small flowers and straight, cylindrical, 7-9-seeded legume.

Haarera Hutch. et Bruce, gen. nov. [Compositae]; inter genera tribus Vernoniacearum involucri bracteis subulatis in receptaculum cavatum late turbinatum connatis distinctissimum.

Capitula homogama, tubuliflora. *Involucrum* late turbinatum, bracteis circiter 8-seriatis imbricatis subulatis numerosis exterioribus gradatim brevioribus. *Receptaculum* cavatum et late turbinatum, alveolatum. *Corollae* aequales, actinomorphae, tubo tenui, limbo profunde 5-lobato, lobis angustissimis apice caudato-appendiculatis extra glandis sessilibus instructis. *Antherae* apice inappendiculatae, basi late sagittatae. *Styli rami* subulati, hirtelli. *Achaenia* anguste 4-alata, glabra. *Pappi setae* caducissimae, paucae, barbellatae. *Herba* erecta, superne ramosa, ubique pilis longis inferne transverse locellatis superne elongatis et unilocellatis ornata; *folia* alterna, sessilia, integra vel subintegra, infra glanduloso-punctata. *Capitula* solitaria, pedunculata. *Flores* rubro-purpurei.



Haarera alternifolia Hutch. et Bruce, gen. nov. 1, hair from peduncle. 2, part of involucre opened out. 3, flower with ovary and pappus removed. 4, anthers. 5, style-arms. 6, achene and pappus-seta. 7, achene.

Haarera alternifolia (O. Hoffm.) Hutch. et Bruce, comb. nov.—*Bothriocline alternifolia* O. Hoffm. in Engl. Pflanzenw. Ost.-Afr. C: 403 (1895).

Herba erecta, usque ad 2 m. alta; rami striati, pilis paucis infra medium multilocellatis pubescentes. *Folia* alterna, sessilia vel subsessilia, lanceolata vel obovato-oblancheolata, apice obtusa, ad basin angustata, 3–9 cm. longa, 1–2.5 cm. lata, supra glabra, infra nervis leviter scabrido-pubescentibus et glandulosa. *Capitula* solitaria, pedunculata, circiter 1.6 cm. longa et lata, turbinata, multiflora. *Involucra* bracteae circiter 8-seriatae, subulato-lineares, acute acuminatae, pilis purpurascenscentibus pubescentes, subaequales, circiter 7 mm. longae, interiores lanceolatae, acuminatae, basi in receptaculum profunde concavum coalescentes. *Flores* circiter 1 cm. longi, purpurei. *Corolla* 5-lobata, lobis anguste lanceolatis usque ad 3 mm. longis apice caudato-appendiculatis, tubo glanduloso circiter 6 mm. longo. *Stamina* 5, antheris oblongo-lanceolatis circiter 3 mm. longis. *Achaenia* anguste obovata, circiter 1.5 mm. longa, teretia, siccitate 4-alato-angulata, inter angulos maculis multis fuscis linearibus minutis notata. *Stylus* 9 mm. longus, bilobatus, lobis gracilibus pubescentibus 3 mm. longis. *Pappi setae* caducae, paucae, barbellatae, circiter 2.5 mm. longae.

TANGANYIKA TERRITORY: Kiruru, Upare, 2600 ft., near swamp, A. E. Haarer 498; Samé, Pare district, 2800 ft. approximately, A. E. Haarer 1241; Kikori, 4200 ft., very common purple-flowered herb to 6 ft. high, forming thick masses of flower in *Acacia formicarum* wood and associated with *Hibiscus cannabinus*, B. D. Burt 2770; Pangani and Himo R., 2200–2500 ft., Volkens 554 (type).

This new genus, which is named in honour of Mr. A. E. Haarer, of the Department of Agriculture, Tanganyika Territory, is very remarkable amongst the *Vernonieae* in having a hollow turbinate receptacle. This is formed by the concretion of the numerous narrow linear involucral bracts. The indumentum on these and on the upper part of the shoots is composed of multicellular hairs, the lower part of each hair being beautifully marked with purplish transverse walls, the upper part being unicellular, elongated and pale coloured.

Barleria spinisepala Bruce, sp. nov. [Acanthaceae]; affinis *B. homotrichae* C. B. Cl., sed floribus solitariis axillaribus, sepalis anguste lanceolatis spinulosis differt.

Suffruticosa circiter 3 dm. alta, ramis teretibus reflexo-pubescentibus. *Folia* obovata, breviter petiolata, circiter 2 cm. longa, 1 cm. lata, apice mucronata, basi anguste cuneata, supra leviter pubescentia, infra breviter reflexo-pubescentia, nervis lateralibus utrinsecus 4 infra praesertim prominentibus. *Flores* purpurei, axillares, solitarii, sessiles. *Bracteae* circiter 1.5 cm. longae, ad spinas pinnatifidas reductae. *Sepala* 4, adaxialia et abaxialia circiter 1.5 cm. longa, 0.3 cm. lata, anguste lanceolata, marginibus spinulosis, lateralibus 1 cm. longa, 0.2 cm. lata, lanceolata, acuminata,

integra. *Corolla* subaequaliter 5-lobata, tubo usque ad 2.1 cm. longo extra leviter pubescente, lobis ovatis circiter 1 cm. longis 0.8 cm. latis apice rotundatis. *Stamina* 2, medio tubi affixa, filamentis circiter 7 mm. longis basi pubescentibus, antheris oblongis 2 mm. longis e tubo leviter exertis. *Staminodia* 2 vel 3. *Discus* cupuliformis, circiter 1.5 mm. altus, margine crenulato. *Ovarium* ovoideum, glabrum, stylo 1.2 cm. longo ad basin dense pubescente; ovula 4. *Capsula* glabra, circiter 1.6 cm. longa, 0.5 cm. lata; semina 2 vel 3, hirta, suborbicularia, applanata.

KENYA COLONY: Kajiado, 5,700 ft., in dry pasture land, a small woody herb about 1 ft. in height, with thorny bracts and mauve flowers, E. R. Napier 755 (type); N. E. slopes of Aberdare mountains, 6000 ft., in poor stony ground, W. J. Dowson 542.

This plant belongs to the *Acanthoidea* Section of the genus *Barleria*; its narrow spiny pinnatifid sepals are a distinguishing feature.

Dicliptera Napierae Bruce, sp. nov. [Acanthaceae]; affinis *D. mossambicensi* Klotzsch, sed bracteis obtusis, inflorescentiis laxioribus, pedunculis multo longioribus differt.

Herba circiter 3–5 dm. alta; rami albo-pubescentes, indumento reflexo. *Folia* ovata vel ovato-rotundata, sessilia vel breviter petiolata, 0.9–1.8 cm. longa, 0.7–1.4 cm. lata, apice rotundata usque acuta vel leviter acuminata, basi rotundata, utrinque pubescentia. *Cymae* laterales, longe pedunculatae, pedunculis sub anthesin 8 mm. longis, in statu fructifero usque ad 4 cm. longis. *Bracteae* ovatae, circiter 1.1 cm. longae, 0.8 cm. latae, apice obtusae vel subacutae, mucronulatae, glabrescentes, conspicue reticulatae. *Bracteolae* lanceolatae, circiter 6 mm. longae, acuminatae. *Calyx* 5-lobatus, lobis lineari-lanceolatis circiter 3 mm. longis. *Corolla* magenta vel pallide purpurea, bilabiata, extra pubescens, tubo circiter 8 mm. longo, labio supero 1 cm. longo, infero 1.1 cm. longo apice 3 dentato. *Stamina* 2; filamenta reflexo-pubescentia, antherarum thecis superpositis. *Ovarium* 1.5 mm. longum, stylo 1.4 cm. longo glabro. *Capsula* circiter 7 mm. longa, glabra, seminibus 4 glabris 3 mm. diametro.

KENYA COLONY: Ngong, 7,000 ft., “wet weather” river bed amongst rocks and grass, flowers mauvish-pink, bracts persistent but turning brown, E. R. Napier 539 (type); Ulu, thorn country in short grass, sandy soil amongst rocks; herb about 1–1½ ft. high, magenta flowers and anthers, papery bracts, very few flowers out at one time, E. R. Napier 30.

This plant is characterized* by the large persistent ovate bracts.

Dyschoriste decumbens Bruce, sp. nov. [Acanthaceae]; affinis *D. Volkensii* Lindau, sed foliis minoribus spathulatis, corollae tubo longiore et angustiore differt.

Suffrutex parvus, decumbens; ramuli juniores breviter puberuli, maturi glabrescentes. *Folia* spathulata, breviter petiolata,

1.0-1.5 cm. longa, 0.5-0.8 cm. lata, obscure crenulata, apice truncata vel rotundata, minute apiculata, supra leviter infra dense pubescentia; nervi laterales utrinsecus 4. Flores viridi-flavi, axillares, sessiles, saepe solitarii vel geminati. Calyx cylindricus, 1.2 cm. longus, extra dense griseo-puberulus, intus adpresso-pubescent, tubo circiter 8 mm. longo, lobis 5 lineari-lanceolatis acutis 4 mm. longis. Corolla subaequaliter 5-lobata, extra leviter pubescens, tubo circiter 2.2 cm. longo anguste cylindrico, lobis obovatis 9 mm. longis 5 mm. latis apice rotundatis. Stamina 4, e tubo leviter exserta, antheris 1.5 mm. longis basi mucronatis. Capsula 1.3 cm. longa, subglabra.

KENYA COLONY: Rift valley, Narak road, just before it turns north after travelling parallel with the Ngong Hill, 5000 ft.; in scrub country subject to drought; decumbent and creeping among the roots of *Acacia* and dry grass, flowers greenish yellow, sometimes faintly tinged with purple, *E. R. Napier* 413 (type).

This plant is characterized by its small spatulate leaves, which are clustered together at the nodes.

Isoglossa ovata Bruce, sp. nov. [Acanthaceae]; affinis *I. strigosulae* C. B. Cl. sed floribus minus pubescentibus majoribus, foliis majoribus basi latioribus differt.

Herba erecta, usque ad 1 m. alta, ramulis subteretibus glabrescentibus. Folia ovata, usque ad 9 cm. longa et 5.5 cm. lata, apice acuta vel acuminata, basi rotundata vel rarissime acuta, inferiora petiolata, petiolis usque ad 3 cm. longis, superiora subsessilia, utrinque leviter strigoso-pubescentia. Inflorescentiae laxae paniculatae, terminales et axillares, leviter striguloso-pubescentes, bracteis linearibus circiter 5-8 mm. longis. Calyx fere ad basin 5-lobatus, lobis pubescentibus lineari-lanceolatis usque ad 7 mm. longis. Corolla alba vel rosea, bilabiata, leviter pubescens, 1.4-1.8 cm. longa, tubo lobis longiore, labio inferiore 3-lobato, superiore 2-lobato. Stamina 2, filamentis glabris 1.3 cm. longis, antheris ovatis bilocularibus, thecis superpositis. Ovarium oblongo-ovoideum, circiter 4 mm. longum, stylis circiter 1.3 cm. longis. Capsula circiter 1.5 cm. longa, 4 mm. lata, glabrescens.

KENYA COLONY: Near Nairobi, Aug. 1903, Whyte (type); Magathi, 6000 ft. in forest undergrowth, tall herb rather straggling, varying from 1-3 ft., flowers white, *E. R. Napier* 85.

TANGANYIKA TERRITORY: Mgigile, Pare district, approximately 3500 ft., *A. E. Haarer* 1348; Keni, Rombo, East Kilimanjaro, approximately 4000 ft., in hedgerow, flowers pink, herbaceous, 3 ft., *A. E. Haarer* 216.

XI.—CHIDLOWIA, A NEW TREE GENUS OF CAESALPINIACEAE FROM WEST TROPICAL AFRICA. A. C. HOYLE.

Chidlowia Hoyle, gen. nov. [Caesalpinaceae-Amherstieae], affinis *Schotiae* Jacq., a qua calycis tubo brevior 5-dentato, dentibus apertis, ovarii stipite tubo haud adnato, paniculis elongatis, legumine magno elongato, recedit.

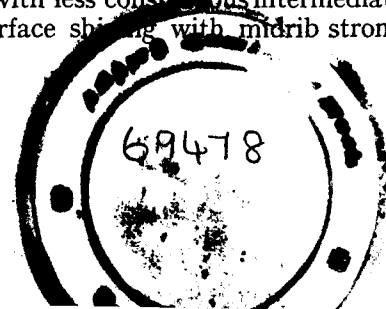
Calycis tubus campanulatus, aequaliter et brevissime dentatus, dentibus 5 apertis. Discus carnosus, calycis tubo adnatus, margine libero et petala staminaque ferente. Petala 5, subaequalia, sessilia, valde imbricata, calyce magis longiora. Stamina 10, libera, filamentis glabris filiformibus; antherae uniformes, loculis longitudinaliter dehiscentibus. Ovarium stipitatum, ∞ -ovulatum; stylus filiformis stigmatibus parvo terminale. Legumen oblongo-lineare, magnum, plano-compressum, coriaceo-lignosum, vi elastica dehiscens. Semina orbiculata, compressa, funiculo brevissimo crasso; albumen 0; cotyledones planae, carnosulae. — Arbores inermes. Folia abrupte pinnata, foliolis coriaceis. Stipulae parvae, caducae. Flores rubri, in paniculas elongatas conferti. Bractae et bracteolae minutae, caducissimae.

Species 1, Africae tropicae occidentalis verisimiliter endemica.

Calyx-tube campanulate, regularly and very shortly dentate, teeth 5, open in aestivation. Disc fleshy, adnate to the calyx-tube, its margin free and bearing the petals and stamens. Petals 5, subequal, sessile, strongly imbricate, much longer than the calyx. Stamens 10, free, with filiform filaments, glabrous; anthers uniform, with loculi dehiscing longitudinally. Ovary stipitate, ∞ -ovulate; style filiform with a small terminal stigma. Legume oblong-linear, large, flattened, coriaceous-woody, dehiscing elastically. Seeds orbicular, compressed, with a very short broad funicle; endosperm 0; cotyledons flat, fleshy. — Unarmed trees. Leaves abruptly pinnate; leaflets coriaceous. Stipules small, caducous. Flowers red, borne in elongated slender panicles. Bracts and bracteoles minute, very early caducous.

Species 1, apparently endemic in West Tropical Africa.

Chidlowia sanguinea Hoyle, sp. nov. A large or small tree, wholly glabrous, with very rough bark; branchlets terete, striate, at first inconspicuously lenticellate. Stipules small, very early caducous. Leaves paripinnate, up to 25 cm. or more long: petiole up to 2.5 cm. long, like the rachis terete; leaflets 4-5-jugate, coriaceous, more or less unequal-sided, the lowest ovate, the middle pairs oblong-elliptic, the distal pair obovate-elliptic, 4-12 cm. long, 2-5 cm. broad, apex more or less abruptly long-acuminate; acumen 1-1.5 cm. long, acute, mucronulate; base very broadly to narrowly cuneate or occasionally rounded, more or less oblique, the upper side larger; main lateral nerves arcuately ascending, 5-7 on each side, raised on both surfaces, with less conspicuous intermediate nerves and reticulation, upper surface shining with midrib strongly impressed, lower



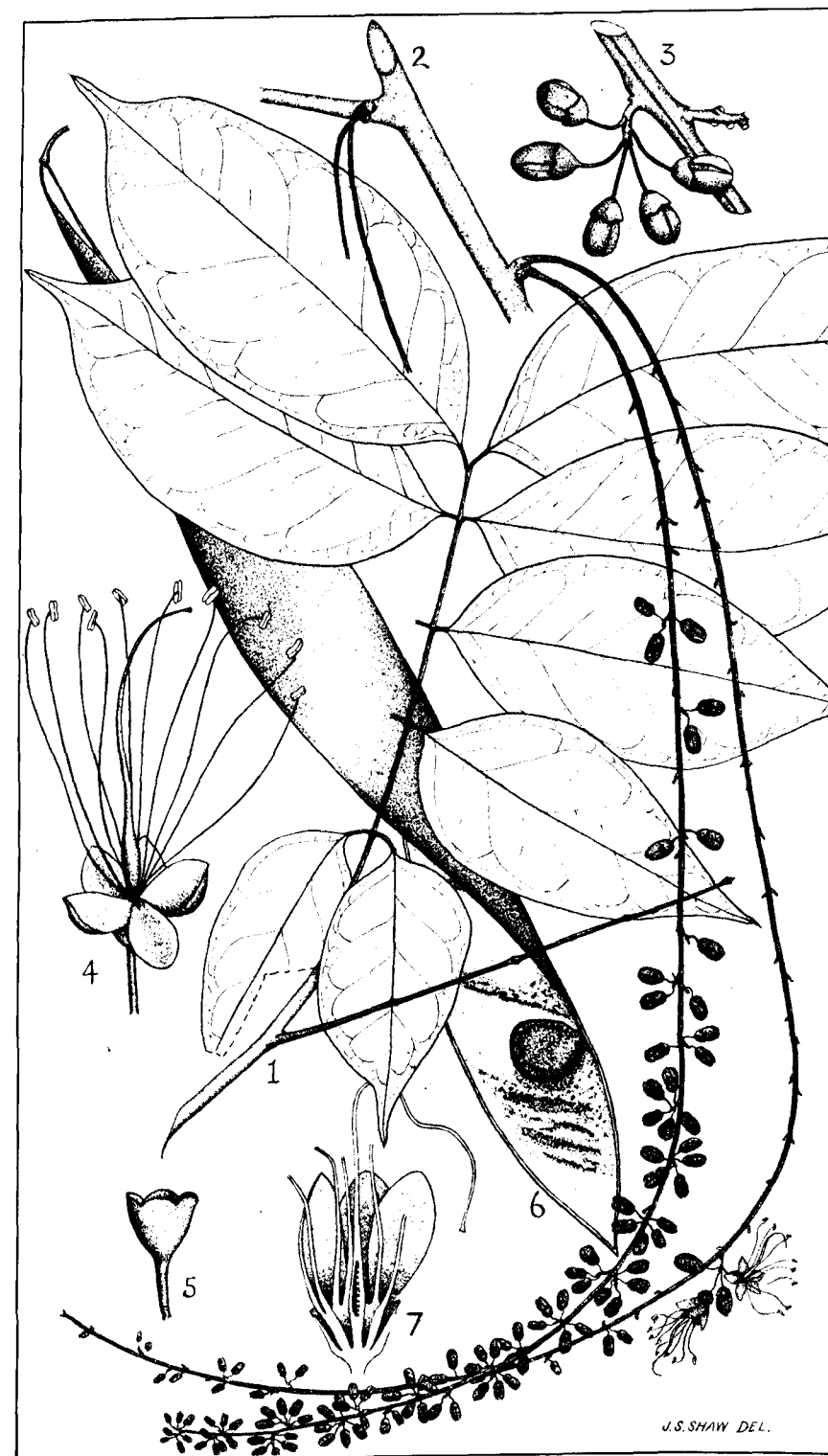
surface dull with midrib prominent, margin slightly revolute with marginal nerve. *Panicles* pendulous, solitary or 2 together on the old wood, or occasionally terminal on young branchlets, very slender, up to 25 cm. or more long, rhachis angular in the upper part, terete below, striate, 1-1.5 mm. in diameter, lateral branchlets of the panicle numerous (40 or more), exceedingly short, 2.5-4 mm. long, 5-7-flowered; bracts and bracteoles minute, very early caducous. *Flowers* wine-red throughout, small; pedicels slender, 3-3.5 mm. long; calyx campanulate, tube transversely rugulose, coriaceous, 2 mm. long, 3 mm. broad, with 5 very short, broadly rounded slightly ciliolate teeth, open in aestivation; petals subequal, free, sessile, imbricate, the abaxial petal outside in bud, 6-7 mm. long, 4-5 mm. broad, ovate to oblong-elliptic, obtuse, coriaceous, margin slightly scarious; disc thick, fleshy, adnate to the base of the calyx-tube and about the same length, free for about half its length, the petals arising below the margin, and the stamens from the margin; stamens 10, free, filaments filiform, from a broader base, about 25 mm. long; anthers dorsifixed, versatile, broadly oblong-ellipsoid, 1.5 mm. long; ovary stipitate, stipe 2.5 mm. long, arising from the receptacle within the cupular disc, ovary itself 4-5 mm. long, lanceolate, scarcely falcate, tapering into the filiform 20 mm. or more long style, which broadens into a small capitate stigma; style and stamens much crumpled in bud; ovules 10-12. *Legume* oblong-linear, acute at both ends, up to 45 cm. long and 5.5 cm. broad, valves coriaceous-woody and very elastic, dehiscing along both sutures and becoming spirally twisted, smooth shining dark brown outside with oblique splits in the surface; glabrescent inside with oblique fibrous transverse septa; sutures scarcely thickened, seeds (immature?) up to 9 or 10, suborbicular, 23 mm. long, 20 mm. broad, 4 mm. thick, shining red-brown and finely pitted especially towards the margin, abruptly contracted to the narrow eccentric 3-4 mm. long hilum; funicle very short and thick, 3 mm. long, 4.5 mm. broad.

WEST TROPICAL AFRICA. Gold Coast: Offin Headwaters, Ashanti, *Vigne* 1056 (type in Kew Herb.); Juaso, Ashanti, *Vigne* 1796; *Irvine* 385. Sierra Leone; Kennema, *Aylmer* 225 (S.L.F.H. No. 558); York Pass, *Lane Poole* 102, 198, 447.

A small spreading tree 6-10 m. high in closed forest, or a medium or tall tree up to 25 m., sometimes with bark "channelled, grooved, knotted and gnarled," and with wine red flowers in long pendulous racemose panicles, and large woody pods. Said to be common at York Pass, Sierra Leone, where it is a "big tree."

Vernacular names—*Samantawa*, *Breni-Atawa* (Ashanti).

The generic name *Chidlowia* is given in honour of the collector, Mr. Chidlow Vigne, Silviculturist, Gold Coast Forest Service; Mr. Vigne was the first to suggest that his specimens represented a new genus.



Chidlowia sanguinea Hoyle—drawn from type specimen. 1, branchlet bearing leaf, $\times 0.7$. 2, older branchlet with inflorescences, $\times 0.7$. 3, portion of inflorescence-axis, $\times 2$. 4, open flower, $\times 2$. 5, calyx, $\times 3.5$. 6, valve of pod from *Vigne* No. 1796, $\times 0.35$. 7, longitudinal section of flower, $\times 3.5$.

For the following description of the wood of this new genus I am indebted to Mr. H. E. Desch, Imperial Forestry Institute, Wood Structure Department.

DESCRIPTION OF WOOD.—Wood hard and moderately heavy, with interlocked fibre producing ribbon grain on radial surface; texture moderately coarse but even; dull grey-brown colour, rather streaky in appearance; vessel lines conspicuous as deep scratches on longitudinal surfaces. Pores of medium size, individually distinct to the naked eye. Soft tissue (parenchyma) abundant, (a) as borders to the vessels, distinct with lens on end surface and prominent on longitudinal surfaces, (b) as wavy tangential bands. Rays fine, visible with lens on end surface; tendency to storeyed arrangement.

MATERIAL.—Imperial Forestry Institute No. 5749. (Vigne's number 1056).

Note.—This description is based on one small hand specimen which appears to be from a young tree and may be entirely sapwood.

XII.—CONTRIBUTIONS TO THE FLORA OF BURMA: X.* C. E. C. FISCHER.

Acacia brunnescens C. E. Parkinson, sp. nov. [Mimosaceae]; *A. pseudo-Intsia* Miq. et *A. pennatae* Willd. affinis, ab illa inflorescentia glabra, ab hac foliolis majoribus, ab utraque inflorescentiis inermibus recedit.

An extensive climber, the stems armed with prickles, the branchlets unarmed, smooth and dark brown. Leaves 11–21 cm. long, rhachis glabrous, furnished with a large oblong gland about 2.5 cm. above the base and with two glands at the top, one between each of the two terminal pairs of pinnae. Pinnae 8–12 pairs, 9–10 cm. long, minutely brown-hairy along the channel above. Leaflets 36–48 pairs along each pinna, glabrous, becoming brown in drying, oblong with a square base and rounded apex, the midrib nearer the upper edge of the leaflet, 8–10 mm. long, 1.7–2 mm. wide at the base and somewhat narrower at the top. Panicles terminal and from the axils of the uppermost leaves, glabrous and unarmed; peduncles 1 to 3 together, 1.5–2 cm. long, glabrous; flower heads claret-coloured in bud, yellow when open, 1.3 cm. in diameter. Calyx 2–2.5 mm. long, cleft half way down, the acute segments clothed with short hairs in the upper part. Corolla 2.5–3 cm. long, cleft about one-fourth down, the lobes hairy at the tip. Stamens 0.5 cm. long. Fruit not seen.

LOWER BURMA. Pegu Yoma, Insein District, Pyinmadaw, flowers Dec., C. E. Parkinson (type); Tavoy, Eindayaza to Mintha Sakan, flowers Nov., R. N. Parker 2191. Burmese name: Sooyit (Pegu Yoma).

The leaves turn a characteristic brown in drying.

*Continued from K.B. 1931, p. 29.

Eugenia spissa Craib [Myrtaceae].

Known from Siam.

S. Tenasserim, Htahpe Chaung, Ngawun Res, 300 ft., flowers Jan., *C. E. Parkinson* 1614. "A tree 30 ft. high; flowers white." Chan name: *Mai wa*.

Viburnum cordifolium Wall. [Caprifoliaceae].

Known from the Himalayas, from Kumaon to Bhutan.

Myitkyina District, Hpimaw Pass, 11,000 ft., young fruit July, *Sukoe* per *C. E. Parkinson* 10,078. "Shrub; stem soft, sub-herbaceous; fruit red."

Viburnum shweliense W. W. Smith [Caprifoliaceae].

Reported from W. China.

Myitkyina District, Hpimaw Pass, above 11,000 ft., flowers July, *Sukoe* per *C. E. Parkinson* 10,083. "Middle-sized tree; calyx red, corolla white."

Lonicera Braceana Hemsl. [Caprifoliaceae].

Found in the Khasia Hills.

Myitkyina District, Hkamkawn, 3100 ft., flowers July, *Sukoe* per *C. E. Parkinson* 10,026. "Woody climber; stems and twigs dark-grey; flowers white, yellowish-purple outside."

Lonicera Henryi Hemsl., forma [Caprifoliaceae].

Previously known from W. China.

Myitkyina District, Hpimaw Pass, 10,000 ft., flowers July, *Sukoe* per *C. E. Parkinson* 10,088. "Climber; flowers whitish."

Lonicera purpurascens Hook. f. et Thoms., forma [Caprifoliaceae].

Known from Kashmir to Sikkim in the Himalayas.

Myitkyina District, Hpimaw Pass, 11,000 ft., flowers July, *Sukoe* per *C. E. Parkinson* 10,072. "Shrub; flowers whitish or yellowish-white."

Agapetes Bulleyana Diels [Vacciniaceae].

Hitherto known only from N. W. Yunnan.

Myitkyina District, Kangfang-Chimali Pass, 6200 ft., young fruit May, *Sukoe* per *C. E. Parkinson* 9869. "Epiphytic shrub."

Vaccinium Delavayi Franch. [Vacciniaceae].

From Yunnan.

Myitkyina District, Chimali Pass, 10,000 ft., flowers May, *Sukoe* per *C. E. Parkinson* 9908. "Epiphytic shrub; flowers white, pinkish in bud."

Vaccinium scopulorum W. W. Smith [Vacciniaceae].

Known from Yunnan.

Myitkyina District, Langyang, 3500 ft., young fruit April, *Sukoe* per *C. E. Parkinson* 9183. "Epiphytic shrub; roots bulbous."

Palaquium obovatum (Clarke) King et Gamble [Sapotaceae].

Known from the Malay Peninsula. It is included in Roger's edition of Lace's list without reference to any collected specimen, but probably on the authority quoted below.

S. Tenasserim, Divisional Forest Officer, Coll. List 447, Imperial Forest School Dehra Dun 4369. Burmese name: *Pinlebyin aywetgyi*.

Diospyros Wallichii King et Gamble [Ebenaceae].

Reported in Siam and the Malay Peninsula.

Mergui, Tenasserim, Sindin, flowers March, *Maung Po Khant* per *C. E. Parkinson* 11,331. Vernacular name: *Tok-pin*.

Styrax benzoides Craib [Styracaceae].

Known previously only from Siam.

Myitkyina District, Langyang—Htawpaw, 3200 ft., flowers April, *Sukoe* per *C. E. Parkinson* 9180. "Middle-sized tree; stem dark-grey; blaze red; flowers white, stamens yellow."

Strophanthus perakensis Scortechini [Apocynaceae].

Found in the Malay Peninsula.

Victoria Point, Tha-tay-kyun, Tenasserim river banks, flowers March, *Maung Po Khant* per *C. E. Parkinson* 11,377.

Pseuderanthemum angustifolium Ridl. [Acanthaceae].

Known from Siam.

Mergui, Maliwun, flowers Feb., *R. N. Parker* 3179. "Shrub 30-60 cm. high, on rocks in stream-bed; flowers bright mauve."

Alseodaphne merguensis *C. E. Parkinson*, sp. nov. [Lauraceae]; ab *A. grandi* Nees foliis minoribus subtus brunneis haud glaucis, inflorescentia pubescente haud glabra distinguenda.

A tall tree, branchlets with thin, brown, smooth bark; young parts clothed with reddish-brown pubescence. Leaves 15-20 cm. long, 6-8 cm. wide, obovate, narrowed down to the 1.2 cm. long petiole, apex rounded or shortly acuminate, soon glabrous and turning dark brown, lateral nerves 8-10 pairs, ascending and looping with distinct transverse nerves and venation. Flowers yellowish, umbellate on the short branches of a slender axillary panicle hardly as long as the leaves; peduncles 7-10 cm. long; flower-buds clavate, yellow-brown pubescent, pedicels 3 mm. long. Perianth segments 6, the three outer smaller. Stamens 9, anthers 4-celled, the outer 6 with introrse anthers, 3 inner with extrorse anthers. Fruit ellipsoid-oblong, 4 cm. long, 1.8 cm. in diameter, black when ripe, the peduncle not swollen.

LOWER BURMA. South Tenasserim, Mergui District, Victoria Point, *Maung Po Khant* per *C. E. Parkinson* 11,341 (type); Palauk, *Sukoe* per *C. E. Parkinson* 11,035; Maliwun, *Sukoe* per *C. E. Parkinson* 10984; Amherst District, Thaungyin Valley, Mepale, *Maung Tha Myaing* 35 and 149. Burmese name: *Kaswe*. The fruit was described from No. 11,035.

Glochidion nanogynum Hook. f. [Euphorbiaceae].

Reported from the Malay Peninsula.

Mergui, Maliwun, fruit Jan., R. N. Parker 3159. "Small tree; capsule 6-seeded; seeds red."

Dendrocalamus Hamiltonii Nees et Arn. [Gramineae].

Known from N. E. India. It is included in Lace's List of trees and shrubs of Burma, but without definite locality.

Myitkyina District, Wasaung, April, Sukoe per C. E. Parkinson E 37. "Stems in densely packed clusters." Vernacular name: *Wabo*.

XIII.—MISCELLANEOUS NOTES.

PROFESSOR W. A. ROBYNS.—We learn with pleasure that Professor W. A. Robyns has been appointed Director of the Jardin Botanique de l'Etat, Brussels, in succession to Professor E. De Wildeman.

GEORGE FORREST.—We share the wide-spread regret caused by the sad news of the death, from heart failure, of Mr. George Forrest, which occurred on the 5th January at Tengyueh in Yunnan, western China. He was still a comparatively young man—he was born on the 13th March, 1873—and, judging from his wonderful achievements during the last thirty years, it is undoubted that he would have done much further valuable work had his life been prolonged, but he has lived long enough to establish a reputation which secures him a prominent place in the front rank of botanical collectors, and his name will be remembered for all time with gratitude and honour. It is no exaggeration to apply to him the phrase, slightly modified, used by Humboldt of Forrest's illustrious countryman, Robert Brown, *collectorum botanicorum facile princeps*.

Forrest was a native of Falkirk. In early manhood he spent some time in Australia and South Africa, and it was not till he was nearly thirty that he entered on the career in which he has so distinguished himself. On the recommendation of the late Sir Isaac Bayley Balfour he was engaged by Mr. A. K. Bulley, of Neston, Cheshire, to collect plants and seeds in China, and made his first expedition there in 1904-06. The expedition which has proved to be his last was his seventh.

Forrest was fortunate in getting into districts of Yunnan and eastern Tibet which were especially rich in interesting plants and which were practically unexplored botanically. His collections comprise about 30,000 numbers, and are remarkable for the excellence of the specimens and the admirable labels furnished with them. It is a pleasure to see and deal with such material. Several new genera, very numerous new species, and a host of interesting and beautiful garden plants have become known to us through Forrest's labours. His collections which were received at the Royal Botanic

Garden, Edinburgh, have been the subject of numerous contributions to the volumes of the *Notes* published by that establishment. An almost complete set has been presented by Edinburgh to Kew.

Among the honours awarded to Forrest were the Victoria Medal of Honour and the dedication of volume cxlviii of *Curtis's Botanical Magazine*, by the Royal Horticultural Society. A portrait of him, with biographical note, appears in the recently published volume, "Curtis's Botanical Magazine Dedications, 1827-1927," by E. Nelmes and W. Cuthbertson, and the same portrait is published in the *Gardener's Chronicle* of January 23, 1932. Forrest was elected a Fellow of the Linnean Society in 1924.

The Hon. VICARY GIBBS.—By the death of Mr. Vicary Gibbs on January 13th, Kew has lost an old and valued correspondent. For nearly thirty years a constant interchange of plants, chiefly hardy trees and shrubs, has been carried on between this establishment and Aldenham. Besides being a cultivator in the first rank, Mr. Gibbs was an ardent collector. For many years past he has paid an annual visit to Kew, the last in November, 1931, to inspect the nurseries and arrange exchanges, and it was interesting to see how keen he was to obtain additional species for his collection irrespective of any ornamental qualities they might possess. The result is that Aldenham possesses a collection of trees and shrubs probably second only in this country to that of Kew in extent. In the Ericaceae Aldenham is weak, but only because of the unfavourable nature of the soil; the harshness of the climate also makes impossible the cultivation of many plants that give so much beauty and interest to the gardens of Sussex and Hampshire, not to mention those farther west. Mr. Gibbs took a rather grim pride in the fact that Aldenham had achieved a frost during every month of the year.

Equalling his acquisitiveness as a collector was his love of order and cleanliness. Aldenham has many rare plants but after a tour of the garden one always felt that a weed was probably the rarest. His love of pruning his trees, generally in a pyramidal shape, was one of his best known characteristics. It became in the end something of a joke amongst his numerous friends. But although he may have carried the process too far for the taste of most people, there is no doubt that he has laid the foundation of many fine trees if they are allowed to stand.

This is not the place to dwell on his triumphs in the horticultural show tents, but we believe that the gold medals he has been awarded number one hundred, not to mention silver cups and other trophies. His exhibits of vegetables have never been surpassed. Although his chief interest no doubt was in trees and shrubs, his greenhouses sheltered fine collections of *Streptocarpus*, *Cape Pelargonium* and other things. Whatever has been grown at Aldenham has been grown well. The gardening world has lost a great and in many respects unique personality.

The International Association of Wood Anatomists.—We note with interest that, as the outcome of unofficial meetings at the Cambridge University Forestry School, during the 5th International Botanical Congress, to discuss the formation of an International Association of Wood Anatomists, a committee was appointed to draw up a constitution for an 'Association' and report to the "Congrès International du Bois et de la Sylviculture" held at Paris in 1931.

A constitution was duly adopted at this Congress with the following objects: (a) to interchange ideas and information through correspondence and meetings, (b) to facilitate the collection and exchange of material, (c) to work towards standard terminology and descriptions, (d) to stimulate the publication of scientific articles and abstracts, and (e) to encourage and assist the study and teaching of wood anatomy. Further particulars of the organisation are given in "Tropical Woods" No. 27, pp. 20-23.

Septoria Cotyledonis.—Elsenburg, the locality for this fungus in South Africa given in *K.B.* 1931, 203, was stated to be in Natal instead of in Cape Province, owing to a misreading of the list accompanying the collection.

Botanical Magazine.—The second part of Vol. clv. of the Botanical Magazine was published on February 1st and contains the following plant portraits:—

Cycnoches Egertonianum Bateman (t. 9260), from Central America, the plant figured is a male specimen and *C. Rossianum* Rolfe is considered to be the female form and is therefore made conspecific with *C. Egertonianum*; *Watsonia Wordsworthiana* Matthews & L. Bolus (t. 9261), a beautiful pink-flowered species from the Tulbagh Division, Cape Province, S. Africa; *Schizophragma viburnoides* Stapf (t. 9262), from southern and south-eastern China and Formosa—this is a new combination, the plant having been originally placed in the genus *Pileostegia* by Hooker & Thomson; *Rhododendron sanguineum* Franch. (t. 9263), a low shrub found in north-western Yunnan between 3300 and 4200 m.; *Ceanothus Fendleri* A. Gray (t. 9264), a low shrub of the eastern Rocky Mountains from Arizona to South Dakota; *Selago serrata* Bergius (t. 9265), an interesting member of the genus from the south-western corner of the Cape Province, South Africa, which was originally introduced by Masson in 1774; *Primula Dubernardiana* Forrest (t. 9266), discovered by Forrest in 1904 on the eastern flank of the Mekong-Salween divide, south-western China; *Raffenaldia primuloides* Godron (t. 9267), an interesting Crucifer from North Africa; *Erodium Mouretii* Pitard (t. 9268), a native of western Morocco; *Fremontia mexicana* Macbride (t. 9269), found in Mexico and Lower

California, and *Phlomis italica* Linn. (t. 9270), which is a native of the Balearic Isles and is not found in Italy.

Mesembryanthema.*—This is a most unusual form of book dealing only with the stemless or almost stemless plants which until a few years ago were all included in the genus *Mesembryanthemum*. The information relating to these interesting South African succulents is printed in English, German and Dutch, which makes the volume somewhat bulky. The book is mainly the work of Mr. N. E. Brown, whose first acquaintance with the group began as long ago as 1865, when he saw a collection of over 300 species at Reigate, some of the plants or descendants of them having formed part of the celebrated Haworth's own collection.

Since 1925, when Mr. Brown first published in the *Gardeners' Chronicle* his key to the segregated genera, a great amount of work has been done, not only by himself, but by botanists in South Africa and in Europe, where the fancy for these weird and interesting plants has developed much more rapidly than in England. Naturally there has arisen considerable difference of opinion as to the amount of generic "splitting" desirable and in regard to the interpretation of the older species with new or living material, many of them being represented by ill-preserved herbarium specimens or known only from figures. This is particularly noticeable in the case of some species; for example the *Mesembryanthemum edentulum* of Haworth has been described in the course of the last few years as *M. apiculatum* Kensit, *M. binum* N. E. Br., *Echinus apiculatus* L. Bolus, *Braunsia bina* Schwantes, and now in this book it is *Braunsia edentula* N. E. Br. Again, the *M. canum* of Haworth has been called *M. Tugwelliae* L. Bolus, *Juttadinteria Tugwelliae* Schwantes, *Hereroa Tugwelliae* L. Bolus, *Bolusanthemum Tugwelliae* Schwantes, and now Mr. Brown says it has to be *Bijlia cana* N. E. Br. The lay botanist will be apt to enquire whether about 25 to 30 genera instead of about 100 would not have been sufficient to accommodate the species which, until a few years ago, were all included in one genus.

The book is profusely illustrated by photographs, a few of the species in their natural habitat in South Africa being shown by photographs taken by Dr. I. B. Pole Evans. The remainder are mainly photographs of cultivated plants in this country or on the Continent and do not therefore necessarily show the plants as they are found in the arid South African Karoo and in Namaqualand; there are also two coloured plates by Mr. N. E. Brown. One of the most minute species is *Conophytum Comptonii*, shown on page 145, fig. 44, D; this plant in its natural habitat on the top of the escarpment near the Van Rhyns Pass, Calvinia Division, almost defies

**Mesembryanthema*, by N. E. Brown, A.L.S., Dr. A. Tischer and M. C. Karsten, edited by E. J. Labarre, pp. 323. L. Reeve & Co., Ltd., Bank Street, Ashford, Kent, England (1931). Price 36s. (in Germany R.M. 37; in Holland 22 gulden).

detection. A mistake has been made in stating that this species comes from the Malmesbury Division.

Three authors have been responsible for the book. Mr. Brown has supplied practically all the descriptions, Dr. Tischer has translated these into German and contributed a chapter on cultivation and diseases, while Miss Karsten translated the English and German text into Dutch and the Dutch and German into English and has also compiled a chapter on "General Ecology," mainly from the writings of Dr. Marloth and others with actual experience of the group in the veld.

The book is primarily intended for the cultivator or "fancier" of these wonderful South African succulents. The genera are not defined and there are no keys, but the excellent photographs will very often be sufficient to determine many of the species in cultivation without much reference to the descriptions, some of which are relatively very short.

J. H.

British Marine Algae.*—A copy of the new "Handbook of British Seaweeds" prepared by Dr. L. Newton, Professor of Botany at University College, Aberystwyth, has been received from the Trustees of the British Museum. The appearance of this work has been awaited with interest as it is 81 years since the great classic, Harvey's "Phycologia Britannica," still the stand-by of many British algologists, was published.

The volume opens with an introductory chapter containing an account of the main groups of marine algae with paragraphs on their distribution, their ecology and economic uses, and also on their collection and preservation. In the body of the work the main groups are dealt with in the following sequence:—Myxophyceae, Chlorophyceae, Phaeophyceae, Rhodophyceae, and the arrangements of the orders and families is, as a whole, that of the "Catalogue" published by Batters in 1902. Keys to genera, some of which appear to be original, are provided at the commencement of the groups, and useful keys are also given to the species. The descriptions of both genera and species are short, but they are accompanied by copious and most serviceable illustrations. Some of the latter are by the author, but most are the work of the late Mr. Percy Highley, the well-known artist at the British Museum.

The author had an onerous task which has been carried out under circumstances of difficulty and the publication of the volume forms a landmark in the history of British Algology. For the greater number of species the author is on safe ground and her work has been well done. There remain many doubtful species and several notoriously difficult genera which have long been an obstacle in the way of the publication of a Flora. No doubt Prof. Newton is fully

*Handbook of the British Seaweeds, by Lily Newton, Ph.D., F.L.S. The Trustees of the British Museum, London, 1931. Pp. xiii. 478 and 270 figures. Price 15s.

conscious that in these cases much revision will be necessary as the result of further research. This is not the place to enter into detailed scrutiny. One serious defect, which it appears was due to a misunderstanding, must, however, be noted, namely that though the work is intended to be a complete Flora, only a very small proportion of the species added to the British list since 1902 has been incorporated. This neglect of recent work involves the omission of eight genera, including the well-known *Colpomenia* and over 30 species.

Biographical Index of British and Irish Botanists.*—

Britten and Boulger's Index has long been recognised as an exceedingly useful work of reference for biographical details of deceased botanists of British and Irish nationality. It originally appeared by instalments in the Journal of Botany for the years 1888-1891, and so much supplementary information was subsequently received that the Index, continued to the end of the year 1892, was published as a separate work of 188 pages in 1893. Three Supplements, issued in 1899, 1905, and 1908 respectively, carried the work to the end of 1907, and this second, much enlarged edition, revised by Dr. A. B. Rendle, carries it to the beginning of 1928.

The information supplied includes the dates of birth and death of the botanist concerned, and an indication of his occupation, degrees, and titles, offices held, and published botanical work. The present whereabouts of any correspondence or manuscripts and the existence of any herbarium or of plants collected are also given, and the chief sources of further information are cited.

In a work of this comprehensive nature there are bound to be numerous omissions and inaccuracies, and Dr. Rendle asks that he may be notified of any that are detected. Since it is stated in the Preface that, in including names, "generosity has been shown to those who have contributed to local botany," certain additional names may be suggested such as Henry Clarke, 1858-1920, who published many new county records for Cardigan (Rep. Bot. Soc. & Exch. Club Brit. Isles, 1920, 101: 1921), and A. S. Montgomery, 1844-1922, whose herbarium is preserved in the Museum Free Library, Cheltenham (l.c. 1922, 707: 1923). Botanists should be grateful to Dr. Rendle, and to Mr. John Ardagh, whose assistance is specially acknowledged in the preface, for bringing this very useful work up to date.

Royal Horticultural Society Honours to Kewites.—Under this heading in *K.B.* 1932, 43, five lines from the bottom of the page, "Messrs. Sutton & Sons, St. Albans" should read "Messrs. Sanders, St. Albans."

*A Biographical Index of deceased British and Irish Botanists, compiled by James Britten and George S. Boulger. Second edition, revised and completed by A. B. Rendle. London: Taylor and Francis, 1931, 8vo., pp. xxii + 342. Price 15s. net.

The late Mr. Ledger's collection of succulent plants.—Mr. Walter E. Ledger, who died on December 11th, 1931, was a constant correspondent of Kew and frequently visited the Gardens, where he was a very familiar figure, as he almost always was dressed as a sailor. His particular interest was the genus *Ceropegia*, but he was also a keen cultivator of Orchids, *Haemanthus*, *Crinum*s, and other plants both tender and hardy, and had got together an unique collection of *Ceropegias* at his home at Wilton Grove, Wimbledon. His executors have very kindly presented the whole of his living collection of tender plants to Kew, as well as his dried collection of *Ceropegias* with his notes and drawings. The living plants, some 300 in number, the majority being *Ceropegias* and bulbous plants, have now been received and form a very valuable addition to the Kew collections.

Mr. Ledger's interest in plants dates back some forty years and it was rather from their peculiarities or scientific interest than from their beauty that he was drawn to collect and study certain groups.

Mr. C. H. Wright, who knew Mr. Ledger intimately, has kindly sent the following note about his botanical activities: "Although interested in cultivated plants generally Mr. Ledger devoted himself specially to *Asclepiadaceae* and *Amaryllidaceae*, many species of which he grew at his home at Wimbledon. His favourite genus was *Ceropegia*, of which, with the assistance of various correspondents in South Africa, he got together a fine collection of species. As soon as a plant new to him flowered he brought a specimen to Kew not only to have it named or the name confirmed, but also to learn as much as possible about it, for he was not content with superficial knowledge. It is much to be regretted that, with his great knowledge and keen observation of the plants he was specially interested in, he published so little.

"Mr. Ledger was extremely fond of the sea and used to spend his summers in cruising around the British Isles in his yacht 'The Shrimp' and in visiting cottage gardens where (as he told the writer) he often found uncommon plants growing which had been brought to England by sailors. In his early years Mr. Ledger travelled in South America."

MR. T. W. TAYLOR.—We record with very deep regret, as this goes to press, the death, on March 4th, of the Curator, Mr. T. W. Taylor.

BULLETIN OF MISCELLANEOUS INFORMATION

No. 3 1932

ROYAL BOTANIC GARDENS, KEW

XIV.—SOME INDIAN RHODOPHYCEAE, ESPECIALLY FROM THE SHORES OF THE PRESIDENCY OF BOMBAY. II.* F. BOERGENSEN.

Erythrotrichia carnea J. Ag., Till Algerne Systematik vi. 1883, 15; Rosenvinge, Mar. Alg. Denm., part i. 1909, 67, fig. 8.—*Conferva carnea* Dillwyn, Brit. Confervae, 1809, pl. 84.—*Conferva ceramicola* Lyngb., Hydrophyt. Dan. 1819, 144, pl. 48 D. *Erythrotrichia ceramicola* Aresch., Phyc. Scand., 1850, 210; Berthold, Bang. Golf. Neapel, 25.

This species was found as an epiphyte upon the lower stems of *Chondria cornuta* sp. nov. and on *Haloplegma Duperreyi* cast ashore at Okha Port. The Indian specimens, which were fructiferous, agree well with the descriptions of Berthold and of Rosenvinge. The filaments are about 14–22 μ thick.

INDIA: Okha Port; Santa Cruz, near Bombay.

Distr. Atlantic Ocean, Mediterranean Sea, Malayan Archipelago, Pacific coast of America.

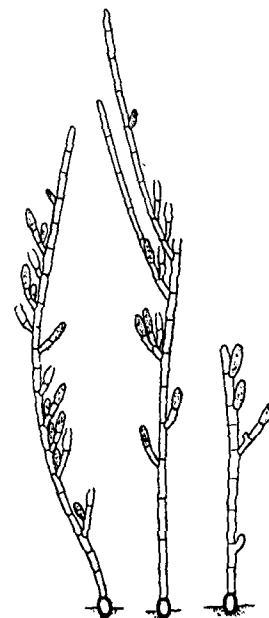


Fig. 1. *Acrochaetium erectum* Boergs. Three plants with monosporangia ($\times 250$).

*Continued from K.B. 1931, p. 24.

Acrochaetium erectum Boergs., sp. nov.; *A. Dufourii* Collins proximum, quod tamen filamentis erectis pluribus, thallo magis racemoso, cellulis brevioribus, sporangiis brevioribus et crassioribus praecipue distinguitur.

Thallus usque ad 400–500 μ altus e cellula basali oritur filum emittente erectum plus minus ramosum e cellulis cylindricis 5 μ latis et 12 μ longis compositum. *Rami* sparsi aut secundati, rarissime oppositi. *Chromatophorum* parietale, pyrenoide laterali instructum. *Sporangia* sessilia aut pedicellata, ellipsoideo-subcylindrica, 10 μ longa, 5 μ lata.

INDIA. Dwarka, upon *Agardhiella robusta*, Boergesen 5431 (type).

The basal cell (Fig. 1) is partially immersed in the thick cuticle of the host and is usually a little longer than broad, namely 8–9 μ long and 5–6 μ broad. I have always found only a single erect stem from the spore. In most cases this erect stem is not ramified below and many of the specimens consist only of the short main filament from which a few sporangia or quite short branches are given off. The ramification is alternate or secund: I have only once seen two pedicels with sporangia given off oppositely from the same cell. The sporangia are sessile or pedicellate, oblong-cylindrical, 4–5 μ broad, 10–11 μ long.

Of the many small species of *Acrochaetium* with a single basal cell, our plant is especially reminiscent of *A. Dufourii* Collins growing on *Sargassum* (Rhodora, vol. xiii, 1911, 187; compare Hamel, in Revue Algolog., 1926, 111, fig. 18), but this is a more branched plant with several erect filaments of shorter cells, and with shorter and thicker sporangia.

Acrochaetium dwarkense Boergs., sp. nov.; *A. macropodi* Kylin verisimiliter proximum, quod tamen praeter alia ramis saepe alternantibus, chromatophoro stellato, sporangiis sessilibus (rarissime pedicellatis), pilis praesentibus a nostra specie distinguitur.

Thallus epiphyticus, ad 500 μ altus, e cellula basali globosa 9–10 μ lata et filis erectis (1–pluribus) compositus. *Fila erecta* opposita ramosa, in superiore parte ramorum plus minus unilateraliter ramosa, e cellulis in inferiore parte 6–7 μ latis 10–13 μ longis, in superiore 3–4 μ latis sistens. *Chromatophorum* parietale, lobatum, pyrenoide minore laterali munitum. *Monosporangia* ovato-globosa, pedicellata aut sessilia, 5 μ lata, 6–7 μ longa.

INDIA: Dwarka, on old specimen of *Dictyotaceae*.

From the basal globular cell, the wall of which is about 1–1.5 μ thick, several (usually 2–4) erect filaments issue (Fig. 2b). Near the base, the cells are about 6–7 μ broad and 10–13 μ long, tapering upwards to about 3–4 μ . The filaments are very much branched from the base and upwards. The ramification is in most cases opposite and a pair of branchlets are given out from almost every cell in the main filaments, but occasionally a single branch only is developed, and in the upper part of the filaments the ramification has

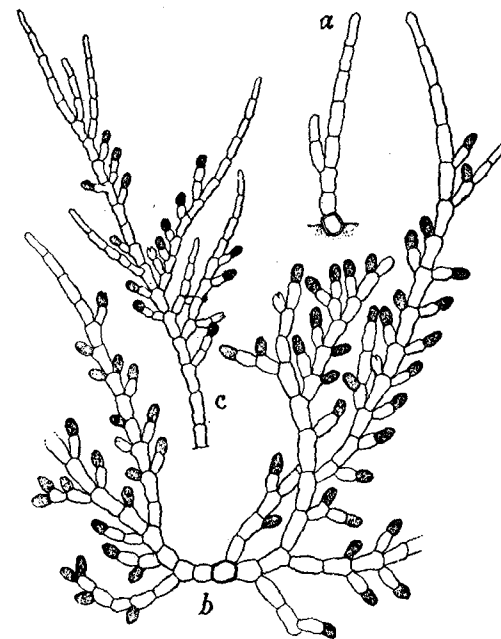


Fig 2. *Acrochaetium Dwarkense* Boergs. a, a young plant; b, plant with monosporangia; c, part of a plant. (a, b, $\times 300$; c, $\times 165$.)

a tendency to become unilateral (Fig. 2c). The uppermost slender parts of the filaments are unbranched.

The chromatophore is a thick, parietal, irregularly lobed plate with a slightly protruding pyrenoid.

The sporangia are oblong-globular, about 6–7 μ long and 5 μ broad. They are either sessile or pedicellate, the latter being the more frequent. The pedicels are nearly the same length as the sporangia.

Acrochaetium sargassicola Boergs., sp. nov.; *A. affini* Howe et Hoyt proximum, quod tamen disco basali magis evoluto, antheridiis alio modo formatis praecipue differt.

Thallus usque ad 2 mm. altus. *Cellula basalis* major, oblongo-subcylindrica, parte basali in textura hospitis immersa; e parte superiore, haud immersa, fila erecta nascuntur. *Fila erecta* a basi ramosa, apicem versus sensim paullum attenuata, in parte basali 8–13 μ lata, superne 5 μ lata. *Cellulae* cylindricae, inferiores 18–25 μ longae, superiores ad 50 μ longae, chromatophorum parietale pyrenoide laterali instructum complectentes. *Ramificatio* uberrima, ramis sparsis, in superiore parte plus minus secundatis. *Sporangia* sessilia aut pedicellata, subcylindrico-ellipsoidea, 16–19 μ longa, 11 μ lata. *Antheridia* et *carpogonia* in ramulis brevibus plerumque secundatim ortis nascuntur.

INDIA: Bombay, growing socially upon *Sargassum* sp.; Boergesen 5005 (type).

The plant (Fig. 3) reaches a height of more than two mm. The basal cell (Fig. 4a) is oblong-subcylindrical, often a little narrowed in the middle. The lowermost part is embedded in the tissue of the host. It has a length of about $26-28\ \mu$ and a breadth of $12-15\ \mu$ and has thick walls. In rare cases an accessory cell is developed close to the original basal cell (Fig. 5a). The erect filaments are from $8-13\ \mu$ broad with cells $18-25\ \mu$ long. Higher up, the filaments taper gradually and the cells are longer, about $8\ \mu$ broad and $50\ \mu$ long. The tips of the filaments are about $5\ \mu$ and the apical cells are rounded.

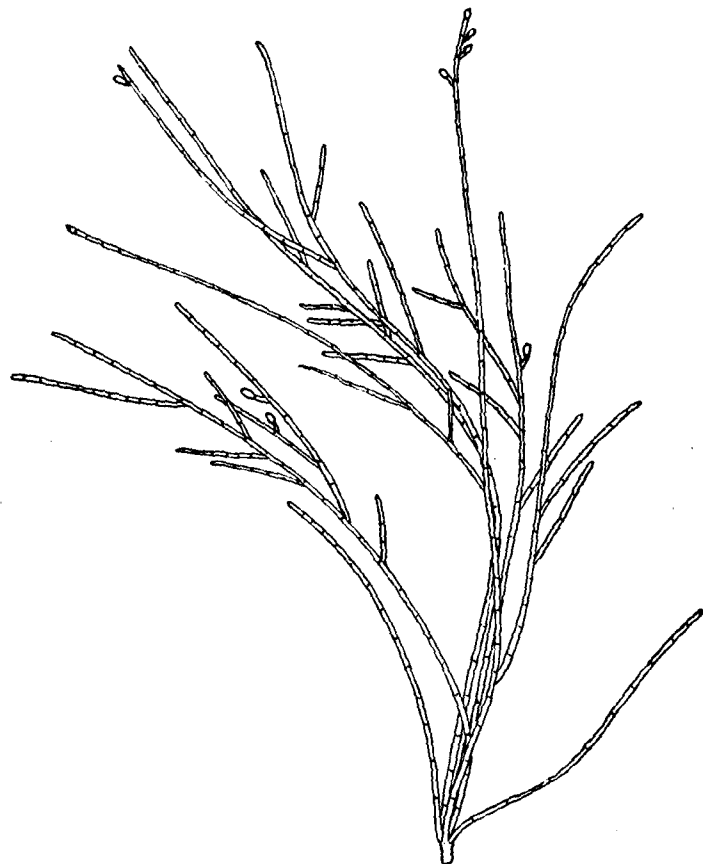


Fig. 3. *Acrochaetium sargassicolum* Boergs. Habit of plant ($\times 120$).

The plant is much branched above, and the branches are given off irregularly on all sides, though with a tendency to be unilateral. As far as can be seen from dried material (my material in spirit had dried), the chromatophore is parietal with a large protruding pyrenoid. The sporangia are ellipsoidal in shape; though generally sessile or pedicellate, some are terminal at the ends of the filaments. The sporangia are about $11\ \mu$ thick and $16-19\ \mu$ long. The antheridia (Fig. 4d) are developed on short unilateral or rarely opposite

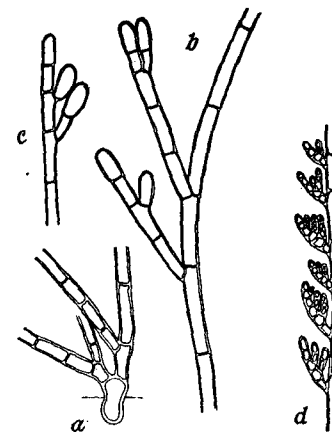


Fig. 4. *Acrochaetium sargassicolum* Boergs. a, base of plant; b, c, branches with monosporangia; d, branch with antheridia. (a, b, c, $\times 300$; d, $\times 250$).

branchlets. The main filaments of the branchlets are about $50\ \mu$ long and composed of 5-6 short cells. The ramuli with antheridia are produced on the upper side of these cells (Fig. 5c). Very few carpogonia were seen and these were in most cases in rather poor condition. They occur in the branchlets close to the antheridia and have the usual lageniform shape (Fig. 5c). Monosporangia occur on the same plant and even on the same branch as the sexual organs (see Fig. 5b, showing branchlets with sporangia and antheridia alternating).

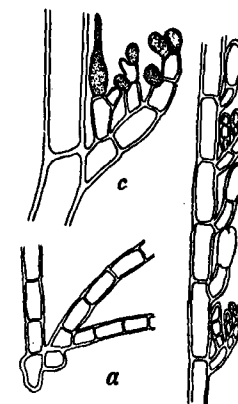


Fig. 5. *Acrochaetium sargassicolum* Boergs. a, base of plant showing beginning of a disc ($\times 250$). b, branch with monosporangia and antheridia alternating ($\times 350$); c, branchlet with a carpogonium and antheridia ($\times 600$).

Acrochaetium sargassicolum comes near to the three related species, *A. affine* Howe et Hoyt, *A. robustum* Boergs. and *A. Hoytii* Collins. A thorough comparison of their relationship has been made by Howe and Hoyt (see Memoirs New York Bot. Gardens, 1916, 118). Besides

differences in size, etc., *A. robustum* has a small disc, which is also more or less developed in *A. affine*, but is not present in *A. Hoytii*.

Acrochaetium subseriatum Boergs., sp. nov.; *A. seriato* Boergs. proximum, quod tamen thallo robustiore et cellulis brevioribus a specie nostra distinguitur.

Thallus caespitosus, usque ad 1 mm. altus, e filamentis brevibus irregulariter ramosis in thallo hospitis repentibus surgens et e filamentis erectis ramosis compositus. *Fila erecta* in basi plus minus quoquoersum, in superiore parte unilateraliter ramosa, e cellulis cylindricis inferne 27 μ longis, 5–8 μ latis, medio 35 μ longis, 4–6 μ latis, composita; chromatophorum parietale, pyrenoide laterali instructum. *Sporangia* oblongo-ovata, 11–12 μ longa et 6–7 μ lata, sessilia aut raro pedicellata, ad basin ramorum seriatim orta.

INDIA: Tuticorin, in *Chondria* sp. epiphytica, Boergesen 5710 (type).

This plant (Fig. 6) is found upon *Chondria armata* Okam. var. *plumaris* (described in this paper). It forms dense, very branched tufts, about 1 mm. high. The base consists of short, irregularly ramified, creeping filaments composed of short cells (Fig. 6b). These filaments are probably partly immersed in the cuticle of the host

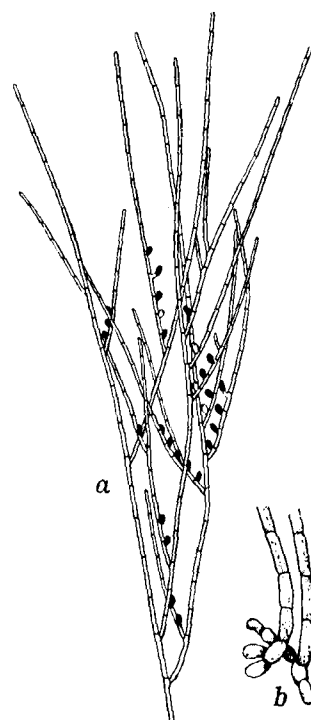


Fig. 6. *Acrochaetium subseriatum* Boergs. a, upper part of the thallus with sporangia ($\times 150$). b, basal part of a plant ($\times 350$).

(without being endophytic), but on account of the scarcity of material this could not be proved. From the basal filaments several erect filaments arise. These consist, in the lower part, of cells about 4–5 times as long as broad, and, in the middle, of cells about 6–8 times as long as broad, which taper a little towards the apex. The upper ends are obtuse and hairs are not present. The filaments are less branched in the lower part than higher up; the branches are given out on all sides, but in the upper parts they have a tendency to be unilateral (Fig. 6a). The cells contain a parietal lobed chromatophore with a large, much protruding pyrenoid in the middle (Fig. 7). The sporangia are seriatly placed along the upper side of the branches (Fig. 6a). They are as a rule sessile, but now and then a sporangium is pedicellate, and two-celled branchlets with a sporangium from each cell are also rarely present. The sporangia are oblong-obovate, about 11–12 μ long and 7–8 μ broad.

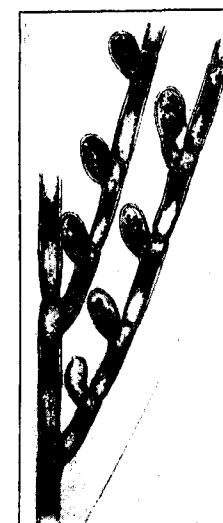


Fig. 7. *Acrochaetium subseriatum* Boergs. Part of the thallus with sporangia ($\times 600$).

The plant is certainly nearly related to the West Indian *A. seriatum*, but it is easily recognised by its slender form and especially by its relatively much longer cells and less marked pectinate appearance.

Grateloupia indica Boergs., sp. nov.; *G. undulatae* J. Ag. proxima videtur, quae tamen praeter alia thallo solidiore, colore obscuriore, perforationibus nullis a specie nostra distinguitur.

Thallus plus minus caespitosus disco parvo adfigitur, unde frons tenax, muscosa, mox dilatata, oblongo-linearis et irregulariter divisa exsurgit. *Thallus* usque 1 m. altus, colore rubro-purpureus, in thalli adultiore feminei forminibus numerosissimis minimis

distinctus, margine irregulariter sinuoso et undulato, hic illic proliferationibus instructus. *Tetrasporangia* cruciatim divisa per totam superficiem thalli dispersa. *Cystocarpia* sparsim in thallo immersa.

INDIA : Okha Port, cast ashore, *Boergesen* 5490 (type).

From a small basal disc a short compressed cuneate stipe is given off which soon broadens into the flat oblong-linear thallus which then extensively divides (Plate II). It is of a very tough consistency and in the living condition is very mucilaginous and slippery. The colour of the dried specimens is dark purple-red with a violet tinge in the older parts of the thallus, becoming paler upwards. The thallus can reach considerable dimensions. I have seen specimens more than 1 metre long, though the largest specimen brought home was only 50 cm. The thallus soon divides into a number of lobes of various sizes and shapes. The margin is irregularly sinuate and waved. In the older parts of the female thallus a great number of small holes are gradually formed, up to 1-2 mm. broad, which probably originate from emptied cystocarps. In the dried female specimens, where the thallus is very perforated, numerous small spatulate proliferations are given off from the margin.

A transverse section shows that the thallus consists of a peripheral layer composed of densely packed short cells which are the terminal cells of short branch-systems. From the innermost larger cells, irregularly- (often stellately-) divided, filaments are given off, running through the mucilaginous interior. The cruciately-divided tetrasporangia scattered in the thallus are formed in the cortical layer.

The cystocarps are dispersed throughout the thallus. After the fertilization of the auxiliary cells these divide into two and from the uppermost cell the gonimoblast filaments are formed from which the carpospores originate. The gonimoblast is surrounded by convex filaments forming an urceolate cavity with an ostiole above. The building up of the cystocarp appears to agree well with Kylin's description of *G. filicina*, except that the latter has several gonimolobes (see Lunds Universitets Årsskrift, N.F., Avd. 2, Bd. xxvi. 19-21, 1930).

This species is related to the West Indian *G. undulata*. The latter has a somewhat smaller, thicker and firmer thallus, which is of a darker and, when dried, more brownish violet, colour. Further, the thallus is less waved along the margin, marginal proliferations are more commonly given off, and the perforations which occur in this new species have not been observed.

Halymenia porphyroides * *Boergs.*, nom. nov. — Syn. ? *Callymenia Harveyana* J. Ag. in Syst. Alg. hod. advers. 1844, 40; Spec. Alg. ii. 288; non *Halymenia Harveyana* J. Ag., Anal. algolog., 1892, 55.

*The name is in allusion to *Porphyra miniata*, which species it strongly recalls, the colour only being a little darker.

PLATE II



Grateloupia indica Boergs, sp. nov.

PLATE III



Halymenia porphyroides Boergs, sp. nov.

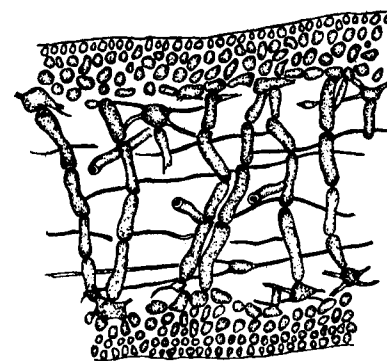


Fig. 8. *Halymenia porphyroides* Boergs. Transverse section of the thallus ($\times 150$).

INDIA : Dwarka ; Okha Port (cast ashore). Karachi, J. A. Murray (Herb. Kew.).

Distr. Cape.

The relationship of this plant with earlier described species has given me much trouble, especially as in most cases I had not access to original specimens. I am strongly inclined to believe that my plant is the same as *Callymenia Harveyana* J. Ag. from the Cape and wrongly placed in that genus. The Indian plant is a member of the *Grateloupiaceae* and referable to the genus *Halymenia*, but since the name *H. Harveyana* is already occupied, Agardh's specific epithet cannot be maintained.

The plant is fastened to rocks and stones by means of a small disc from which a very short stipe changes into the leaf-like lamina (Plate III). In a young, complete specimen the stipe is about $\frac{1}{2}$ cm. long and the base of the thallus broadly cordate. The thallus is tough and elastic with roundish, sinuate and waved edges and becomes gradually more or less lobed. The colour is fine rosy-red. The thallus may reach large dimensions : for instance, a specimen preserved in the Kew Herbarium is 48 cm. long and 41 cm. broad.

A transverse section (Fig. 8) shows that the peripheral layer on both sides of the thallus is composed of short cell-rows several times divided, the innermost cells in these being the larger. In the mucilaginous interior of the thallus numerous transversely placed vigorous filaments are found, connecting the cortical layers on both sides. And crossing in all directions between these filaments are

thinner ones, taking their origin from stellately divided cells, found in great numbers below the cortical layers.

The tetrasporangia, which occur scattered in the cortical layer, are cruciately divided, and measure about $16\ \mu$ by $24\ \mu$ broad.

The cystocarps (Fig. 9) are likewise found scattered in the interior of the thallus. From the auxiliary cell a single cluster of carpospores is formed. The surrounding filaments unite in forming a rather loose-walled, urceolate cavity and the ripe carpospores escape through a small ostiole in the cortical layer.

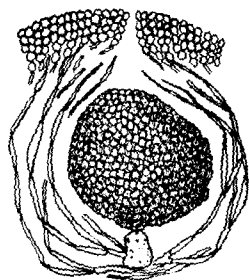


Fig. 9. *Halymenia porphyroides* Boergs. Section through thallus showing cystocarp ($\times 150$).

***Halymenia polydactyla* Boergs., sp. nov. ; *H. Agardhii* De Toni proxima, sed nostra species thallo robustiore tenaciore colore obscuriore, stricturarum absentia distincta est.**

Thallus 27 cm. altus et ultra (?), disco basali substrato adfixus, supra stipitem cuneatim expansus, mox repetitive dichotome divisus, segmentibus teretibus tubulosis circiter 5-7 mm. latis fastigiatis apicibus obtusis. *Tetrasporangia* in strato corticali immersa, sparsa, cruciatim divisa, subgloboso-oblonga, 19-24 μ lata et 20-27 μ longa. *Cystocarpia* ignota.

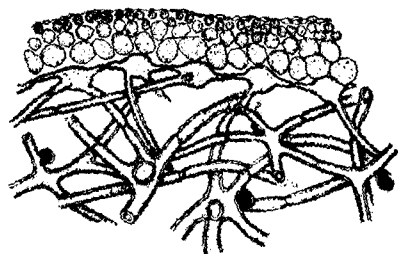


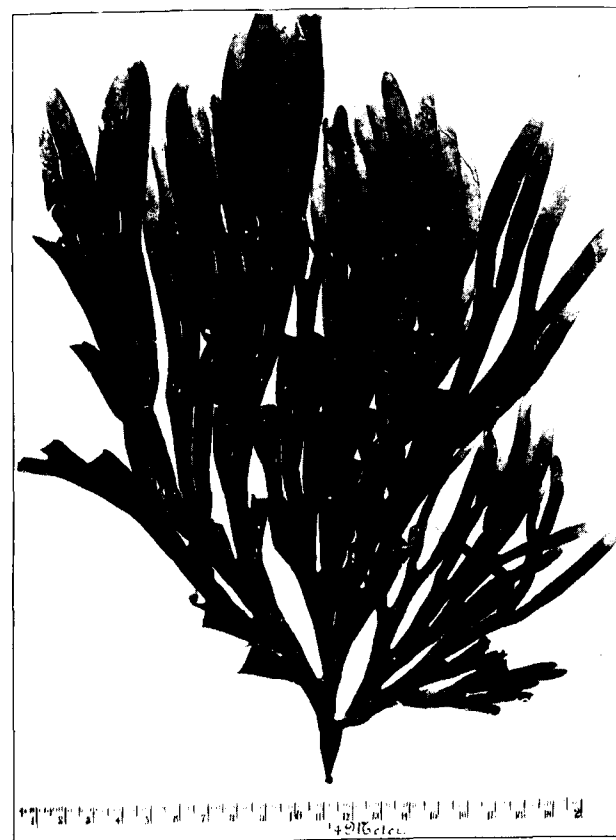
Fig. 10. *Halymenia polydactyla* Boergs. Part of transverse section of the thallus ($\times 150$).

INDIA : Okha Port, *Boergesen* 5521 (type) ; Dwarka ; Karachi, Sept. 1881, *J. A. Murray* ; Manora, *Miss L. Here* (Herb. Kew.).

Distr. India, Jedan Isles.

The largest specimen gathered of this handsome plant reaches a height of 27 cm. (Plate IV). The base, present in this specimen only, consists of a small roundish disc about 4 mm. broad, from which

PLATE IV



Halymenia polydactyla Boergs, sp. nov.

the short, vigorous, compressed, cuneate stem arises. The stem is 2 cm. high, when the first division takes place. The thallus is repeatedly forked, fastigiate but with some tendency to become flabellate. The segments are terete or a little compressed below, tubulose, about 5-7 mm. thick in material preserved in spirit and made turgid in water, up to 9 mm. in dried specimens. Just below the forks the thallus reaches a breadth of up to 15 mm. In the basal part the distance between the forks is often less than 2 cm., higher up in the thallus about 5 cm. The upper ends of the segments are blunt. The colour is dark purple red in the lower parts, becoming lighter red upwards. The consistency is very tough.

A transverse section (Fig. 10) shows that the wall is composed of small thick-walled cells. Seen from above these cells are roundish-polygonal with a diameter of about 5-9 μ . The cells underneath are larger and pass over into stellate cells. Near the periphery these cells are rather short-rayed; towards the interior the rays are lengthened more and more, forming a very loose tissue in the mucilaginous interior of the tubes. The breadth of these filaments varies from 4 to 20 μ , and the length of the cells of which the filaments are composed is about 130 μ . Here and there gland-cells issuing from the stellate cells are present.

Only tetrasporic plants were found. The tetraspores occur in the epidermal tissue and are of rather variable size and shape, roundish to oblong.

The Indian plant is certainly nearly related to *Halymenia Agardhii* De Toni. I have had two specimens of this to compare with mine, one from Florida (comm. Dr. M. A. Howe) and Crouan's specimens named *Chrysymenia dichotomo-flabellata* in Mazé et Schramm's *Algues de la Guadeloupe*. The Indian plant differs from these in its much more robust and generally larger and tougher thallus. Its colour furthermore is a much darker red than the fleshy-rose colour of the two specimens referred to. Moreover no constrictions are present in the Indian plant, and it seems also to be more regularly divided. When the difference in geographical distribution is added to these considerations it seems most natural to regard the plant from the East as a separate one from that of the Atlantic.

Mme. Weber van Bosse to whom I sent a photograph of the specimen figured on Pl. III kindly informed me that the Indian plant is very similar to her *Halymenia Agardhii* (List of Siboga-Algae, p. 237) if not identical with it.

In his *Icones of Japanese Algae* Okamura has just described (vol. vi. p. 21, pl. 266) a *Halymenia* which he refers, though with great reservation, to *H. Agardhii* De Toni. On sending a photo of my plant to Prof. Okamura, he kindly replied: "The only difference which comes to my notice is the roundness of the axils in yours, while in ours it is acute and very narrow." Professor Okamura was

also kind enough to send me half of one of his few specimens. After comparing the Japanese plant with the Indian one I am inclined to consider the two plants distinct. Besides the character pointed out by Okamura, his specimen differs also in its smaller thallus, lighter colour and its seemingly softer consistency, reminding one of *Halymenia Agardhii*.

***Halymenia venusta* Boergs., sp. nov. ; *H. Harveyanae* J. Ag. proxima ;** differt thallo firmiore et crassiore, colore rubro obscuriore, proliferationibus magis copiosis plerumque ex utraque thalli superficie nascentibus.

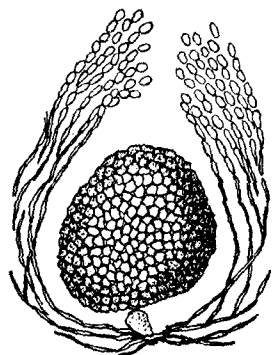


Fig. 11. *Halymenia venusta* Boergs. Section through thallus showing cystocarp ($\times 165$).

Thallus 30 cm. altus et ultra, plano-compressus, tenax et lubricus, colore ruber, stipitatus, disco parvo basali adfixus, basi in stipitem perbreve cuneatim decurrens. *Lamina* plus minus divisa, laciniis aut latioribus aut angustioribus, proliferationibus numerosis irregulariter divisis pinnatis, pinnulis acutis e margine thalli saepe etiam ex utraque superficie thalli ortis. *Cystocarpia* et *tetrasporangia* in thallo dispersa.

INDIA : Dwarka, exposed coast in low-lying rock pools near low water mark, Boergesen 5442 (type).

The thallus is fastened to the substratum by means of a small disc. From this the short, cuneate stipe, about $\frac{1}{2}$ cm. long, changes abruptly into the rapidly broadened flat thallus. This is of very variable shape, sometimes hardly divided, forming large, flat fronds up to 20 cm. broad, occasionally divided into several lobes. The entire margin is densely proliferous, and in most of the specimens the surface also is proliferous (Plate IV.) The proliferations vary much in size, being usually quite small or having a length of several centimetres, and are usually repeatedly divided. Their main stems are rarely more than $\frac{1}{2}$ cm. broad, generally less, and the apices of the pinnules are sharply acute. Their growth is of the fountain type (*Springbrunnentypus*). The divisions of the thallus are broadly rounded below, and likewise the proliferations and pinnules. The

[*Kew Bulletin*, 1932.

PLATE V



Halymenia venusta Boergs, sp. nov.

thallus is very tough, about 500 μ thick, and slimy, adhering strongly to paper. At the periphery it is composed of a cortical layer formed by short, forked cell-rows. The peripheral cells are oblong, densely packed and about 5-7 μ broad and 10 μ long. The whole cortical layer is about 50-60 μ thick. From the innermost largest cells, irregularly twisted and often stellately ramified filaments grow out, crossing each other in the mucilaginous interior.

The cystocarps (Fig. 11) are scattered throughout the thallus and are formed in the interior of the tissue. The carpospores form a dense, roundish body. This is surrounded by curved filaments and is surmounted by an ostiole about 50-80 μ in diameter in the cortical layer, through which the carpospores escape. The tetraspores are formed in the cortical layer and likewise occur scattered throughout the whole thallus. They are small, about 12 μ broad and 20 μ long and cruciately divided.

The present species belongs to the subgenus *Acanthymenia* J. Ag. It is, as noted above, related to *H. Harveyana* J. Ag. (*H. Floresia* Harv., Phycol. Austral. pl. 214) of which I have seen several specimens in Herb. J. Agardh at Lund. The Indian plant differs in its much more numerous marginal and also surface proliferations. The colour and consistency of the thallus is also somewhat different, and likewise the method of branching, this being more or less markedly pinnate in *H. Harveyana*. On account of the very finely divided branching there is a close transition between branches and proliferations (see Okamura, Icones of Jap. Algae, vol. iv. p. 43, pl. 162).

Our plant also shows some likeness to broad forms of *H. Floresia* Ag., but this species differs in its lighter colour, thinner thallus, fewer proliferations and difference in size of the peripheral cells (cf. Weber van Bosse, Algues du Siboga, pp. 228 and 232).

Fruiting specimens were gathered in January.

Cryptonemia undulata Sonder in Linnaea, vol. xxvi. 516; Harvey, Phyc. Austral. tab. 205; Kützing, Tab. Phycol. 19, tab. 31. INDIA: Dredged off Dwarka at about 5 fathoms; Okha Port; Karachi, J. A. Murray (in Herb. Kew.); K. G. Naik (a single specimen in spirit).

Distr. Australia.

This plant may now be recorded from the Indian Ocean. In the Kew Herbarium are to be found some large specimens from Karachi labelled *Delesseria subdichotoma*, but it is evident that they do not belong to that family but to the Cryptonemiales. They agree in fact with *Cryptonemia undulata*, specimens of which I have seen from Encounter Bay and Champion Bay in J. Agardh's Herbarium at Lund. My specimens are irregularly divided, the lobes having a breadth of $\frac{1}{2}$ -3 cm. with vigorous nerves which run up through the thallus and become divided several times until they disappear. Along the edges of the older part of the thallus more or less numerous proliferations are present, and these are also occasionally developed

from the surface. They are usually small, with a short stalk and a small roundish leaf-like upper part 1–2 mm. broad.

Some smaller specimens collected at Dwarka and Okha Port agree well with Kützing's figure. The lobes reach a breadth of only 1–2 cm., their edges are very waved and they have few proliferations.

A transverse section of the thallus, which is about 70 μ thick, shows that it consists at the periphery of a layer of densely placed short assimilating cells and one or two layers of larger roundish ones below. The medullary tissue is composed of thick-walled filaments tightly woven together. The midrib develops through the division of the cells of the cortical layer, which form short, dense, vertical rows of cells.

In one of my specimens a few cystocarps were found. They occurred in the small leaf-like part of the proliferations, immersed in the medullary tissue (see Kylin in Lunds Univers. Årsskrift, Avd. 2, Bd. xxi., 1925, p. 20, fig. 8). The cluster of carpospores forms roundish clumps and the ripe carpospores escape through a small ostiole.

Sarconema furcellatum Zanard., Plant. Mar. Rubr. Enum. no. 79, tab. viii, fig. 1.—*Plocaria furcellata* Mont., Pugill. Pl. Yemens. no. 12; Sylloge Gen. Crypt., p. 413. *Trematocarpus furcellatus* Kütz., Tab. Phycol., vol. xix. tab. 73 c, d. *Gracilaria furcellata* Zanard., Plant. Mar. Rubr. Enum. p. 58, no. 84. *Dicranema Montagnei* Grün., Alg. Fidschi, Tonga- und Samoa-Inseln, p. 43.

INDIA: Bombay: Backbay, Malabar Hill; Dwarka; Karachi, J. A. Murray (Herb. Kew.).

Distr. Red Sea.

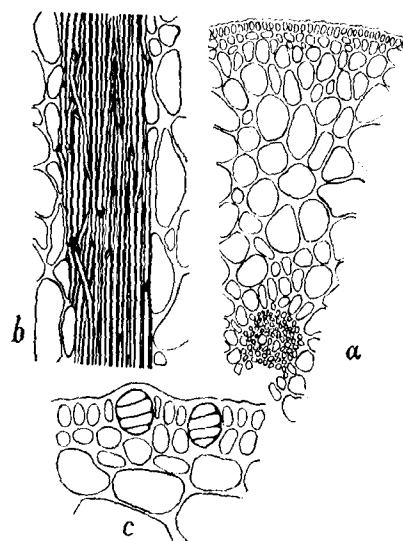


Fig. 12. *Sarconema furcellatum* Zanard. a, transverse section of the thallus (about $\times 60$). b, longitudinal section of the central strand (about $\times 175$). c, part of the peripheric tissue with tetrasporangia (about $\times 200$).

In referring the Indian material to this species, which hitherto has been known only from the Red Sea, I should point out that I have not been able to compare my specimens with the original material, but Kützing's figures and description appear to make it evident that the Indian and the Red Sea plants are identical. For synonymy see the remarks by Bornet in Mazza, Saggio di Algologia Oceanica (La Nuova Notarisa, 1907, pp. 31–35).

The repeatedly forked thallus forms dense, broad, intricate tufts up to 15 cm. high, which bear a strong resemblance to the tufts of *Furcellaria fastigiata*. The breadth of the thallus varies considerably: in specimens from exposed shores its diameter is about 1½ mm.; in specimens from sheltered localities it is scarcely ½ mm. The apical growth is of the fountain type. A transverse section (Fig. 12a) shows at the periphery a layer of densely placed rectangular cells about 12 μ long and 6 μ broad. Below this is a parenchymatous tissue composed of roundish-polygonal cells becoming larger inwards. In the middle of the thallus there is a central strand, about 150 μ broad, composed of densely packed thick-walled cells about 5–7 μ in diameter: a longitudinal section (Fig. 12b) shows that these are filaments of long cells with more or less oblique transverse walls.

The tetrasporangia (Fig. 12c) are formed in the peripheral layer; they are broadly oval, about 35 μ long and 25 μ broad and zonately divided. Tetrasporic specimens were gathered in January.

Judging from dried material, the plant seems to have decumbent creeping rhizome-like filaments such as occur in *Furcellaria fastigiata*.

The plant was found near low water mark in exposed places, attached to stones and shells.

Aghardhiella robusta (Grev.) Boergs., comb. nov.—*Dumontia robusta* Grev., Alg. Brit. p. 62. *Solieria australis* Harv., Phyc. Austral. tab. 149; Kützing, Tab. Phyc. vol. xix. tab. 27. *Rhabdonia robusta* J. Ag., Spec. Alg. ii. p. 355.

INDIA: Dwarka, dredged at about 5 fathoms. Okha Port, cast ashore. Karachi, 1859, W. J. S. Pullen (Herb. Kew.); A. B. Kotwall.

Distr. Australia, Japan (?), Malayan Archipelago.

During a visit to Lund, Prof. Kylin kindly informed me that the type species of the genus *Rhabdonia*, namely *R. coccinea* Harv., has an apical cell, whereas several others of the genus have the fountain (*Springbrunnen*) type of growth characteristic of the genus *Agardhiella*. These latter species should be transferred to this genus, and in accordance with this view the present species becomes *Agardhiella robusta*, comb. nov., as above.

Of the figures quoted, that of Kützing agrees best with the Indian plant; the Japanese plant pictured by Okamura (Icones Jap. Alg., vol. iv. p. 102, pl. 174) has a very different aspect from ours (see also Yendo, Bot. Mag. Tok., xxviii., 1914, p. 273). The plant is irregularly branched on all sides. At the base the branches are as a rule much constricted but become rapidly thicker and remain almost

cylindrical until they taper slowly into the upper acute apex. The larger specimens reach a height of 37 cm. and the filaments in these specimens have a breadth of 3 mm, but several of the specimens are more slender with the thicker filaments only 2 mm. and others scarcely 1 mm. broad.

These thin specimens show much resemblance to the var. *tenuiramea* A. and E. S. Gepp (Journ. Bot. 1906, p. 255), which I was able to examine during a visit to the British Museum, London, where Mr. A. Gepp most kindly showed me his specimens.

A transverse section shows that the cortical layer consists of short branchlets composed of oblong roundish cells which are small outside but larger within. Long unicellular hairs are common in the young thallus. From the wall of the innermost larger cells, stellately divided filaments grow out, crossing the innermost mucilaginous interior in all directions. Only tetrasporic specimens were found. The zonately divided tetrasporangia are formed in the cortical layer and originate, as pointed out by Kylin (in Lunds Universitets Årsskrift, N.F., Avd. 2, vol. xxiv, 1928, p. 71), from terminal cells of the branchlets.

Calliblepharis fimbriata Kütz., Phyc. gen. 404; Spec. Alg., 755; Tab. Phyc., vol. xviii, tab. 11a; J. Agardh, Spec. Alg., ii. 621.—*Sphaerococcus fimbriatus* Ag., Spec., 299; Suhr, Uebers. Alg. Ecklon, 10, no. 35, tab. 2, fig. 12.

INDIA: Karachi, J. A. Murray; Manora, near Karachi, Miss L. Here.

Distr. Cape.

Of this plant, known only from the Cape, several fine specimens are present in the Kew Herbarium. I have compared the Indian specimens with plants from Mossel Bay in J. Agardh's Herbarium at Lund, and found that they agree well. The largest specimen measured 26 cm. high.

It grows by means of an apical cell such as Kylin pointed out for *C. jubata* (Kylin, Entwicklungsgesch. Florideenstudien, p. 72). The thallus is divided into several lobes about $\frac{3}{4}$ cm. broad, and these possess along the margin dense proliferations about $\frac{1}{2}$ –1 cm. long. The latter have a short stipe and an irregularly divided upper part. Very rarely surface proliferations also occur.

Hypoglossum spathulatum Kütz., Spec. Alg., p. 877; J. Agardh, Spec. Alg., iii. 3, 186; Kylin, Lunds Universitets Årbog, N.F., Avd. 2, Bd. xx. 9.—*Delesseria spathulata* Kütz., Tab. Phyc., vol. xix, tab. 12. *D. hypoglossoides* Harv., Phyc. Austral., tab. 87; Kütz., Tab. Phyc., vol. xix., tab. 13.

INDIA: Okha Port, east ashore.

Distr. Australia, Malay Archipelago.

I collected several specimens of this plant, which appear to agree with the Australian species, as represented by Harvey's Alg. Austral. Exsicc. no. 282, of which we have a fine specimen in the Botanical

Museum at Copenhagen, and by several specimens in Herb. J. Agardh at Lund.

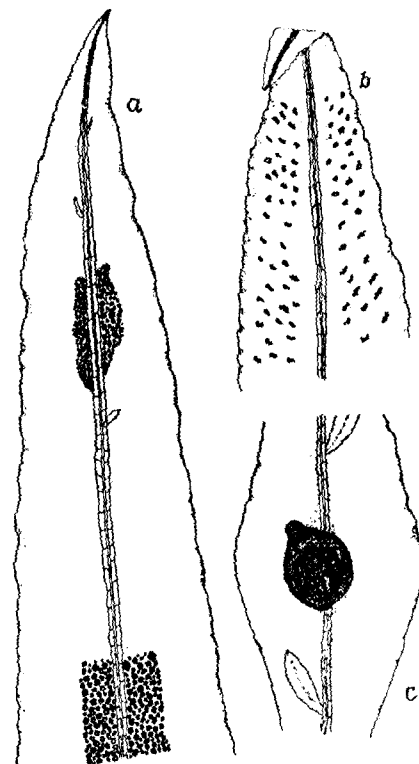


Fig. 13. *Hypoglossum spathulatum* Kütz. a, part of thallus of tetrasporic plant ($\times 6$). b, part of the same of antheridial plant ($\times 6$). c, part of thallus with a cystocarp ($\times 6$).

The plant forms densely branched bushes up to 10–12 cm. high of a fine rosy-red colour. The almost linear fronds of which the thallus consists are up to about 4 mm. broad in their broadest part and vary little in width except at the acute summit. They consist of a single layer of cells, except for the midrib, which is three cells thick and to which later on cortical cells are added (Fig. 14). Proliferations are given out in great numbers from the midrib.

In the tetrasporic plant (Fig. 13a) the sori are found in long narrow belts on both sides of the midrib. These sori are about 3 mm. long and .2 mm. broad, and are, when fully developed, rectangular in shape. Between each pair of sori there is a sterile area 1 cm. or more long.

The antheridial bodies (Fig. 13b) are found on both sides of the midrib in small, irregularly shaped, scattered groups. The cystocarps, which are developed from the midrib, are urceolate, with a short neck above about 115 μ broad (Fig. 13c). The fully developed cystocarp has a breadth of about 500 μ . All the fruiting specimens

were gathered in the middle of January. Mme. Weber v. Bosse (Vidensk. Medd. naturh. Forening, Bd. lxxxii., 1926, 113) mentions that she found tetrasporic plants at Kei Islands, otherwise fruiting specimens do not seem to have been recorded.

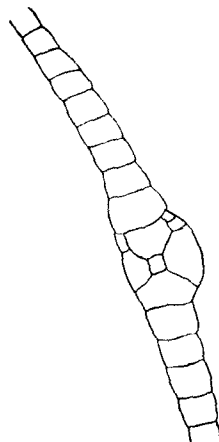


Fig. 14. *Hypoglossum spathulatum* Kütz. Transverse section of thallus ($\times 50$).

***Herposiphonia tenella* Nägl.**, in Schleiden und Nägeli, Zeitschr. für wissenschaftl. Botanik, Heft iii-iv. 238, tab. viii (1846); Falkenberg, Rhodomelaceen, 304.—*Hutchinsia tenella* Ag., Spec. Alg., ii. 105.

INDIA : Dwarka (sterile).

Distr. In most warmer seas.

A few small pieces were found intermingled in the thallus of *Boodlea siamensis* Reinb. The distribution of the branches and branchlets on the creeping rhizome is normal (as described by Falkenberg, l.c., p. 303). The diameter of the rhizome is about 80–110 μ , and the segments are about as long as broad. The number of pericentral cells is 9–10 in the main branches and 7–8 in the branchlets. The branchlets are short, composed of about 12 segments; they are much curved with their upper ends turned towards the growing point. The apices are broadly rounded, and the trichoblasts are poorly developed. The specimens have a similar appearance to the plant figured in Mar. Alg. D.W.I., vol. ii. 289, fig. 289.

***Chondria cornuta* Boergs.**, sp. nov.; a *C. tenuissima* Ag. et speciebus aliis affinis, parte apicale ramulorum cystocarpiferorum in prolongationem cornutam producta ad basin cystocarpiorum praesentem inter alia discedit.

Thallus caespitosus, circiter 15 cm. altus, e filamentis erectis teretiusculis circiter $\frac{1}{2}$ – $\frac{3}{4}$ mm. latis undique ramosis, ramis acutis sparsis virgatis subrectis, compositus. *Tetrasporangia* in ramulis inflatis et in gyrum ductis immersa. *Cystocarpia* solitaria, in latere

superiore ramulorum sessilia, urceolata, ovato-subglobosa, circiter 700 μ longa, 200 μ lata.

INDIA : Bombay (Malabar Hill), *Boergesen* 5076 (type); Santa Cruz, Karachi, *J. A. Murray* (Herb. Kew.).

The plant is common on the shores near Bombay, where it was found on rocks or in rock-pools in exposed places near or a little below low-water-mark. Fruiting specimens were gathered in January.

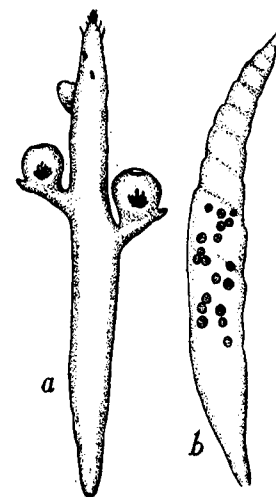


Fig. 15. *Chondria cornuta* Boergs. a, a branchlet with cystocarps ($\times 17\frac{1}{2}$). b, a tetrasporic branchlet ($\times 17\frac{1}{2}$).

The plant grows in dense tufts up to a height of about 15 cm. The erect main shoots are but slightly branched below, though branches are developed above. The lower ones are long, the upper shorter and directed towards the main stems. The insertion is narrow but they gradually attain normal size and then taper gradually towards the acute apex. From the larger branches short ramuli are given off in the same way. The main filaments are about $\frac{1}{2}$ – $\frac{3}{4}$ mm. thick. A transverse section shows 5 pericentral cells surrounded by a cortical tissue, the cells of which become gradually smaller outwards. The colour of the plant is dark red-brown when dried.

The tetrasporangia (Fig. 15b) are formed in the upper ends of the branches and in the ramuli. The uppermost fertile ramuli are short and thick, about 100 μ broad and 3–5 times as long; the lowermost are longer. They enlarge in a screw-like manner.

The cystocarps (Figs. 15a, 16) are formed on the upper side of short ramuli. As the cystocarps increase in size, they appear to be placed terminally on a short stalk, which is the lower end of the ramulus. The upper end of the ramulus is directed downwards and appears below the cystocarp as a short spine. The ripe cystocarp is about 450 μ long and almost as broad.

The cystocarps are thus situated very similarly to those of *C. tenuissima* Ag. (see Thuret et Bornet, *Études Phycologiques*, 1878, plates 43-48), but in this the apex of the ramulus in the ripe cystocarp is very little developed, being seen only as a short scar-like outgrowth from the ripe cystocarp.

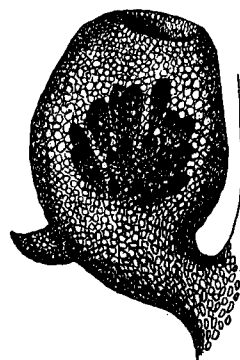


Fig. 16. *Chondria cornuta* Boergs. A cystocarp ($\times 50$).

C. arborescens J. Ag. has a similar spine, but this species differs from our plant in size, ramification and general appearance.

In the Kew Herbarium are found two specimens referable to *C. cornuta*. They are female plants gathered at Karachi by J. A. Murray and labelled *Chondriopsis lanceolata* Harv. According to Harvey's figure (*Phycol. Austral.*, tab. 239) this plant differs in ramification and in the absence of spines at the base of the cystocarps.

***Chondria dasyphylla* Ag. Sp. Alg. p. 350; Falkenb. Rhodomelaceen, 197, tab. 22.**

A female plant was found as an epiphyte on *Udotea indica*.

INDIA: Dwarka.

Distr. Seems to occur in most warmer seas.

***Chondria armata* Okam., Icones Jap. Alg., vol. i., 69, pl. 16, figs. 9-19; Weber van Bosse, Liste des Algues du Siboga, 353.—*Lophura armata* Kütz., Tab. Phyc., vol. xvi., p. 2, tab. 3, figs. a-b. *Rhodomela crassicaulis* Harv., Alg. exsicc. Ceylon no. 8; Fergusson,**



Fig. 17. *Chondria armata* Okam. var. *plumaris* Boergs. Apex of a ramulus with trichoblasts ($\times 150$).

Alg. exsicc. Ceylon no. 10; Svedelius in *Botaniska Studier tillägnade F. R. Kjellman*, 191, figs. 3-9. *Chondriopsis crassicaulis* J. Ag., *Analecta Algologica*, 1892, p. 161. *Chondria minima* Weber, *Liste des Algues du Siboga*, p. 309, pl. vii. fig. ix.; non *Chondria crassicaulis* Harv., Alg. nov. Wright, in *Proc. Amer. Acad.*, vol. iv., p. 329.

INDIA: Tuticorin, Burma (Herb. Mus. Brit.).

Distr. New Caledonia, Japan, Malayan Archipelago, Ceylon, India.

Okamura was the first to point out that *Lophura armata* Kütz., and the plant from Ceylon which Harvey named *Rhodomela crassicaulis*, are the same species. As Harvey's plant is a *Chondria*, and as he had already given the specific name *crassicaulis* to another *Chondria*, the plant must, as stated by Okamura, bear the epithet which Kützting gave it. Later Dr. Anna Weber added to this species what has proved to be another synonym, namely her species *Chondria minima*.

When I began the examination of this plant I had only seen a few specimens of Harvey's *Rhodomela crassicaulis* preserved in J. Agardh's herbarium at Lund and a few species of *Chondria armata* from Japan given me by Professor Yamada. My Indian specimens agreed with Harvey's plant, and on comparing them with the Japanese plant I believed that we had most probably to do with two distinct species, one (Harvey's) being characterized by its featherlike thallus (which is also seen in the Indian material in the living state), and the other with ramuli arranged all round the main axis, as described and figured by Kützting and Okamura. Some anatomical differences also appeared to be present. In mine, large, vigorous, spirally arranged and freely protruding trichoblasts were present in great numbers, densely covering the protruding acute apex of the ramuli (Fig. 17). In the Japanese plant, on the other hand, the trichoblasts were much smaller, evidently densely pressed to the



Fig. 18. *Chondria armata* Okam. var. *plumaris* Boergs. Upper part of young thallus ($\times 4\frac{1}{2}$).

surface of the thallus, and the acute summit of the ramuli was not, or only a very little, covered by the trichoblasts. Specimens of Harvey's and Fergusson's plants, from Ceylon and Tuticorin respectively, which I saw at Kew and at the British Museum, were all featherlike and confirmed my opinion that the Japanese and the Ceylon plant were specifically distinct.

On my return from England Dr. Weber very kindly sent me all her material of *Chondria armata*. By means of this valuable collection I have convinced myself that the two forms really belong to the same species, since they are connected by intermediate forms. Thus specimens from Flores, Dutch East Indies, had the ramuli surrounding the summit of the main axis, and in some of the specimens from Ceylon the arrangement of the ramuli was not markedly featherlike. Furthermore, in some fine material in spirit of his Ceylon plant, which Prof. N. Svedelius most kindly sent me, the ramuli are not so regularly pectinate, but often grow out in all directions and the trichoblasts are absent or very poorly developed.

From the above we may conclude that the plant when typically developed has two very distinct forms; a more eastern form, which I propose to call var. **typica**, known from Japan and New Caledonia, with ramuli on all sides; and a more western form, known from India and Ceylon, which I propose to call var. **plumaris**.

In contrast to Svedelius' specimens which grew in very exposed places my specimens were found on sheltered coasts and possibly the featherlike form is an adaptation due to the sheltered locality.

Fig. 18 shows a young shoot, with ramuli, of the var. **plumaris**. The ramuli are, in the young upper part, arranged spirally, but during growth a dislocation takes place, the result being that they become arranged in two opposite rows along the main axis. The ramuli are fusiform, tapering somewhat below and markedly so towards the acutely pointed apex. The plant belongs to the Section *Euchondria*. A transverse section shows 1 central and 5 pericentral cells, surrounded by a thick layer of roundish cells which become gradually smaller externally. As pointed out by Svedelius, the plant has thick, creeping, perennial, rhizome-like stems fixed to the rocks by rhizoids; from this basal part the annual erect filaments arise. My specimens were sterile.

XV.—TWO NEW FERNS FROM COLOMBIA.*

WILLIAM R. MAXON.

In sorting out and identifying recently a large number of ferns of the F. C. Lehmann collection (chiefly from Colombia and Ecuador) acquired by the Royal Botanic Gardens, Kew, through the Bentham Trustees many years ago, the writer met with many numbers that apparently had not been studied by Hieronymus, presumably because of their having been collected in insufficient quantity for the

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numbered sets distributed by the collector to various herbaria. Some of these are rare species, which have been published by Hieronymus and others on the basis of other numbered specimens of the Lehmann collection. However, the two species here discussed appear not to have been previously described; each is represented by a single specimen only.

For the privilege of studying the rich Lehmann collection the writer wishes to express his thanks to the Director, and at the same time to acknowledge gratefully many courtesies extended during two summers at Kew.

Dryopteris (*Meniscium*) **minuscula** Maxon, sp. nov.; a *D. gigantea* (Mett.) C. Chr. specie americana altera subgeneris *Meniscii* frondibus simplicibus gaudente notis omnibus valde recedit.

Rhizoma (incompletum) repens, parvum (circa 5 mm. diam.), apice paleis reticulatis teneris brunneis glabris circa 4 mm. longis acuminatis late ovatis sparse vestitum. *Folia* 4, subfasciculata, 20–27 cm. longa, longe stipitata, omnino glabra, stipitibus teretibus lucidis brunnescentibus circa 0.5 mm. diam. gracillimis, aut laminam aequantibus aut plerumque multo longioribus; laminae simplices, 10–12 cm. longae, 2.5–4 cm. latae, anguste elliptico-oblongae, apice acuto vel acutiusculo abrupte caudatae, basi late cuneatae sed non decurrentes, marginibus anguste scariosis subrepandis, costa utrinque valde prominente supra anguste sulcata, nervis 30–35-jugis utrinque prominentibus obliquis (angulo 45° egredientibus) marginem fere attingentibus ibidem arcuatis; areolae supra perspicuae medio laminae utroque 10–12-seriatae, venis transversis supra prominentibus, sterilibus angulo acuto (45°) conjunctis (ramo excurrente subaequali apice hydathodo elongato incrassato), fertilibus angulo latiore conjunctis et saepe arcuatis, ramo excurrente plus minusve reducto; *sori* rotundi vel oblongi, parvi (1–1.5 mm. diam.), sporangiis glabris, sporis ovoideis ochraceis rugoso-alatis circa 55 μ longis et 30 μ latis.

COLOMBIA: Habitat in locis abruptis humidis ad fluvium Rio Dagua in regione maritima haud procul ab oppido Buenaventura, alt. 0–300 m., *Lehmann* 4433. Typus in herbario Kewense asservatur.

A unique species, differing widely in all diagnostic characters from *Dryopteris gigantea* (Mett.) C. Chr., the only simple-leaved American species of the subgenus *Meniscium* previously known. It is probable, however, that the plant attains a somewhat greater size than indicated by the single specimen at hand.

Dryopteris (*Lastrea*) **perstrigosa** Maxon, sp. nov.; species ob paleas rachis et costarum persistentes majusculas insignis, *D. horrenti* Hieron. subgeneris *Lastreae* affinis, quae ut videtur differt: pinnis distantioribus basi 2.5 cm. latis majoribusque, costis subtus fusciscentibus lucidisque et paleis minoribus caducis fusciscentibus parce praeditis, notis pubescentiae, et soris supramedialibus marginum lobis aliquando obtectis.

Rhizoma et stipes desunt. *Lamina* (fere completa) 75 cm. longa, 16–20 cm. lata, ambitu anguste lineari-lanceolata, pinnato-pinnatifida, utroque gradatim attenuata, rachi valida, basi fere 5 mm. crassa, ubique densissime hirtello-strigosa (pilis fulvescentibus vel sordido-albidis rigidis obliquis circa 0.5 mm. longis), supra profunde sulcata, persistente paleacea, paleis laxe divergentibus fulvescentibus linearibus attenuatis parce pubescentibus ciliolatisque crebre striolatis firmis lucidis usque ad 1 cm. longis et 1 mm. latis; *pinnae* crasso-herbaceae, opacae, utrinque sordido-virides, infra apicem brevem pinnatifidum circa 45 utroque latere, infra oppositae vel suboppositae, sursum alternae, plerumque subremotae, sessiles, profunde pinnatifidae, mediales 8–10 cm. longae, basin versus circa 1.5–1.8 cm. latae, lineari-attenuatae, apice serrato-caudatae, recte patentes, inframediales sensim breviores decurvatae, inferiores remotae interstitiis 2–2.5 cm. distantes, infimae nonnullae abbreviatae valde reflexae, costis pinnarum omnium ubique dense hirtello-strigosis et subtus inter basin et medium paleis attenuatis lucidis laxe imbricatis majusculis eis rachis similibus ornatis, costis basi subtus etiam aerophoro fusco duro elevato-rotundato magno instructis; *segmenta* pinnarum majorum 30–35 utroque costae latere, recte patentia, ligulato-linearia, obtusa, plus minusve falcata, circa 8–10 mm. longa, 2.5 mm. lata, ala angustissima 0.5–0.8 mm. lata conjuncta, marginibus ciliolatis sinuatis vel subcrenatis, revolutis sed non soros amplectentibus, sinubus exacte linearibus interstinctis; segmentorum costulae etiam nervi supra pilis setiformibus crassiusculis albidis obliquis strigosi, subtus costulae copiose et nervi parce albedo-strigosi, parenchymate pilis fragilibus brevissimis perpaucis praedita; *nervi* 12–16-jugi, obliqui, crebri, simplices, immersi, marginem attingentes; *sori* exacte mediales, subrotundi, mediocres, conferti et aetate confluentes, exindusiati, receptaculis siccitate elevatis; sporangia numerosissima, brunnea, glabra, sporis fabiformibus sublaevibus $45\ \mu \times 30\ \mu$ diam.

COLOMBIA: Habitat in declivibus montis Paramo de las Delicias in Andibus centralibus Popayanensibus, alt. ut videtur 3000–3300 m., *Lehmann*; "B. T. 913." Typus in herbario Kewense asservatur.

Related, as appears from the description, to *D. horrens* Hieron., but exceedingly well marked by its more numerous and invariably simple veins, its strictly medial sori, its copious dense strigose pubescence throughout, and especially its numerous persistent scales upon the rachis and costae. Although the specimen is old, the last character is conspicuous, the slender glossy scales forming a loose, subimbricate covering upon all but the uppermost pinnae for about half their length.

XVI.—CONTRIBUTIONS TO THE FLORA OF SIAM.* ADDITAMENTUM XXXIII.

Anotis trimera Craib [Rubiaceae-Hedyotideae]; a speciebus aliis floribus axillaribus distincte pedicellatis, pedunculo communi vix evoluto distincta.

Caules annui, circa 30 cm. alti, simplices vel pauci-ramosi, sicco brunnei, iuventute fusci, glabri. *Folia* opposita, oblongo-lanceolata vel lanceolata, apice subobtusata, basi cuneata, ad 5 cm. longa et 1.8 cm. lata, subchartacea, sicca supra viridia vel fusca, subtus pallidiora, glabra, costa pagina utraque plus minusve conspicua vel subtus prominula, nervulis lateralibus utrinque circa 4 obliquis pagina utraque obscuris, nervulis omnino obscuris, petiolo ad 4 mm. longo suffulta; stipulae ad 5 mm. longae, lobulatae, piluloso-puberulae, persistentes. *Pedunculi* axillares, petiolo saltem dimidio breviores, flores circa 5 gerentes, parvi-bracteati; pedicelli 5–8 mm. longi, glabri. *Receptaculum* vix 1 mm. longum, glabrum. *Calycis* tubus brevis, pauperius ciliolatus, segmenta 3, late lanceolata, acuta, 2.5 mm. longa, basi fere 1 mm. lata, ciliolata, dorso carinata. *Corolla* dorso puberula; tubus 2 mm. longus, intra inferne parce pilosus; lobi 3, vix 1 mm. longi, basi paulo ultra 1 mm. lati. *Stamina* 3, filamentis circa 0.5 mm. longis ad corollae tubi apicem insertis, antheris 0.75 mm. longis. *Stylus* corollae subaequilongus. *Fructus* 3.5 mm. longus, apice e calyce exsertus, calycis segmentis persistentibus, apice loculicide dehiscens; semina loculo quoque 2–3, ambitu oblonga, facie altera concava, altera convexa.

Saraburi, Muak Lek, *Put* 1873.

Ophiorrhiza aggregata Craib [Rubiaceae-Hedyotideae]; ab affini *O. costata* Ridl. calycis segmentis pro rata longioribus, corollae lobis dorso angustius alatis, stigmatibus acutis recedens.

Caules annui, erecti, ad 17 cm. alti, inferne radicales, basi circa 3 mm. diametro, fistulosi, glabri. *Folia* opposita, paribus inter se aequalibus, elliptico-oblonga vel oblongo-ovata, apice acuminata, basi cuneata vel late cuneata, ad 15 cm. longa et 6.5 cm. lata, chartacea, sicca supra fuscescentia, subtus pallide brunnescentia, primo ad marginem pauperius brevius setulosa, aliter glabra, costa supra conspicua subtus prominente, nervis lateralibus utrinque 11–13 supra conspicuis subtus prominulis intra marginem arcuatim iunctis, nervulis obscuris, petiolo usque ad 2.5 cm. longo suffulta; stipulae cito deciduae, 7 mm. longae. *Inflorescentia* terminalis, pedunculo communi brevi vel ad 2 cm. longo densius longius crispatis puberulo suffulta, densa, circa 2 cm. diametro, bracteis brevibus deciduis. *Receptaculum* 1.25 mm. longum, costatum, dense pallide ferrugineo-puberulum. *Calycis* segmenta 5, deltoidea vel oblongo-deltoidea, 0.75 mm. longa, dorso dense puberula. *Corolla* alba (ex *Kerr*), dorso sparse puberula, primo superne valde costata; tubus circa 7 mm. longus, intra medio albo-pilosus; lobi 5, circa

*Continued from *K.B.*, 1931, p. 448.

2.5 mm. longi. *Stamina* 5, filamentis 2.5 mm. longis glabris ad corollae tubi 3 mm. supra eius basem affixis, antheris linearibus vix 2.5 mm. longis. *Stylus* 3 mm. longus, stigmatibus subacutis vix 2 mm. longis.

Pang-nga, Kao Bangto, 900 m., by stream in evergreen forest, *Kerr* 17212.

***Ophiorrhiza alata* Craib** [Rubiaceae-Hedyotideae]; ab affini *O. costata* Ridl. foliorum nervis lateralibus magis numerosis, calycis segmentis et corolla longioribus recedit.

Caules herbacei, ad 50 cm. alti (ex *Kerr*), glabri, sicco fusco-brunnei, iuventute nodos prope pallide parvi-maculati. *Folia* opposita, paribus inter se aequalibus vel parum inaequalibus, saepissime elliptica vel oblongo-elliptica, apice longius subacute acuminata, basi cuneata, late cuneata, vel subacuminata, 8-14.5 cm. longa, 3-5.8 cm. lata, chartacea, sicca supra saepissime fusciscentia, subtus pallide viridia vel brunnescentia, supra marginem versus setulis brevibus instructa, subtus ad costam nervosque laterales pilis brevibus sparse instructa, costa supra conspicua subtus prominente, nervis lateralibus utrinque 11-13 arcuatis intra marginem anastomosantibus supra conspicuis subtus prominulis, nervis transversis paucis subconspicuis, petiolo 1-3 cm. longo glabro suffulta; stipulae deciduae, circa 3 mm. longae. *Inflorescentia* terminalis, pedunculo communi ad 4 cm. longo incluso ad 9 cm. longa et 6 cm. diametro, pedunculo cum ramulis pilis brevibus crispatis ferrugineis tecto; bractae angustae, deciduae; flores albi (ex *Kerr*), pedicellis brevibus vel ad 2.5 mm. longis pilis brevibus ferrugineis obtectis suffulti. *Receptaculum* ad 1.5 mm. longum, costatum, pilis brevibus ferrugineis plus minusve deciduis instructum. *Calycis* segmenta deltoideo-lanceolata, subacuta, circa 1.5 mm. longa. *Corolla* dorso papilloso-puberula; tubus circa 12.5 mm. longus, intra supra staminum insertionem ad antherarum apices hirsutus; lobi 5, late lanceolati, circa 3.5 mm. longi et 1.5 mm. lati. *Stamina* 5, filamentis vix 3 mm. longis glabris circa 5 mm. supra corollae tubi basem insertis, antheris 2.75 mm. longis. *Stylus* ad 1 cm. longus, stigmatibus duobus latis obtusis.

Chantabun, Kao Soi Dao, 1300-1600 m., evergreen forest, *Kerr* 9643.

***Ophiorrhiza angkae* Craib** [Rubiaceae-Hedyotideae]; ab *O. condensa* Craib inflorescentia laxa distincte pedunculata inter alia recedit.

Caules e rhizomate repente annui, circa 30 cm. alti, fistulosi, brunnei vel subvirides, primo sparse crispatis ferrugineo-pubescentes. *Folia* opposita, paribus inter se aequalibus vel fere inaequilateralia, apice obtuse acuminata vel subacuminata, basi cuneata, acuminato-cuneata, vel rarius rotundata, ad 13 cm. longa et 4.5 cm. lata, membranaceo-chartacea, sicco subtus pallidiora,

supra setulis sparsis instructa, subtus ad nervos puberulo-setulosa, nervis lateralibus utrinque 10-14 supra conspicuis subtus prominulis intra marginem anastomosantibus, petiolo 0.5-2 cm. longo suffulta; stipulae angustae, circa 2 mm. longae, deciduae. *Inflorescentia* terminalis, pedunculo communi saltem 2 cm. longo densius crispatis pallide ferrugineo-puberulo suffulta, subaxe ramosa, 2-3.5 cm. longa, 3-4.5 cm. lata; pedicelli breves; bractae saepe persistentes, angustae, circa 3 mm. longae. *Receptaculum* sparse puberulum. *Calycis* segmenta 5, deltoidea, 0.5 mm. longa. *Corolla* alba (ex *Kerr*), dorso fere glabra; tubus 4 mm. longus, intra 1 mm. infra apicem annulo denso pilorum alborum instructus; lobi 5, lineares, acuti, circa 4.5 mm. longi et 0.75 mm. lati, dorso glabri, apice medio alati, intra furfuracei. *Discus* carnosus, conspicuus. *Stamina* 5, inclusa, filamentis circa 1 mm. longis glabris 1 mm. supra corollae tubi basem insertis, antheris circa 1.5 mm. longis. *Stylus* 6.5 mm. longus, parce puberulus; stigmata rotundata, 1 mm. diametro.

Doi Angka, 1300 m., dense evergreen forest, *Kerr* 5284.

***Ophiorrhiza approximata* Craib** [Rubiaceae-Hedyotideae]; *O. aggregatae* Craib habitu similis sed caule iuventute pilis brevibus ferrugineis subadpressis oblecto, haud glabro distinguenda.

Caules circa 30 cm. alti, basi lignosi, primo dense crispatis subadpresse ferrugineo-pubescentes. *Folia* oblongo-oblancheolata, oblongo-elliptica, vel elliptica, apice obtuse subacuminata, basi saepe parum inaequilateralia, cuneata, ad 14 cm. longa et 6.5 cm. lata, chartacea, sicco viridia, subtus pallidiora, supra marginem versus setulis paucis brevibus instructa, subtus ad nervos ferrugineo-puberula, aliter setulis brevibus inconspicuis sparse instructa, costa supra conspicua vel impressa subtus prominente, nervis lateralibus utrinque 12-14 pagina utraque conspicuis vel subtus prominulis, nervulis paucis pagina utraque conspicuis, petiolo 1-3.3 cm. longo suffulta; stipulae 1 cm. longae, ad medium bilobatae, deciduae. *Inflorescentia* terminalis, pedunculo communi ad 7 mm. longo ferrugineo-tomentoso suffulta, compacta, 1.5 cm. diametro; pedicelli breves. *Receptaculum* 1.5 mm. longum, sulcatum, puberulum. *Calycis* segmenta deltoidea, subacuta, 0.6 mm. longa, dorso puberula, ciliolata, dorso medio incrassata. *Corolla* alba (ex *Kerr*), extra puberula; tubus 4 mm. longus, intra paulo supra medium annulo pilorum brevium instructus; lobi 5, inter se parum inaequales, oblongi vel oblongo-deltoidei, obtusi, 2-2.5 mm. longi, 1-1.2 mm. lati, sat crassi. *Stamina* 5; filamenta 1.5 mm. longa, glabra, 0.75 mm. supra corollae tubi basem affixa; antherae lineares, 2 mm. longae, basifixae, loculis acutis vel brevissime apiculatis. *Stylus* stigmatibus fusiformibus subacutis inclusis 3.5 mm. longus, parce puberulus.

Puket, Katu, 50 m., evergreen forest, *Kerr* 17569.

***Ophiorrhiza bambusetorum* Craib** [Rubiaceae-Hedyotideae]; ab *O. argentea* Wall. ex G. Don, cui habitu subsimilis, foliis floribusque maioribus, antheris multo longioribus recedens.

Caules annui, circa 15 cm. alti, iuventute dense crispatis ferrugineo-puberulo-tomentelli, basi lignosi. *Folia* opposita, paribus inter se fere aequalibus, oblongo-lanceolata vel oblongo-ovata, apice obtuse subacuminata, basi cuneata vel rotundato-cuneata, 7-11 cm. longa, circa 3 cm. lata, chartacea, sicco supra plumbea, subtus pallida, pagina superiore glabra, inferiore ad nervos crispatis ferrugineo-puberula, aliter setuloso-puberula, costa supra conspicua vel impressa subtus prominente, nervis lateralibus utrinque circa 12 supra subconspicuis subtus fere prominulis, petiolo 0.3-1.5 cm. longo suffulta; stipulae alte bifidae, circa 6 mm. longae, deciduae. *Inflorescentia* terminalis, pedunculo communi ad 2 cm. longo ferrugineo-tomentello suffulta, ad 2 cm. longa et 3 cm. diametro; pedicelli breves vel receptaculo paulo longiores, densius puberuli. *Receptaculum* 1.25 mm. longum, puberulum. *Calycis* segmenta 5, deltoidea, circa 0.75 mm. longa. *Corolla* subpunicea (ex Kerr), dorso puberula; tubus circa 7.5 mm. longus, intra paulo supra staminum insertionem pilosus; lobi 5, ad 3.5 mm. longi et 2 mm. lati. *Stamina* 5, filamentis 3 mm. longis glabris 2.25 mm. supra corollae tubi basem insertis, antheris linearibus 2.25 mm. longis. *Stylus* 3 mm. longus; stigmata ambitu subovata, obtusa, fere 2 mm. longa.

Surat, Sawng Pi Nawng, 50 m., bamboo forest, Kerr 12383.

***Ophiorrhiza bicolor* Craib** [Rubiaceae-Hedyotideae]; ab *O. membranacea* Craib foliis paulo sed distincte crassioribus, receptaculo puberulo, antheris brevioribus recedit.

Caules annui, ad 1 m. alti (ex Kerr), glabri, brunnei, primo angulati, mox teretes, ad 4 mm. diametro. *Folia* opposita, paribus inter se aequalibus vel subaequalibus, lanceolata, oblongo-lanceolata, vel interdum elliptico-ovata, apice obtuse acuminata, basi cuneata vel acuminato-cuneata, lateribus saepe inter se parum inaequalibus, 7-14 cm. longa, 3-6 cm. lata, chartacea vel rigide chartacea, sicco supra viridia vel fusco-viridia, subtus pallida, supra marginem versus setulis paucis brevibus instructa, subtus glabra, costa supra conspicua subtus prominente, nervis lateralibus utrinque 8-10 pagina utraque conspicuis, nervulis paucis subtus conspicuis, petiolo 1-3 cm. longo suffulta; stipulae cito deciduae, ultra medium pedunculo communi brevi vel ad 2 cm. longo longius crispatis subferrugineo-puberulo suffulta, congesta, circa 2 cm. diametro, ramis cum pedicellis brevibus breviter subferrugineo-pubescentibus. *Receptaculum* puberulum, paulo ultra 1 mm. longum. *Calycis* segmenta deltoidea, circa 0.75 mm. longa. *Corolla* alba (ex Kerr); tubus 6 mm. longus, 2 mm. infra apicem annulo denso pilorum alborum intra instructus; lobi 5, circa 1.5 mm. longi. *Stamina* bene inclusa; filamenta 0.5 mm. longa, glabra, 1 mm. supra corollae tubi basem inserta; antherae fere 1.75 mm. longae. *Stylus* 5 mm. longus, stigmatibus 1 mm. longis ambitu oblongo-ellipticis.

Pang-nga, Kao Katakam, 900 m., evergreen forest, Kerr 18480.

***Ophiorrhiza calcarea* Craib** [Rubiaceae-Hedyotideae]; ab *O. bicolore* Craib ramulis bifacialiter crispatis puberulis, foliis tenuioribus, stipulis deciduis, inter alia recedens.

Caules annui, bifacialiter crispatis mox furfuraceo-puberuli, primo angulati, mox teretes, ad 3 mm. diametro, brunnei vel demum substraminei. *Folia* opposita, paribus inter se subaequalibus, ovato-lanceolata vel oblongo-lanceolata, apice obtuse acuminata vel subacuminata, basi saepe parum inaequilaterialia, cuneata vel rotundata, 10-16 cm. longa, 3-5.5 cm. lata, membranacea vel chartaceo-membranacea, sicco subtus pallidiora, supra sparse setulosa sed marginem versus setulis brevioribus et magis numerosis, subtus glabra, costa supra conspicua subtus prominente, nervis lateralibus utrinque circa 10 pagina utraque conspicuis vel inferiore subprominulis, margine setuloso-ciliolata, petiolo 1-2 cm. longo suffulta; stipulae deciduae. *Inflorescentia* terminalis, pedunculo communi 1.5-4 cm. longo crispatis ferrugineo-puberulo suffulta, ad 6 cm. diametro; pedicelli receptaculo subaequilongi vel eo paulo longiores. *Receptaculum* paulo costatum, puberulum, 1 mm. longum. *Calycis* segmenta late deltoidea, obtusa, 0.5 mm. longa. *Corolla* alba (ex Kerr); tubus 5 mm. longus, intra medio pilosus; lobi 5, oblongi, 2 mm. longi, 1 mm. lati. *Stamina* 5, filamentis 3.5 mm. longis glabris 1.25 mm. supra corollae tubi basem insertis, antheris exsertis 1.5 mm. longis. *Stylus* 2 mm. longus; stigmata 1.5 mm. longa, longius acuminata.

Krabi, 50 m., evergreen forest at foot of limestone hill, Kerr 18851.

***Ophiorrhiza condensa* Craib** [Rubiaceae-Hedyotideae]; inter species caule iuventute pilis oblecto et antheris haud 2 mm. longis inflorescentia parva terminali subcapitata cognoscenda.

Caules annui, 15-23 cm. alti, primo ferrugineo-tomentelli, mox crispatis ferrugineo-puberuli, brunnei. *Folia* opposita, paribus inter se fere aequalibus, oblongo-lanceolata vel suboblonga, apice obtuse acuminata vel subacuminata, basi haud rarius inaequilaterialia, cuneata vel rotundato-cuneata, ad 11 cm. longa et 3.8 cm. lata, chartacea vel fere membranacea, sicco supra viridia, subtus pallida, supra sparse setulosa sed apud marginem setulis brevioribus et magis numerosis, subtus ad nervos crispatis ferrugineo-puberula, aliter setuloso-puberula, costa supra conspicua subtus prominula, nervis lateralibus utrinque 10-12 supra conspicuis subtus subprominulis intra marginem anastomosantibus, margine breviter setuloso-ciliata, petiolo usque ad 2 cm. longo suffulta; stipulae circa 1 cm. longae, deciduae, inter se plus minusve connatae sed saepissime fere e basi liberae. *Inflorescentia* terminalis, pedunculo communi circa 3 mm. longo dense puberulo suffulta, sub anthesin haud 1 cm. diametro, compacta, pedicellis dense puberulis ad 1 mm. longis. *Receptaculum* puberulum, vix 1 mm. longum. *Calycis* segmenta deltoidea, obtusiuscula, circa 0.5 mm. longa. *Corolla* alba (ex Kerr), extra puberula; tubus 4 mm. longus, intra sub apicem annulo denso

pilorum alborum instructus; lobi 5, lineares, 2.5 mm. longi. *Stamina* 5, ad pilorum annulum attingentia, filamentis brevibus, antheris linearibus vix 2 mm. longis. *Stylus* puberulus, 5 mm. longus, stigmatibus latis.

Kanburi, Wangka, 400 m., bamboo forest, *Kerr* 10436.

***Ophiorrhiza kratensis* Craib** [Rubiaceae-Hedyotideae]; ab *O. scabrella* Ridl. corolla extra subglabra inter alia distinguenda.

Caules 15–40 cm. alti, basi lignosi, simplices vel superne ramosi, iuventute dense adpresse ferrugineo-pubescentes, mox puberuli. *Folia* opposita, paribus inter se fere aequalibus, lanceolata ovatave, apice obtuse subacuminata, basi haud rarius parum inaequilaterialia, cuneata vel interdum rotundata, 6–12 cm. longa, 2–3.7 cm. lata, chartacea, sicca supra fusciscentia, subtus pallide viridia, supra sparse inconspicue setulosa, setulis marginem versus magis numerosis et brevibus, subtus ad nervos ferrugineo-puberula, costa supra saepissime impressa subtus prominente, nervis lateralibus utrinque 8–10 supra conspicuis subtus prominulis intra marginem anastomosantibus, petiolo ad 1.7 cm. longo suffulta; stipulae 2–3 mm. longae, deciduae. *Inflorescentia* terminalis, sublaxa, pedunculo communi usque ad 2 cm. longo adpresse ferrugineo-pubescente suffulta, pedicellis usque ad 2 mm. longis puberulis. *Receptaculum* 1.25 mm. longum, costatum, puberulum. *Calycis* segmenta 5, deltoidea, 0.75 mm. longa, dorso carinata. *Corolla* dorso subglabra; tubus circa 7 mm. longus, intra medio annulo denso pilorum alborum instructus; lobi 5, oblongo-lanceolati vel suboblongi, 3 mm. longi, 1.75 mm. lati. *Stamina* ad corollae tubi basem posita, filamentis brevibus, glabris 1 mm. supra corollae tubi basem insertis, antheris linearibus, 1.5 mm. longis. *Stylus* vix 5 mm. longus; stigmata subrotundata, circa 1 mm. diametro.

Krat, Kao Kuap, *Put* 2950.

***Ophiorrhiza longifolia* Craib** [Rubiaceae-Hedyotideae]; ab *O. scabrella* Ridl. calycis segmentis longioribus, corollae tubo pro rata multo longiore, ab *O. merguense* (Hook. f.) foliis pro longitudine angustioribus recedit.

Caules 10–25 cm. alti, basi lignosi, iuventute densius crispatis ferrugineo-pubescentes. *Folia* opposita, paribus inter se inaequalibus, oblongo-lanceolata, elongato-lanceolata, vel rarius suboblonga, apice obtuse acuminata, basi cuneata, interdum acuminato-cuneata, haud rarius inaequilaterialia, 5.5–13 cm. longa, 1.7–4.2 cm. lata, membranaceo-chartacea, sicca supra viridia, subtus pallida, pagina superiore setulis sparsis brevibus et marginem versus brevioribus et magis numerosis instructa, inferiore ad nervos crispatis ferrugineo-puberula, costa supra conspicua subtus prominula, nervis lateralibus utrinque 10 pagina utraque conspicuis, petiolo 0.8–2.3 cm. longo suffulta; stipulae 1 cm. longae, angustae, fere e basi inter se liberae. *Inflorescentia* terminalis, pedunculo communi circa 2 cm. longo ferrugineo-tomentello suffulta, circa

1 cm. longa et 3 cm. lata. *Receptaculum* puberulum, 1 mm. longum. *Calycis* segmenta receptaculo subaequilonga. *Corolla* alba (ex *Kerr*), extra puberula; tubus 7 mm. longus, intra 2 mm. infra apicem annulo denso pilorum alborum instructus; lobi 1.75 mm. longi. *Stamina* bene inclusa; filamenta glabra, circa 1.5 mm. supra corollae tubi basem inserta; antherae 1.5 mm. longae. *Stylus* circa 6 mm. longus, pilis paucis instructus; stigmata brevia, acuta.

Trang, Chawng, 100 m., evergreen forest, *Kerr* 15163.

***Ophiorrhiza longipes* Craib** [Rubiaceae-Hedyotideae]; *O. Lacei* Craib habitu subsimilis sed bracteis elongatis sub anthesin deficientibus distinguenda.

Caules 10–15 cm. alti, simplices, primo crispatis ferrugineo-pubescentes. *Folia* opposita, paribus inter se aequalibus, late ovata, subelliptica, vel elliptica, saepissime apice obtusa, basi late cuneata vel truncata, 3.5–7 cm. longa, 2.5–4.2 cm. lata, subchartacea, sicca supra viridia, subtus pallida, pagina superiore setulis sparsis et marginem versus brevioribus et magis numerosis instructa, inferiore ad nervos nervulosque crispatis puberula, costa supra conspicua subtus prominente, nervis lateralibus utrinque 7–8 supra conspicuis subtus prominulis, petiolo ad 1 cm. longo suffulta; stipulae deciduae. *Inflorescentia* terminalis, pedunculo communi 2.5–4.5 cm. longo crispatis puberulo suffulta, 1.5 cm. diametro. *Receptaculum* puberulum, 1 mm. longum. *Calycis* segmenta 0.5 mm. longa. *Corolla* alba (ex *Kerr*), dorso subglabra vel omnino glabra, longitudinaliter alata; tubus 3.75 mm. longus, intra 2 mm. supra basem annulo pilorum alborum instructus; lobi 3 mm. longi, 1.5 mm. lati. *Stamina* ad pilorum annulum vix attingentia; filamenta brevia, glabra, 0.5 mm. supra corollae tubi basem inserta; antherae 1 mm. longae. *Stylus* 3.5 mm. longus.

Muang Tak, Mê Mue, 200 m., common in deciduous forest, *Kerr* 6162.

***Ophiorrhiza membranacea* Craib** [Rubiaceae-Hedyotideae]; ab *O. gracili* Kurz foliis latioribus brevius acuminatis, bracteis conspicuis sub anthesin deficientibus distinguenda.

Caules herbacei, glabri. *Folia* opposita, paribus inter se aequalibus vel inaequalibus, ovato-lanceolata, oblongo-ovata, vel subovata, apice acuminata vel subacuminata, obtusa, basi cuneata, acuminato-cuneata, vel subtruncata, ad 16 cm. longa et 6 cm. lata, membranacea, sicca viridia, subtus pallidiora, pagina superiore setulis sparsis instructa, inferiore glabra, nervis lateralibus utrinque circa 12 supra subconspicuis subtus subprominulis, margine breviter setuloso-ciliata, petiolo ad 4.5 cm. longo suffulta; stipulae deciduae. *Inflorescentia* et terminalis et interdum ex axillis supremis orta, pedunculo communi circa 2 cm. longo suffulta, ramis brevibus vel ad 2.5 cm. longis, bracteis parvis deciduis, pedicellis receptaculis paulo brevioribus. *Receptaculum* circa 1.5 mm. longum, tenuiter costatum, glabrum. *Calycis* segmenta brevia. *Corolla* alba (ex *Kerr*); tubus

5.5 mm. longus, intra paululo supra medium annulo angusto pilorum alborum instructus; lobi 5, circa 2 mm. longi, basi vix 1 mm. lati. *Stamina* 5, filamentis 2.5 mm. longis glabris 1.5 mm. supra corollae tubi basem affixis, antheris linearibus vix 2 mm. longis ad corollae tubi apicem attingentibus. *Stylus* 2 mm. longus, glaber, stigmatibus ambitu oblongo-lanceolatis subacutis.

Surat, Kao Nawng, 900-1000 m., evergreen forest, *Kerr* 13289.

Ophiorrhiza oblonga Craib [Rubiaceae-Hedyotideae]; ab *O. argentea* Wall. ex G. Don foliis tenuioribus, corollae lobis oblongis, ab *O. fontinali* Ridl. calycis segmentis conspicue longioribus recedit.

Rhizoma lignosum, repens, caules erectos 7-15 cm. altos primo dense adpresse ferrugineo-pubescentes emittens. *Folia* opposita, paribus inter se saepissime inaequalibus, oblongo-lanceolata lateve lanceolata, apice saepissime subacute subacuminata, basi cuneata, 4-11 cm. longa, 1-2.3 cm. lata, chartacea, sicca supra plus minusve fusciscentia, subtus pallida, pagina superiore marginem versus sparse setulosa, aliter glabra, inferiore ad costam nervosque laterales parce crispatis ferrugineo-puberula, nervis lateralibus utrinque ad 10 pagina utraque conspicuis vel superiore subconspicuis, petiolo 0.5-1.4 cm. longo suffulta; stipulae angustae, circa 3 mm. longae, saltem paucis diutius persistentibus. *Inflorescentia* terminalis, pedunculo communi 1-2.5 cm. longo breviter adpresse ferrugineo-pubescente suffulta, vix 1 cm. longa, ad 2 cm. lata; pedicelli receptaculo subaequilongi. *Receptaculum* circa 1 mm. longum, costatum, furfuraceo-puberulum. *Calycis* segmenta 5, anguste deltoidea, circa 0.5 mm. longa. *Corolla* alba (ex *Kerr*), extra inferne parce furfuraceo-puberula; tubus 5 mm. longus, intra paulo infra medium annulo pilorum alborum instructus; lobi 2.25 mm. longi, dorso medio carinati. *Stamina* fere ad corollae tubi apicem attingentia; filamenta 2.5 mm. longa, 0.5 mm. supra corollae tubi basem inserta; antherae 1.6 mm. longae. *Stylus* 1.5 mm. longus, glaber; stigmata plus minusve fusiformia, stylo subaequilonga.

Trang, Kao Soi Dao, 400 m., evergreen forest, *Kerr* 19157.

Ophiorrhiza patula Craib [Rubiaceae-Hedyotideae]; inter species siamenses probabiliter *O. hispidulae* Wall. ex G. Don maxime affinis sed ab omnibus foliis subtus ad costam nervosque laterales pilis ferrugineis sat longis divergentibus conspicue instructis distinguenda.

Caules ad 40 cm. alti, ferrugineo-pubescentes, basi lignosi, ad 2 mm. diametro. *Folia* saepissime elliptico-oblonga, apice acuminata vel subacuminata, basi saepe parum inaequilaterialia, cuneata vel late cuneata, 3-7 cm. longa, 1.5-3 cm. lata, chartacea, sicca brunnescentia, subtus pallidiora, supra setulosa, setulis ferrugineis vel rarius pallidis ad costam et marginem versus magis numerosis, subtus ad costam pilis ferrugineis divaricatis dense instructa, ad nervos laterales similiter sed minus densius tecta, aliter pilis similibus sparse instructa, costa supra conspicua subtus prominente, nervis lateralibus utrinque 8 supra subconspicuis subtus prominulis,

nervulis paucis subtus conspicuis, petiolo 5-15 mm. longo indumento ei caulium simili instructo suffulta; stipulae filiformes, circa 5 mm. longae, deciduae. *Inflorescentia* et caules et ramulos breves laterales terminans, pedunculo communi 1.5-3.5 cm. longo ferrugineo-pubescente suffulta, 1-2.5 cm. diametro; pedicelli breves. *Receptaculum* ferrugineo-pubescentia, 1 mm. longum. *Calycis* segmenta 5, sublanceolata, subacuta, receptaculo subaequilonga, dorso ferrugineo-pubescentia. *Corolla* punicea (ex *Kerr*), dorso ferrugineo-subpilosa; tubus 5 mm. longus, intra medio annulo denso pilorum alborum instructus; lobi 2 mm. longi, 1.25 mm. lati, dorso medio alati. *Discus* carnosus, conspicuus. *Stamina* 5, ad pilorum annulum haud attingentia, filamentis brevibus glabris, antheris 1.25 mm. longis. *Stylus* 3.75 mm. longus, pilis paucis instructus; stigmata 1 mm. longa, basi 0.75 mm. lata, obtusa.

Prachuap, Kao Luang, 1200 m., open scrub, *Kerr* 10853.

Ophiorrhiza plumbea Craib [Rubiaceae-Hedyotideae]; ab *O. fontinali* Ridl. calycis segmentis conspicue longioribus, ab *O. merguense* (Hook. f.) foliis longioribus pro rata angustioribus distinguenda.

Caules e rhizomate lignoso ad 13 cm. alti, iuventute dense adpresse ferrugineo-subhirsuti. *Folia* opposita, paribus inter se subaequalibus vel saepe valde inaequalibus, saepissime oblongo-oblanceolata, apice obtuse acuminata vel subacuminata, rarius subrotundata, basi longius cuneata, 3-13 cm. longa, 1.2-3 cm. lata, subchartacea, supra viridi-plumbea, subtus griseo-viridia, pagina superiore marginem versus sparse adpresse setulosa, aliter glabra, inferiore ad costam nervosque crispatis ferrugineo- vel griseo-ferrugineo-puberula, costa supra conspicua saepe impressa subtus prominente, nervis lateralibus utrinque 8-12 supra subconspicuis subtus prominulis, nervulis paucis subtus conspicuis vel subprominulis, petiolo ad 1.3 cm. longo suffulta; stipulae angustae, ad 5 mm. longae, deciduae. *Inflorescentia* terminalis, densa, pedunculo communi ad 4 cm. longo crispatis pallide ferrugineo-puberulo suffulta, circa 1 cm. longa et 1.5 cm. lata; pedicelli receptaculo breviores. *Receptaculum* 1 mm. longum, costatum, puberulum. *Calycis* segmenta sublanceolata, circa 0.75 mm. longa. *Corolla* alba, apice punicea (ex *Kerr*), extra longius puberula; tubus 4.25 mm. longus, intra paulo supra medium annulo denso pilorum alborum instructus; lobi 5, circa 2.25 mm. longi. *Stamina* 5, ad pilorum annulum fere attingentia; filamenta 0.75 mm. longa, 0.75 mm. supra corollae tubi basem inserta; antherae 1.5 mm. longae. *Stylus* 3.5 mm. longus, pilis paucis oblique erectis instructus; stigmata complanata.

Pang-nga, Kao Katakawm, 700 m., evergreen forest, *Kerr* 18430.

Ophiorrhiza Ridleyana Craib [Rubiaceae-Hedyotideae]; ab affini *O. scabrella* Ridl. calycis segmentis conspicue maioribus inter alia distinguenda.

Caulis erectus, 10–30 cm. altus, lignosus, basi ad 4 mm. diametro, iuventute densius breviter crispatis pubescens, demum puberulus. *Folia* late lanceolata vel oblongo-elliptica, apice saepissime subacuminata, obtusa, basi cuneata vel subacuminata, saepe parum inaequilateralia, 3.5–8.5 cm. longa, 1.3–3 cm. lata, chartacea, sicco supra viridia, subtus cinereo-viridia vel pallide brunnea, interdum purpurea, supra setulis saepissime cito deciduis sparse instructa et ad marginem setulis brevioribus magis numerosis persistentibus scabridula, subtus ad costam nervosque breviter subhirsuta, costa supra conspicua subtus prominente, nervis lateralibus utrinque 6–8 supra conspicuis subtus prominulis, petiolo 5–10 mm. longo supra canaliculato glabro aliter indumento ei caulis simili instructo suffulta; stipulae deciduae. *Inflorescentia* terminalis, corymbiformis, circa 1 cm. longa et 1.5 cm. diametro, pedunculo communi 1–1.5 cm. longo densius breviter crispatis pubescente suffulta; bractae angustae, circa 1.5 mm. longae, deciduae; flores albi (ex *Kerr*), breviter pedicellati. *Receptaculum* puberulum, 1.25 mm. longum. *Calycis* segmenta 5, deltoidea, obtusa, paululo ultra 1 mm. longa. *Corollae* tubus 3 mm. longus, dorso glaber, intra medio annulo denso pilorum alborum instructus, lobi 5, suboblongi, circa 2 mm. longi, dorso glabri, intra marginem versus breviter hirsuti. *Stamina* 5, filamentis 1.75 mm. longis glabris basem prope corollae tubi insertis, antheris circa 1.25 mm. longis. *Stylus* 3.5 mm. longus, pilis brevibus sparse instructus, stigmatibus latis obtusis.

Doi Sutep, 660 m., evergreen forest, *Kerr* 1174.

***Ophiorrhiza ripicola* Craib** [Rubiaceae-Hedyotideae]; ab *O. Griffithii* Hook. f. foliis floribusque sicco rubris, stipulis conspicue minoribus distinguenda.

Caules e rhizomate plures, erecti, circa 30 cm. alti, glabri, basi lignosi, complanati et sulcati, sicco rubri. *Folia* opposita, paribus inter se inaequalibus vel subaequalibus, parum variabilia, oblanceolata, obovato-oblanceolata, oblongo-elliptica, vel subelliptica, apice acute acuminata, basi cuneata vel acuminata, saepe parum inaequilateralia, 6–12 cm. longa, 2–4.8 cm. lata, chartaceo-membranacea, sicco supra viridia, ad costam et saepe ad nervos laterales rubra, subtus plus minusve rubra, supra setulis sparsis instructa, subtus glabra, nervis lateralibus utrinque circa 10 inferioribus saepe rectis et obliquis superioribus arcuatis et intra marginem anastomosantibus supra conspicuis subtus prominulis, costa supra conspicua subtus prominente, nervulis paucis pagina utraque conspicuis, petiolo 1.3–3.5 cm. longo glabro supra canaliculato suffulta; stipulae deciduae, lanceolatae vel oblongo-lanceolatae, usque ad 5 mm. longae, integrae, glabrae. *Inflorescentia* terminalis, corymbiformis, primo subnutans, circa 2 cm. diametro, pedunculo communi ad 2.5 cm. longo suffulta, pedunculis partialibus 5–7 mm. longis cum pedunculo communi bifacialiter puberulis et sicco rubris; bractae lanceolatae vel oblongo-oblanceolatae, apice angustatae, subacutae, inferiores ad 10 mm. longae et 3 mm. latae, glabrae, sicco rubrae;

bracteolae bracteis similes sed tantum circa 6 mm. longae et 1.5 mm. latae; pedicelli crassi, ad 2 mm. longi, dense crispatis puberuli. *Receptaculum* oblatum, ad 1.5 mm. longum et 3.5 mm. latum, inferne puberulum, superne glabrescens. *Calycis* segmenta deltoideo-lanceolata, obtusa, 1 mm. longa, 0.5 mm. lata, glabra. *Corolla* alba (ex *Garrett*), sicco rubra, extra glabra; tubus 1.5 cm. longus, intra parte triente inferiore glaber, superne pilosus; lobi 5, oblongo-ovati, subacuti, ad 6 mm. longi et 3 mm. lati, intra pilis paucis instructi. *Stamina* 5, filamentis 1.5 mm. longis glabris 9 mm. supra corollae tubi basem insertis, antheris 2.75 mm. longis ad corollae tubi apicem attingentibus. *Discus* carnosus, conspicuus, calyce paululo altior. *Stylus* stigmatibus duobus complanatis inclusis 1.6 cm. longus, puberulus.

Doi Angka, source of Mè Wak, 2425 m., in stream and on banks, *Garrett* 326.

***Ophiorrhiza Schmidiana* Craib** [Rubiaceae-Hedyotideae]; inter species siamenses antheris haud 2 mm. longis et corolla dorso glabra et costata, inflorescentia et terminali et axillari distinguenda.

Caules basi lignosi, 15–22 cm. alti, iuventute dense adpresse ferrugineo-subhirsuti. *Folia* opposita, paribus inter se subaequalibus vel valde inaequalibus, saepissime oblongo-lanceolata, apice obtusa vel subacuta, interdum subacuminata, basi cuneata, saepe inaequilateralia, 3–7 cm. longa, 1–2.5 cm. lata, chartacea, sicca supra viridia, subtus pallida, interdum purpureo-suffusa, pagina superiore parce setulosa, setulis marginem versus magis numerosis et brevioribus, inferiore ad costam nervosque crispatis ferrugineo-puberula, costa supra conspicua saepe impressa subtus prominente, nervis lateralibus utrinque 8–10 supra conspicuis subtus prominulis, nervulis paucis subtus subprominulis, petiolo 5–12 mm. longo suffulta; stipulae parvae, deciduae. *Inflorescentia* et terminalis et axillaris, pedunculo communi 2–4 cm. longo primo dense ferrugineo-puberulo suffulta, ad 4 cm. lata; pedicelli puberuli, receptaculo subaequilongi vel eo paululo longiores. *Receptaculum* circa 1 mm. longum, costatum, puberulum. *Calycis* segmenta 5, oblongo-lanceolata, obtusa, circa 0.75 mm. longa. *Corolla* alba, purpureo-suffusa (ex *Kerr*), extra glabra, costata; tubus 4.5 mm. longus, intra medio annulo conspicuo pilorum alborum instructus; lobi 5, elongato-deltoidei, 2 mm. longi, basi 1 mm. lati. *Stamina* e tubo paululo exserta; filamenta circa 2.75 mm. longa, 0.5 mm. supra corollae tubi basem inserta; antherae vix 2 mm. longae. *Stylus* 1 mm. longus; stigmata acuta, circa 0.75 mm. longa.

Sukotai, Kao Luang, 500 m., evergreen forest, *Kerr* 5911.

***Ophiorrhiza subaequalis* Craib** [Rubiaceae-Hedyotideae]; inter species ramulis glabris vel bifacialiter puberulis ponenda, corollae lobis tubo tantum paululo brevioribus distinguenda.

Caules e rhizomate horizontali annui, ad 35 cm. alti, inferne lignosi, iuventute bifacialiter crispatis puberuli, angulati, cito

glabri, teretes, usque ad 2.5 mm. diametro. *Folia* opposita, paribus inter se aequalibus parumve inaequalibus, oblongo-lanceolata, oblanceolata, vel oblongo-obovata, apice obtuse subacuminata vel acuminata, basi acuminata, ad 8.5 cm. longa et 3 cm. lata, membranacea, supra viridia, subtus pallide viridia, pagina superiore setulis sparsis sed marginem versus magis numerosis inferiore setulis similibus sed praesertim ad nervos laterales instructa, nervis lateralibus utrinque 7-9 supra subconspicuis subtus subprominulis, nervis transversis vix conspicuis, petiolo 6-12 mm. longo suffulta; stipulae deciduae, subfiliformes, 3 mm. longae. *Inflorescentia* terminalis, pedunculo communi circa 2 cm. longo crispatis puberulo suffulta, circa 2 cm. diametro; pedicelli breves vel subnulli; bractae angustae, circa 3 mm. longae, deciduae. *Receptaculum* suboblato, costatum, circa 1.5 mm. longum, glabrum. *Calycis* segmenta deltoidea, circa 0.5 mm. longa. *Corolla* alba (ex *Kerr*), dorso glabra vel apice pauperius puberula; tubus 2.5 mm. longus, intra inferne glaber, apice densius barbatus; lobi 5, lineari-oblongi, tubo subaequilongi, circa 0.5 mm. longi, intra glabri. *Stamina* 5, filamentis 1.25 mm. longis 0.75 mm. supra corollae tubi basem affixis, antheris 1 mm. longis ad corollae tubi apicem attingentibus. *Stylus* 4 mm. longus, inconspicue puberulus, stigmatibus ambitu subellipticis carosis.

Loi, Kao Krading, 1200 m., evergreen forest, *Kerr* 8953.

Ophiorrhiza subpunicea *Craib* [Rubiaceae-Hedyotideae]; *O. communi* Ridl. et *O. rosaceae* Ridl. facie similis, ab ambabus calycis segmentis maioribus et antheris conspicue longioribus recedit.

Caules erecti, 11-25 cm. alti, primo dense adpresse ferrugineo-subhirsuti. *Folia* opposita, paribus inter se subaequalibus vel conspicue inaequalibus, saepissime oblongo-elliptica vel oblongo-lanceolata, apice acute acuminata vel subacuminata, basi saepissime inaequilaterialia, cuneata, acuminata, vel rarius rotundata, 5.5-11 cm. longa, 1.5-3.5 cm. lata, sicca plus minusve rubro-suffusa, subtus pallidiora, membranaceo-chartacea, supra ad marginem breviter setulosa, aliter glabra vel parce setosa, subtus ad costam nervosque crispatis ferrugineo-puberula, costa pagina utraque conspicua, nervis lateralibus utrinque 8-10 pagina utraque conspicuis, petiolo 5-13 mm. longo suffulta; stipulae circa 4 mm. longae, deciduae. *Inflorescentia* terminalis, pedunculo communi 1-2 cm. longo indumento brevi adpresso ferrugineo tecto suffulta; bractae parvae, deciduae; pedicelli breves vel receptaculo subaequilongi. *Receptaculum* circa 1 mm. longum, costatum, praesertim inferne densius adpresse ferrugineo-puberulum. *Calycis* segmenta lanceolata, acuta, circa 0.6 mm. longa. *Corolla* puniceo-alba (ex *Kerr*); tubus 5 mm. longus, primo costatus, extra parce ferrugineo-puberulus, intra paululo infra medium annulo pilorum alborum instructus et supra annulum furfuraceo-puberulus; lobi 1.5 mm. longi, intra furfuraceo-puberuli. *Stamina* ad corollae tubi os attingentia; filamenta 3 mm. longa, 1 mm. supra corollae tubi basem affixa;

antherae 2.25 mm. longae. *Stylus* 1.75 mm. longus, glaber; stigmata fusiformia, acuta, circa 1 mm. longa.

Satul, Kao Keo Range, 700 m., evergreen forest, *Kerr* 14526.

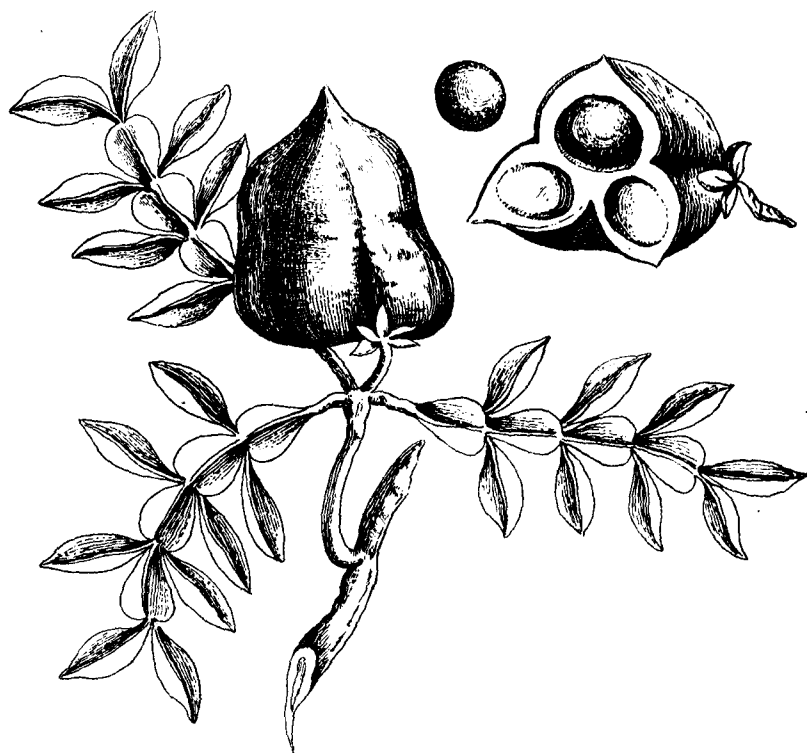
Chirita Elphinstonia *Craib* [Gesneriaceae-Cyrtandreae]; a *C. Marcanii* Craib floribus minoribus magis numerosis, a *C. oculata* Craib corollae tubo intra bimaculato inter alia recedit.

Herba erecta, caule superne ramoso ad 90 cm. alto basi usque ad 2.5 cm. diametro glabro vel pilis perpaucis hic et illic instructo nitido viridi, internodiis inferne purpureo-suffusis, inferne lenticellis paucis conspicuis pallidis instructo. *Folia* opposita, elliptica vel oblonga, rarius obovato-oblonga, basi truncata, ad 15 cm. longa et 9 cm. lata, supra viridia, subtus pallide viridia, pagina superiore pilis erectis molliter pubescentia, inferiore pilis brevioribus magis rigidis sparsioribus instructa, nervis lateralibus utrinque paulo ultra 20 supra parum impressis subtus prominentibus, nervulis fere omnibus obscuris, margine ciliata, petiolo valido ad 3 cm. longo suffulta. *Cymae* cum ramulis petiolo adnatae, pedunculis partialibus usque ad 2 mm. inter se liberis, pedicellis sub anthesin adscendentibus mox erectis demum recurvis circa 1 cm. longis superne paulo incrassatis saepissime pilis paucis postice longitudinaliter instructis. *Calyx* viridis; segmenta 5, lineari-lanceolata, subobtusata, ad 11 mm. longa, dorso medio pilis sparsis rigidis instructa. *Corolla* lutea, tubo intra ad staminum insertionem purpureo-maculato, dorso breviter pubescens; tubus 15 mm. longus, a medio superne amplius; labium posticum e lobis duobus 4 mm. longis 6 mm. latis constitutum, intra inferne pilis glanduloso-capitatis instructum; lobus anticus circa 9 mm. longus et latus, lateralibus maior. *Stamina* 2, inclusa, antheris inter se connatis pallidis conspicue albo-barbatis, filamentis 4 mm. longis. *Discus* brevis, pistilli basem cingens. *Ovarium* circa 6 mm. longum, superne breviter sparse pubescens; stylus 1 cm. longus, sparse breviter pubescens, stigmate papilloso breviter bilamellato.

Described from plants raised at Aberdeen from seed of *Marcan* 2561, collected at Ban Keng, 30 m., limestone hill.

XVII.—ERYTHROPHYSA ALATA. J. HUTCHINSON.

Amongst a number of photographs of paintings of plants, made for Governor van der Stel on his expedition to Namaqualand in 1685, and submitted to Kew for determination by Professor Waterhouse of Trinity College, Dublin, was one which from description might be *Fagara alata* Eckl. & Zeyh. The type specimen of this was obtained from Sonder's herbarium in Vienna, and although a barren shoot, was no doubt the same species as depicted in the drawing. A further examination and search, however, showed the species to be misplaced in the family *Rutaceae* to which the genus *Fagara* belongs, and it was found to be identical with *Erythrophyssa undulata* E. Mey., a genus belonging to the *Sapindaceae*.



Copy of photograph of painting of *Erythrophysa alata* (Eckl. & Zeyh.) Hutch., made for Governor van der Stel in Namaqualand in 1685. Reproduced by permission of Professor G. Waterhouse, Trinity College, Dublin.

Fagara alata was first collected by Ecklon and Zeyher, and they published a short description in their Enumeration in 1835 (p. 118). Harvey in the Flora Capensis vol. i (p. 446), retained it with considerable doubt in the *Rutaceae* as a species of *Xanthoxylon*, the name at that time in use for *Fagara*. Harvey and Sonder still had only the single barren specimen in the latter's herbarium, and they failed to connect it with *Erythrophysa undulata* E. Mey. included by them on p. 238 of the same work. As the name *Fagara alata* is older than *Erythrophysa undulata*, the following new combination is necessary:—

***Erythrophysa alata* (Eckl. & Zeyh.) Hutch. comb. nov.**

Fagara alata Eckl. & Zeyh. Enum. 118 (1835). *Xanthoxylon* ? *alatum* Steud. Nom. ed. 2, ii. 796 (1841); Harv. in Harv. & Sond. Fl. Cap. i. 446. *Erythrophila undulata* Arn. in Hook. Journ. Bot. iii. 258 (1841). *Erythrophysa undulata* E. Mey. in Drege Zwei

Pflanzengeogr. Docum. 183, nomen (1843); Harv. & Sond. Fl. Cap. i. 237 (1860).

Distribution:—Clanwilliam Div.: near Louisfontein, Ecklon & Zeyher 923. Little Namaqualand: common on hillside above Twee Rivieren, fr. Sept., Pearson 6498; granite slopes on both sides of pass north of Garies, fr. Dec., Pearson 5624. Brackdam, 1500 ft., fr. Sept., Schlechter 11,112; Uitkomst, 2000–3000 ft., fl. Aug., Drege; near Ookiep, Foxwell; bewteen Ookiep and Spektakel, about 2000 ft., fr. Aug.-Sept., Bolus 9486.

XVIII.—NOTES ON AFRICAN GRASSES: XII.*

S. M. STENT.

A NEW GENUS FROM THE ORANGE FREE STATE.

Tarigidia Stent, gen. nov.; affinis *Digitariae* Hall., sed spiculis in ramis brevibus paniculae spiciformis dispositis, gluma inferiore elongata differt.

Spiculae anguste ellipticae, elliptico-lanceolatae vel lanceolato-oblongae, subacutae vel acutae, muticae, dorso compressae, infra glumas tarde disarticulatae, dense imbricatae, secundae, in ramis brevibus paniculae spiciformis dispositae. **Anthoecia** duo: inferius ad lemma redactum; superius ♀. **Glumae** dissimiles, spicula breviores; inferior abaxialis, lanceolata vel ovato-lanceolata, tenuiter acuta vel acuminata, firme membranacea, uni- vel trinervis; superior ovata, acuta vel subacuminata, membranacea, trinervis, pilosa. **Anthoecium inferum** sterile: lemma spiculam aequans, elliptico-oblongum vel oblongo-lanceolatum, acutum, 7-nerve, pilosum, firme membranaceum; palea minuta, hyalina, biloba. **Anthoecium superum** ♀, inferum aequans, late lanceolatum, acutum: lemma explanatum late ellipticum, obtusum, trinerve, tenuiter chartaceum, marginibus planis membranaceis; palea lemma aequans, tenuiter chartacea, binervis. **Lodiculae** minutae, cuneatae. **Stamina** 3, antheris linearibus. **Styli** basi connati; stigmata plumosa. **Caryopsis** ignota.—Gramen perenne; foliorum laminae lineares; panicula angusta; rami basi disarticulati; spiculae pilosae.

Species 1, Africae australis incola.

T. aequiglumis Stent, comb. nov.; species unica. **Gramen** perenne, dense caespitosum, 1–1.5 m. altum, innovationibus intra-vaginalibus. **Culmi** e rhizomate brevi erecti vel geniculato-adscedentes, teretes, subvalidi, simplices vel ramosi, 3–5-nodes, glabri laevesque, infra paniculam tenuiter striati. **Foliorum vaginae** carinatae, laxiusculae, chartaceae, marginibus tenuibus, inferiores internodiis aequales vel longiores, plus minusve pilosae vel villosae, superiores internodiis breviores, glabrescentes vel glabrae, ore auriculatae, auriculis ad ligulam adnatis; ligulae oblongae, truncatae, ad 5 mm. longae, tenuiter membranaceae, glabrae; laminae anguste

*Continued from K.B. 1929, 323.

lineares, apice tenuiter acutae vel subsetaceae, ad 25 cm. longae, 3-4 mm. latae, planae, supra ubique et subtus apicem versus scaberulae, ceterum laeves, glabrae vel basin versus pilis paucis pilosae, pone ligulam saepe breviter dense pubescentes, costa media tenui albida infra prominente, marginibus cartilagineis. *Panicula* erecta, cylindrica, spiciformis, densa vel inferne interrupta, 8-11 cm. longa, 5-7 mm. lata, villosa, pallida vel purpurea; rhachis 4-angulata vel triquetra, angulis scaberulis, glabra vel nodis breviter barbata; rami subtriquetri, secundi, usque basin dense spiculati, erecti, appressi, basi molliter pilosi, marginibus sparse ciliati et scaberuli, inferiores 1-1.5 cm. longi, superiores sensim decrescentes; pedicelli bini, brevissimi, teretes. *Spiculae* 4-4.5 mm. longae. *Gluma* inferior 2.5-3 mm. longa, glabra vel dorso sparse pilosa, marginibus scabridis; gluma superior 2.75-3.5 mm. longa, marginibus et inter nervos longe denseque pilosa, apice subglabra et scaberula. *Anthoecium inferum*: lemma supra medium secus carinas pilis patentibus mollibus ad 2.5 mm. longis e tuberculis ortis pilosum, raro etiam infra medium inter nervos pilosum. *Anthoecium superum*: lemma glabrum, pallide stramineum. *Antherae* 2-2.5 mm. longae.—*Antheophora aequiglumis* Goossens in Trans. Roy. Soc. S. Afr. xx. 195, fig. 3 (1932).

SOUTH AFRICA. Orange Free State: Hoopstad District; Odendaalsrust, on an empty plot, *Schultz in Nat. Herb. Pretoria* 8344 (type). Kroonstad District; Groenebloem Station, *Potts* 2674.

The structure of the spikelet is very similar to that of *Digitaria*, but the elongated lower glume and the type of inflorescence place *Tarigidia* beyond the limits of that genus. The lemma of the upper floret has the same characteristic flattened broad thin margins, whilst the very much reduced palea of the sterile lower floret may be found attached to the base of the upper floret as in the genus *Digitaria*. It is probable that the spikelets are often more or less persistent as the short branches easily disarticulate at the base from the rhachis of the inflorescence. This character, together with the spiciform panicle and the somewhat similar structure of the spikelets, no doubt led Mr. Goossens to place our plant in the genus *Antheophora*.

The name *Tarigidia* is an anagram of *Digitaria*.

XIX.—NOTES ON THE FLORA OF SOUTHERN AFRICA: I. MISCELLANEOUS OBSERVATIONS. R. A. DYER.

MALVACEAE.

***Pavonia Burchellii* (DC.) R. A. Dyer, comb. nov.**—The necessity for this new combination is indicated in the following notes. De Candolle, Prodr. i. 438 (1824), described *Burchell* 2557 as *Althaea Burchellii*, a plant to which Burchell in his Catalogue MSS. had applied the name *Urena pilosa*. Confusion in the identity of Burchell's plant was first caused by Ecklon and Zeyher, Plant. Afr. Austr. 37 (1835), who erroneously referred their no. 300 to *Althaea*

Burchellii DC. Thus Harvey, in Harv. & Sond. Fl. Cap. i. 159 (1859-60), who had not seen Burchell's type, retained De Candolle's original diagnosis, and at the same time made the following note on Ecklon and Zeyher's specimen:—"The plant distributed by E. & Z. under this name is an undoubted *Pavonia* (*P. mollis* E. Mey.)."

Ulbrich, in Engl. Bot. Jahrb. lvii. 125 (1922), places *Pavonia macrophylla* E. Mey. ex Harv. as a synonym of the older name *P. Kraussiana* Hochst. (1844) and cites with the former, *Burchell* 2557, and again cites the number in the text, but makes no reference there to *Althaea Burchellii* DC. (1824) of which, as stated, *Burchell* 2557 is the type. Subsequently, however, Ulbrich, l.c. 135, evidently basing his opinion on Harvey, l.c., cites "*Althaea Burchellii* Eckl. et Zeyh. (n. 300) DC. Prodr. l.c." and *Pavonia mollis* E. Mey. as synonyms of *P. columella* Cav. (1787).

Both *Burchell* 2557 and Ecklon and Zeyher 300 are in Kew Herbarium and are entirely distinct. On the other hand the type specimens of *Pavonia macrophylla* E. Mey. ex Harv. and *P. Kraussiana* Hochst. agree very closely with Burchell's plant. *P. Burchellii* occurs frequently in the Karroo and karroid areas throughout the Cape, extending to Orange Free State, Natal and Transvaal.

The main synonymy is as follows:—*Althaea Burchellii* DC. l.c. (1824); *Urena pilosa* Burch. Cat. 2557 ex DC. l.c.; *Pavonia Kraussiana* Hochst. in Flora, xxvii. 293 (1844); *P. macrophylla* E. Mey. ex Harv.

***Pavonia Meyeri* Mast.** in Oliv. Fl. Trop. Afr. i. 191 (1868). Although Ulbrich, l.c., cites the South African species *P. mollis* E. Mey. ex Harv. and *P. Meyeri* Mast. as synonymous with *P. columella* Cav., a Bourbon species, it is considered that the plants represent distinct species. *P. mollis* E. Mey. ex Harv. (1859), however, is a later homonym of *P. mollis* H. B. & K. Nov. Gen. et Sp. v. 282 (1821). In consequence Masters, l.c., applied the specific epithet *P. Meyeri* to the South and Central African plants and this is therefore resuscitated.

The main synonymy is:—*P. mollis* E. Mey. ex Harv. non H. B. & K. l.c.; *Althaea Burchellii* Eckl. & Zeyh. non DC. l.c.; *Pavonia columella* Ulbr. l.c. in part, non Cav.

TILIACEAE.

***Corchorus aspleniifolius* Harv.** in Harv. & Sond. Fl. Cap. i. 229 (1859-60), non Burch. It is very probable that Harvey's description, l.c., was made from Dr. Atherstone's specimen which he cites doubtfully from Grahamstown. He had none of Burchell's specimens at his disposal at the time. There is also reason to believe that Dr. Atherstone's plant actually came from Bechuanaland, for he made botanical collections in that area, and presumably later posted them from Grahamstown where he was domiciled. Further, Dr. Atherstone's specimen agrees very closely with *Burchell* 2337

from Last Water Station in the Chooi Desert, and 2431 from near Kuruman, Bechuanaland. As stated, Harvey had not seen *Burchell* 1737, the type of *C. aspleniifolius* Burch., and it is quite distinct from the above three specimens, which must therefore be given a new name.

Hochreutiner, Jard. Bot. Geneve, 125 (1914), described *Corchorus arenicola* based on a specimen from Litakoun in Bechuanaland, and it appears from his description and notes that *Burchell* 2337, 2431 and Dr. Atherstone's plant may well be placed under *C. arenicola* Hochr., with *C. aspleniifolius* Harv. non Burch. as a synonym.

STERCULIACEAE.

Hermannia stellulata (Harv.) K. Schum. in Engl. Mon. Afr. Pl. v. 74. In view of my note under *Corchorus aspleniifolius* Harv. non Burch., questioning the validity of the locality of Dr. Atherstone's plant cited by Harvey, the present case is also of importance. The type of *Mahernia stellulata* Harv. in Harv. & Sond. Fl. Cap. i. 216 (1859-60) is quoted from Grahamstown, without collector's name. One might well take *Corchorus aspleniifolius* Harv. and *Mahernia stellulata* Harv. as an example of parallel development, for their vegetative appearance is remarkably similar. I have seen no other specimen from Grahamstown which agrees with the type of *Mahernia stellulata* Harv., but as in the case of *Corchorus aspleniifolius*, specimens collected by Burchell (2334) in Bechuanaland, agree very closely. This suggests that the type of *Mahernia stellulata* Harv. came from Bechuanaland and not from near Grahamstown. Evidence which greatly strengthens this view is the presence of the same micaceous sand adhering to both Burchell's specimen and the type. A further examination of Dr. Atherstone's plant of *Corchorus aspleniifolius* Harv. non Burch. established the presence of a small amount of the same type of sand. This plant and the type of *Mahernia stellulata* Harv. without collector's name were both in Herb. Hook. (now Herb. Kew.) and it is suggested that the latter was also collected by Dr. Atherstone in Bechuanaland.

Hermannia jacobaeifolia (Turcz.) R. A. Dyer, comb. nov.—Harvey, in Harv. & Sond. Fl. Cap. i. 212 (1859-60), quotes this species as a synonym of *Mahernia bipinnata* Linn. which appears to have been first validly published by De Candolle, Prod. i. 496 (1824), and in the Index Kewensis De Candolle is given as the author. Glover, Ann. S. A. Mus. ix. 197 (1915), made the combination *Hermannia bipinnata* (Linn.) Glover "*(Mahernia bipinnata* Linn. non. Burch.)," and evidently overlooked the fact that Burchell published his plant as a *Hermannia* and not a *Mahernia*. Thus, according to the International Code, *Hermannia bipinnata* Glover is a later homonym and must have a new name. The oldest valid synonym has therefore been resuscitated.

The main synonymy is as follows:—*Mahernia jacobaeifolia* Turcz. Bull. Soc. Nat. Mosc. xxxi, 220 (1858); *Mahernia pinnata*

Cav. Diss. vi. t. 176, fig. 2 (1788) non Linn.; *Mahernia bipinnata* Linn. ex DC. Prod. i. 496 (1824) excl. syn. *Hermannia pinnata* Linn. Sp. Pl. ii. 943 (1763)?; *Mahernia bipinnata* Harv. in Harv. & Sond. Fl. Cap. i. 212 (1859-60); *Hermannia bipinnata* (Linn.) Glover, l.c., non Burch., Trav. i. 310 (1822).

The type of this species is *Drege* 7316 (in part) collected in the Graaff Reinet Div. on the Sneeuwbergen, 5000 ft. This specimen was also quoted by Harvey, l.c. The species occurs occasionally in the Karroo of the Cape and Orange Free State and extends eastwards to the Zwart Kei River. This latter locality is recorded on Mrs. Barber's specimen in the Kew Herbarium and instead of Albany Div., Queenstown Div. should be substituted.

Hermannia resedifolia (Burch. ex DC.) R. A. Dyer, comb. nov. This species is very closely allied to *H. jacobaeifolia* (Turcz.) R. A. Dyer, but differs in the leaves being pinnate, not bipinnate, and *Burchell* 2280 (type) collected near the source of Moshowing River near Takun, Bechuanaland, is more luxuriant and less glandular-pubescent than *Drege* 7316. Other specimens, however, show a breaking down of the differences. With a larger range of specimens accompanied by field notes, it might be found necessary to unite the two species in which case *H. resedifolia* (DC.) R. A. Dyer would have priority.

PLUMBAGINACEAE.

In view of the fact that the South African plants previously included in the genus *Statice* Linn. must be referred to *Limonium* Mill. (Sprague in Journ. Bot. lxii. 267), it is necessary to make four new combinations. They are as follows:—**L. amoenum** (C. H. Wright) R. A. Dyer; **L. anthericoides** (Schlechter) R. A. Dyer; **L. avenaceum** (C. H. Wright) R. A. Dyer; **L. equisetinum** (Boiss.) R. A. Dyer. All the other combinations except *L. purpuratum* (Linn.) Hubbard, were made by O. Kuntze, Rev. Gen. Plant. ii. 395-6.

XX.—MISCELLANEOUS NOTES.

MR. JOHN COUTTS.—The Minister of Agriculture and Fisheries has appointed Mr. J. Coutts, Assistant Curator in charge of the Decorative Department, as Curator in succession to the late Mr. T. W. Taylor.

DR. N. E. BROWN.—The University of the Witwatersrand, Johannesburg, has conferred the Honorary Degree of Doctor of Science on Mr. N. E. Brown, A.L.S., in recognition of his work on the S. African flora. At the request of the Professor of Botany of the University and to mark the conferment of the degree, the Director presented Dr. Brown to his colleagues in the Herbarium of the Royal Botanic Gardens, Kew, on March 19th.

THOMAS WILLIAM TAYLOR.—The death of Mr. T. W. Taylor on March 4th, which we recorded with deepest regret in the last number of the *Bulletin*, is another very sad loss to Kew. Mr. Taylor was taken ill last December and went into hospital for treatment hoping that only a slight operation would be necessary. After some weeks in hospital, during which time his illness became of a painful nature, an operation was performed and revealed that his condition was critical, and though he rallied well he succumbed a week after the operation had been performed.

Mr. Taylor's untimely death at the early age of 53, so soon after his appointment to the responsible position of Curator, in May 1929, is a great loss to the personnel of the establishment, and all the more so since it has occurred so soon after the lamented death of Dr. T. F. Chipp.

Mr. Taylor was born in Gloucestershire in June 1878, but by association he was more a man of our own neighbourhood, for his father was gardener at Manor House, Ham, and it was under him that he started his career; afterwards he acquired experience at Heythrop Park, on the borders of his native county, and in the famous nurseries of Messrs. James Veitch & Son. He entered Kew as a Student Gardener in 1902, and was promoted to the position of Foreman of the Temperate House in 1906, and later, with the title Assistant Curator, he had charge of all the Tropical Departments. He was promoted to the office of Curator on the retirement of Mr. W. J. Bean. His rise to this, the most important post in botanical horticulture, was due to his great skill as a cultivator, his industry, his capacity as a manager of men, and his love for and great knowledge of plants, especially of Orchids. While he was in charge of the Tropical Departments he was sent by the Director on a tour to the East, and visited Malaya, Java and Ceylon for the purpose of studying tropical vegetation under its native conditions, and more especially to collect and bring home stocks of bananas for cultivation, under quarantine conditions, at Kew for ultimate transmission to the Imperial College of Tropical Agriculture, Trinidad. This was in connection with the research work which is being carried on there in the breeding of strains of bananas resistant to the Panama disease, which is threatening the banana industry in the west Indies. This visit to the Tropics, the first ever undertaken by a Curator of Kew, was rendered possible by the grant to Kew from the Empire Marketing Board for the development of the cultivation of economic plants within the Empire.

On his return to Kew, Mr. Taylor had the opportunity of applying the result of his experience in a practical manner, for plans for carrying out certain alterations in the Tropical Fern House just then received sanction from H.M. Office of Works, and the arrangement of the south bay of the house in the semblance of a Tropical forest was carried out under Mr. Taylor's supervision and may be regarded as a very fitting tribute to his memory. The proper display of

Epiphytic and Tree Ferns in this house is not only beautiful but also of great educational value. His experience was further enlarged by a visit a few years ago to the wonderful gardens on the French and Italian Riviera.

Mr. Taylor was greatly interested in the new Cactus House presented by Mrs. Sherman Hoyt and it was one of his great regrets, while he was in hospital, that he was not able to take any part in the planting and arrangement of the house.

The funeral was attended by the Director and a large number of present and past members of the Kew Staff and by representatives of the Ministry of Agriculture and Fisheries and H.M. Office of Works.

GEORGE CLARIDGE DRUCE.—With the death of Dr. G. C. Druce, F.R.S., which occurred at Oxford on the 29th February, there passed away the most widely known and greatest of British field botanists of the last 50 years. Druce was born at Potterspury, Northamptonshire, on 23rd May, 1850. Apprenticed at the age of 15 to a chemist in Northampton he remained in that city after the completion of his apprenticeship and until he purchased a Pharmacy in The High, Oxford, in 1879. From that year till his death he made his home in Oxford. In his *Flora of Buckinghamshire*, Introduction, pp. cvi-cx (Arbroath, 1926), and in the *Flora of Northamptonshire*, Introduction, pp. cxxi-cxiii (Arbroath, 1930), Druce published some autobiographical details which would be well worth quoting if space permitted.

Few, even among those who have lived as long as Druce did, can have led a more active life. He travelled in many parts of the world. The success of his business and of his other investments showed that he possessed considerable financial ability. His services to the City of Oxford, to the University (as Curator of the Fielding Herbarium), to the Ashmolean Natural History Society, and to Freemasonry have been fully recognised. As a botanist he is best known for his series of excellent county floras (Oxfordshire, ed. i. 1886, ed. ii. 1927; Berkshire, 1897; Buckinghamshire, 1926; Northamptonshire, 1930), his editions of Hayward's *Botanist's Pocket Book* (editions 13-19), the *List of British Plants* (ed. i. 1908, ed. ii. 1928), and the *Comital Flora of the British Isles* (published during the week of his death). From 1903 until his death he was Secretary of the Botanical Society and Exchange Club of the British Isles, to the Reports of which he contributed many valuable, and often extensive, papers. With Prof. S. H. Vines he published accounts of the Dillenian Herbarium (Oxford, 1907) and of the Morisonian Herbarium (Oxford, 1914), both based on collections in the possession of the University of Oxford.

Many honours were awarded to Druce, of which the degrees conferred on him by the Universities of Oxford and St. Andrew's and the Fellowship of the Royal Society were probably most appreciated. He always enjoyed a wide range of popularity, and at times seemed

to court it, yet those who knew him intimately realised the essential simplicity of his character which was, indeed, obvious in the unaffected nature of his home life. Druce did not suffer fools gladly, but he always gave the best help he could to any who sincerely desired it. The following words from the address of the City Rector at the funeral service are the concise truth and bear repetition: "No matter from what angle one might look back over the long career of Dr. Druce, no matter by what criterion one might examine and appraise its story, there was no denying that throughout its course it was that of an exceptional man—exceptional in personality, in vision, in intellectual endowment, in insatiable passionateness of interest, in heroic independence of circumstance, in manifold and outstanding achievement" (*Oxford Times*, 4.3.32.).

It is understood that Druce's extensive collections of specimens and books are to remain at Oxford and be accessible to *bona fide* students. But Oxford without Druce will never be quite the same.

W. B. T.

Sixth International Botanical Congress.—The following note has been received from the Secretary, Dr. M. J. Sirks: "According to a decision by the Fifth International Botanical Congress at Cambridge in 1930, the Sixth Congress will be held in Holland in 1935. An Executive Committee has been formed, the President of which is Professor Dr. F. A. F. C. WENT (Utrecht), while Professor Dr. J. C. SCHOUTE (Groningen) will act as Vice-President, Dr. W. C. DE LEEUW (Bilthoven) as Treasurer and Dr. M. J. SIRKS (Wageningen) as Secretary. The Committee has decided that the Congress will meet at Amsterdam, September 9th-14th, 1935. Scientific Societies are kindly requested to reckon with these dates in planning their own meetings."

Types of Vegetation in Southern Rhodesia.*—Very often, nowadays, a botanist may know little about forestry and a forester little about botany. This is not true, however, of Mr. J. S. Henkel, Chief of the Division of Forests, Southern Rhodesia, who has published a very readable and interesting account of the vegetation of that region. As a forester he has had exceptional opportunities of studying the flora over considerable areas of the colony, and this valuable paper is the result of 11 years' observations. Although there are no really high mountains with subalpine vegetation, such as in East Africa, the distinct types of soil give rise to very marked vegetation formations.

The soils are grouped under four main heads as follows:—(1) the red clay soil (2) granitic soil (3) sandy soil and (4) the black soil of the vleis and plateaux, the last so painfully familiar to the motorist there and in South Africa as "black turf." It is this soil

*By J. S. Henkel, Chief, Division of Forests, Southern Rhodesia; *Proc. Rhodesia Scientific Association*, xxx. pp. 22, with 5 maps (1931).

which makes road travel in Rhodesia so difficult in the rainy season. On the red soil various species of *Acacia* are dominant; on the granite *Parinarium*, *Protea* and *Faurea*, whilst a characteristic plant on the granite kopjes is the interesting "resurrection plant" *Myrothamnus flabellifolia* Welw.; on the sandstone soils the beautiful *Terminalia sericea*, *Burkea africana*, and *Brachystegia* spp. are the dominant trees. The black soil is characteristic of the "vleis" and is usually devoid of trees. It occurs mainly in those places where the subsurface drainage is poor and becomes waterlogged during the rains. This soil carries a heavy crop of coarse grass sometimes as high as 15 ft. Alluvial soils are not extensive owing to the steepness of the river grades, but "pockets" of alluvium are sometimes found in the middle veld at the entrance to river "poorts"; such places, it is surprising to learn, are frost-hollows, and the occurrence of early or late spring frosts is actually the cause of the absence of many species of trees from these otherwise favourable localities. Frosts occur in the high and middle veld, and are often very severe. There is a frost line in both the Zambesi and Limpopo valleys, and it is traceable by the boundary of the "Mopane" and *Hyphaene ventricosa*. In the low veld alluvial soils are more common and it is this deposit that carries the dominant "Mopane" *Copaifera mopane* Kirk, which is so abundant from the foot of the Zoutpansberg in the Northern Transvaal to the Lundi River (see *K.B.* 1931, 227).

One of the most interesting of Mr. Henkel's statements relates to the effect of the advent of Europeans, previous to which the country supported immense numbers of wild animals. Huge herds moving about caused tracks which prevented or limited the spread of fires during the dry season. Since the reduction in numbers of big game, annual fires have become a serious biotic factor, and have destroyed vast tracts of valuable timber. There are now hundreds of square miles covered with short coppice growth which formerly carried a forest of large trees.

Motoring through Southern Rhodesia one finds parts of the roads "made up" with soil taken from neighbouring termite heaps. These vary in size according to situation, from small and inconspicuous heaps to huge mounds in the forest having a diameter of 60 ft. and a height of 20 ft. They carry a very interesting flora, in fact a new flora as compared with that surrounding them, and sometimes very large trees which appear to be of considerable age.

Besides Contour, Temperature and Rainfall maps there is a well executed provisional map of the vegetation types of Southern Rhodesia, an enlarged edition of which is available. To those who, like the present reviewer, have only visited Rhodesia for a short time in the dry season and have found the vegetation of great interest, this paper by Mr. Henkel will be very valuable indeed, especially as it is characterised by an almost entire absence of the formidable phraseology and terms with which many ecologists find it

necessary to arm themselves, but which often serve only to cloud and obscure the more interesting facts associated with the study of vegetation.
J. H.

Horticultural Practices.*—This book, intended primarily for the use of amateur and professional gardeners in the Bombay Presidency plains, has been written by men who are practical horticulturists as well as trained scientists. A surprisingly wide field has been covered for so small a work and the treatment of every part of the subject appears to be adequate. Space has been saved by the rigid exclusion of all illustrations. Though it cannot compare in size and appearance with Firminger's "Manual," the last edition of which was issued in 1904, it has the advantage of being up to date and practical.

A species new to the European flora.—Mr. L. C. Pinatzi, of Athens, has forwarded to the writer a specimen which has been determined as *Valerianella orientalis* (Schlecht.) Boiss. et Balansa. The specimen was collected on Mt. Parnes, Attica, at 500 m., in April 1924, and the species was found there only on that occasion. *V. orientalis* was originally described by Schlechtendal (Linnaea, xvii. 126 : 1843) as *Fedia orientalis* from material collected "in lapidosis collinum pr. Aleppo, d. 19, April. leg. Kotschy." Boissier and Balansa (Boiss. Diagn. ser. 2, ii. 120 : 1856) removed the species to *Valerianella* (Sect. *Locustae*) and Boissier (Flor. Or. iii. 103 : 1875) retains it in this genus but places it in the Section *Cornigerae*. The species must not be confused with *Valerianella leiocarpa* O. Kuntze var. *orientalis* O. Kuntze (*Dufresnia orientalis* DC., *Valerianella Dufresnia* Bunge in Boiss. Flor. Or. iii. 109 : 1875).

V. orientalis (Schlecht.) Boiss. et Balansa is known from Asia Minor (Troas, Lydia, Pamphylia), Syria, and Palestine. It is well known that the Greek flora is taxonomically closely related to that of Asia Minor and the occurrence of *V. orientalis* in Greece is simply an addition to the many known examples of the same species growing on both sides of the Aegean Sea.

W. B. TURRILL.

*A Hand Book of Horticultural Practices, by G. B. Patvardhan and G. B. Deshmukh. Published by Prof. G. B. Patvardhan, Balwant Bhuvan, Deccan Gymkhana, Poona No. 4, 1931, pp. xvi + 190. Price : Rs. 1-12-0.

BULLETIN OF MISCELLANEOUS INFORMATION No. 4 1932 ROYAL BOTANIC GARDENS, KEW

XXI.—A REVISION OF THE GENUS *LEYCESTERIA*. H. K. AIRY-SHAW.

NOMENCLATURE.

The genus *Leycesteria* was established by Nathaniel Wallich (in Roxb., Fl. Ind. ed. Carey & Wall. ii. 181 : 1824), with a single species, *L. formosa*, at that time new to science. The generic name was given in honour of Wallich's "highly esteemed friend William Leycester, Esq., chief judge of the principal native court under the Bengal presidency" (Wallich, l.c. 182). The spelling was modified in 1828 by Reichenbach (Consp. 96) to *Leycesteria*, which is in accordance with Rec. IVb. of the International Rules, ed. 2 (1912), and in 1838 by Endlicher (Gen. 568) to *Leycesteria*,* possibly on the analogy of "Lancastria" (Lancaster). In 1855 Pritzl (Ic. Bot. Ind. i. 628) altered it to *Leicesteria*,† presumably on the ground that the letter "y" did not occur in Latin (except in words of Greek origin).‡ Although the form *Leycesteria* is intrinsically preferable, the original spelling *Leycesteria* must be retained under International Rules, ed. 2, Art. 57.

HISTORICAL : (A) THE GENUS.

Wallich regarded the genus as belonging to "the fifth section of *Rubiaceae* (Juss. in Mém. du Mus. vi. 398), connecting it with the family of *Caprifoliaceae*." He further remarked, "it comes nearest to *Hamellia*," but "by its connate bractes and persistent gemmaceous scales it approaches to *Caprifolium*." It is an interesting fact, though one of doubtful significance, that in K. Schumann's key to the *Rubiaceae* in Engler u. Prantl, Nat. Pflanzenf. iv. Abt. 4, *Leycesteria* would certainly run down to the immediate neighbourhood of the genus *Hamelia*, which Jussieu included in his fifth section; and Reichenbach (Consp. 96 : 1828) actually included *Leycesteria* in *Rubiaceae*, tribe *Hameliaceae*. Achille Richard, however, writing in 1829, gave it as his opinion, based solely on Wallich's description, that *Leycesteria* belonged to the family *Caprifoliaceae* (Mém. Soc. Hist.

*This spelling also occurs in Wight, Illustr. Ind. Bot. ii. 70 (1850), but on p. 72 of the same work yet another variant is used, viz., *Leycesteria*!

†Also in Wallich, Pl. As. Rar. ii. t. 120 (1831), but not in the text.

‡The form *Leucesteria* in Meisner, Pl. Vasc. Gen. ii. 360 (1837-43) is doubtless a misprint, since the original spelling is employed at i. 155 and ii. 111 of the same work. For a similar reason the spelling *Lycesteria*, occurring in Journ. As. Soc. Beng. xxxix. pt. 2, 77 (1870), is clearly a printer's error.

Nat. Paris, v. 292 : 1834) ; and Sprengel (Linn. Gen. Pl. ed. 9, i. 177) and De Candolle (Prodr. iv. 138) independently, in 1830, referred it to that family also. Endlicher (Gen. i. 568 : 1838) placed it beside *Lonicera* and *Diervilla*, and Bentham & Hooker (Gen. Pl. ii. 5 : 1873) and Fritsch (Engler & Prantl, Nat. Pflanzenf. iv. Abt. 4, 169 : 1891 ; including the genus *Pentaptyxis* Hook. fil.) retained it in the same position.

HISTORICAL : (B) THE SPECIES.

The genus remained monotypic for nearly half a century after its original description. In 1870, Sulpiz Kurz described a plant, from specimens sent to him from Sikkim by Anderson, under the name "*Lonicera (Leycesteria) gracilis*," adding : "It is a *Leycesteria*, a genus which, however, does not seem to me to differ from *Lonicera*" (Journ. As. Soc. Beng. xxxix. pt. 2, 77 : 1870). Kurz, therefore, whilst treating the genus *Leycesteria* merely as a section of *Lonicera*, nevertheless recognised that his species belonged to the same category (however designated) as that of Wallich. In view of what will appear later, it is of interest to read his suspicion as to the affinity of *L. gracilis*, expressed as follows : "I thought at first, I might compare this species with *L[onicera]. glaucophylla* H. f. and Th., but judging from the description only it differs in every respect."

In forming this opinion, Kurz showed shrewder judgment than did C. B. Clarke, who, in dealing with the *Caprifoliaceae* for the Flora of British India (iii. 1 : 1880), reduced *L. gracilis* Kurz to *Leycesteria glaucophylla* (Hook. fil. et Thoms.) comb. nov., attributing the new combination (based upon *Lonicera glaucophylla* Hook. fil. et Thoms.) to J. D. Hooker. The latter had previously (Gen. Pl. ii. 6 : 1873) referred *L. glaucophylla* to the genus *Pentaptyxis*, but without actually effecting the combination *P. glaucophylla*. Hooker seems to have decided subsequently that *Lonicera glaucophylla* was a *Leycesteria*, and to have informed C. B. Clarke verbally, since he neither published the new combination himself, nor wrote it on the type sheets in the Kew Herbarium. C. B. Clarke's mistake in uniting *L. gracilis* and *L. glaucophylla* was, however, based upon an earlier misidentification, for which the responsibility appears to rest upon either Hooker or Thompson or both. These two authors described their *Lonicera glaucophylla* (Journ. Linn. Soc. ii. 165 : 1858) from sterile leafy branchlets collected by the former in January 1849 at Yoksun,* near the base of Kinchinjunga, at about 1500 m. elevation. Thomson revisited the locality some years later and obtained flowering material of what he or Hooker took to be the same species (*L. glaucophylla*).† Fortunately, a small portion of one of Thomson's specimens was found in an envelope, labelled "Yoksun, Sikkim, T. Thomson, 1857" in Hooker's handwriting, attached to one of the latter's own type sheets of *L. glaucophylla* in the Kew Herbarium.

*Vide J. D. Hooker, Himal. Journ. i. 334 (1854).

†Vide Gard. Chron. & Agric. Gaz. [xviii.] 700 (1858).

Thomson's fragment is beyond doubt the *L. gracilis* of Kurz ; for, though it is possible to compare only the vegetative parts, the specimens of Hooker's *L. glaucophylla* possess an extremely characteristic indumentum on the under-surface of the leaves, which is very different from that seen in *L. gracilis*. Moreover the presence of stipules in *L. glaucophylla* and their absence in *L. gracilis* has since proved to be a constant point of distinction. A further discussion of the confusion in which these two species have been involved is given in the enumeration (see p. 173).

The next species to be added to the genus was *L. stipulata* Fritsch, comb. nov. (Engler u. Prantl, Nat. Pflanzenf. iv. Abt. 4, 169 : 1891), based upon *Lonicera stipulata* Hook. fil. et Thoms. This species had also been referred to the genus *Pentaptyxis* by Hooker in the Genera Plantarum (l.c., 1873), the actual combination *Pentaptyxis stipulata* Hook. fil. being published (ex C. B. Clarke) in the Flora of British India, iii. 17 (1880). Fritsch's reduction of *Pentaptyxis* to *Leycesteria* seems fully justified, the distinguishing characters relied upon by Hooker being insufficient to warrant its separation.

Leycesteria sinensis Hemsl. was described and figured (Hook. Ic. Plant. xxvii. t. 2633 : 1900) from material collected by Henry in south-eastern Yunnan. It is a close ally of *L. formosa* and its taxonomic status has never been disputed.

In 1910, W. W. Smith collected in Sikkim and, a year later, described and figured (Trans. Proc. Bot. Soc. Edinb. xxiv. 173 : 1911) a supposed new species, *L. Belliana* W. W. Sm. It was stated to be very closely allied to *L. sinensis* Hemsl., but the fact that it possessed stipules suggested a comparison with the other stipulate species of the genus, and careful examination led to the interesting discovery that it was undoubtedly identical with *L. glaucophylla* (Hook. fil. et Thoms.) Hook. fil., *sensu stricto*. Flowering material of this species now being available, the differences between it and *L. gracilis* (Kurz) are immediately obvious.

During his extensive travels in China, 1910-1920, Dr. W. Limpricht collected a *Leycesteria*, which H. Winkler described (Fedde, Rep. Spec. Nov., Beih. xii. 493 : 1922) as a new species, *L. Limprichtii*. This has been found to be the same as *L. formosa* var. *stenosepala* of Rehder, who kindly furnished the writer with a photograph of the type-specimen of Winkler's species in Herb. Hort. Bot. Breslau. Limpricht collected his material in September 1914, some distance north of Ta-tsien-lu, in Szechuan, where, as Rehder remarks (*in litt.*), the var. *stenosepala* "seems to be the prevailing form."

The latest addition to the genus was collected by Capt. F. K. Ward in Assam in 1928, and is described below as *L. crocothyrsos*, sp. nov., the orange-coloured corollas being unique in the genus. Its affinity appears to be with *L. formosa*, but the presence of stipules at once distinguishes it. This is the third stipulate species of *Leycesteria* now known.

COMPARISON WITH OTHER CAPRIFOLIACEOUS GENERA.

Horne (Trans. Linn. Soc. ser. 2, viii. 251: 1914) has referred to *Leycesteria* as "the type genus of the family [Caprifoliaceae]," by which he apparently means the most primitive genus, that is, the genus showing least specialisation, at any rate in the flower. In *Leycesteria* the gynaecium is usually isomerous (5-locular), *L. gracilis* being the only species showing pleiomery in this respect. Other genera in which species occur with a 5-locular ovary are: *Lonicera* (Sect. *Nintooa*); *Sambucus* (varying to 3-locular; the genus is admittedly isolated and "un-typical" of the family); and *Triosteum* (in which the ovary is much more commonly 3-locular). The remaining genera show various degrees of locular abortion and/or suppression.

In *Leycesteria* all the loculi are multiovulate, and multiovulate or pluriovulate loculi are characteristic of all the other genera of the tribe *Lonicereae* (*sensu* Fritsch). This appears to be a primitive character. *Leycesteria* and *Diervilla* have many-seeded fruits, whereas the fruits in the remaining genera are few-seeded, a character which may be regarded as derivative.

Inflorescence. As Fritsch (Engler u. Prantl, Nat. Pflanzenf. iv. Abt. 4, 158: 1891) has indicated, the basic type of inflorescence in the *Caprifoliaceae* is the cyme. In the majority of genera the cymose arrangement has undergone modification, by the suppression either of the terminal flower or of the two lateral flowers of the cyme. *Leycesteria* is the only genus (except the monotypic *Heptacodium*) in which over 50 per cent. of the species have retained the 3-flowered cymose arrangement unmodified. *Lonicera* subgen. *Periclymenum* is characterised by the same arrangement, but the species of that subgenus constitute only about 17 per cent. of the genus as a whole; in the remainder the central flower of each cyme is suppressed. Four of the six known species of *Leycesteria* have the unmodified arrangement; the remaining two have lost the lateral flowers of the cyme, in the same manner as *Symphoricarpos* and most other genera of the *Linnaeëae* and *Lonicereae*. Indeed, the inflorescence of *Leycesteria gracilis* (Kurz) bears an extraordinarily close resemblance to that of *Symphoricarpos sinensis* Rehder (in Sargent, Pl. Wils. i. 117: 1911), the only known Asiatic representative of that genus.

Examination of the inflorescence in the series *L. formosa* (large coloured foliaceous bracts), *L. glaucophylla* (small green foliaceous bracts) and *L. gracilis* (very small non-foliaceous but herbaceous bracts), in which there is a progressive diminution in the size of the bracts, suggests the possibility that, within the genus *Leycesteria*, the number of flowers per inflorescence may have been increased by a gradual transformation of foliage leaves into bracts and the consequent union of several inflorescences into one.

Sommier's discussion (Nuov. Giorn. Bot. Ital. xxii. 217-227: 1890) of the taxonomic value of stipules in the *Caprifoliaceae* is interesting and suggestive. Special reference is made to *Leycesteria*

(*Pentaptyxis*) *stipulata* and to *Lonicera caerulea* L. forma *stipuligera* Somm. The occurrence of stipules in *Leycesteria* and *Lonicera* seems to be an unsuspected link between the two genera. More important still (as has, indeed, been pointed out before*), this character can no longer be used to distinguish absolutely the *Caprifoliaceae* from the *Rubiaceae*. In fact, the only character now remaining to separate these families is their respectively perulate and eperulate buds. (The genera *Alseuosmia* Cunn., *Pachydiscus* Gilg et Schltr. and *Memecylanthus* Gilg et Schltr., with eperulate buds, alternate leaves, valvate corolla-lobes, sometimes free stamens, and anomalous ovular orientation, should probably be excluded from *Caprifoliaceae*.—Vide Gilg u. Schlechter in Engler, Bot. Jahrb. xxxix. 268-70: 1906).

ARRANGEMENT OF THE SPECIES.

The genus was subdivided by Fritsch (in Engler u. Prantl, Nat. Pflanzenf. iv. Abt. 4, 169: 1891) into two sections, *Euleycesteria* Fritsch and *Pentaptyxis* (Hook. fil.) Fritsch, based upon the absence or presence respectively of pith in the stems, the usual absence or presence of stipules, and the zygomorphy or comparative actinomorphy of the corolla. This merely had the effect of separating *L. stipulata* from the remaining 3 species then recognized, and, though Fritsch was undoubtedly right in reducing *Pentaptyxis* to *Leycesteria*, his two subdivisions are scarcely satisfactory in the light of further investigation.

The problem of how best to group the six species is a peculiar one, owing to the unexpectedly great diversity of characters found among them. Two alternatives present themselves: either to leave the genus with no subdivisions at all, or else to make almost as many "groups" as there are species. If the genus be examined with characters in view similar to those employed by Rehder in his Synopsis of *Lonicera*, the second alternative at once appears as the only logical one. If the establishment of several monotypic sections, series, etc., in a small genus should evoke criticism as being a method of unnecessarily extreme analysis, the question might well be asked: What is there, either of science or of logic, in making use of certain criteria for classifying the members of a large genus (such as *Lonicera*), but refusing to make use of the same or equivalent criteria in systematizing an allied, but small, genus (as *Leycesteria*)?

The method of arrangement here proposed, therefore, seeks justification in that it may serve to indicate the peculiarly remote or disjointed nature of the interspecific relationships within the genus. The following is a conspectus.

Subgenus I. **Euleycesteria** (Fritsch *pro sect.*, *emend.*), subgen. nov.—Ovarium 5-loculare, glanduloso-pubescent. Pseudo-verticilli 6-flori, raro 2-flori. Bractee plus minus late ovatae, ovario longiores. (Typus subgeneris, *L. formosa*.)

*Vide Fritsch in Engl. u. Prantl, Nat. Pflanzenf. iv. Abt. 4, 157 (1891).

Section i. FISTULARIA sect. nov.—Foliorum paginae inferioris pubescentia e pilis sparsis rectis plus minus adpressis sistens. Rami subherbacei, manifeste fistulosi. (Typus sectionis, *L. formosa*.)

Series 1. *Formosae* ser. nov.—Stipulae haud evolutae. Corolla alba vel roseo-tincta, supra basin conicam in nectaria oblonga inconspicua paulum ampliata; stylus glaber. (Typus seriei, *L. formosa*.)

Inflorescentia 1-pseudo-verticillata.....1. *L. sinensis*

Inflorescentia 2-pluri-pseudo-verticillata.....2. *L. formosa*

Series 2. *Crocothyrsae* ser. nov.—Stipulae evolutae. Corolla laete flavo-aurantiaca, basi truncato-intrusa in sacculas 5 prominentes valde dilatata; stylus pubescens.....

3. *L. crocothyrsos*

Section ii. PENTAPYXIS (Hook. fil.) Fritsch, emend.—Foliorum paginae inferioris pubescentia e pilis sparsis vel lanuginosis plus minus crispulis vel erectis basibus ut videtur bulbosis sistens. Rami haud herbacei. Corolla ut in Serie 1. (Typus sectionis, *L. stipulata*.)

Series 3. *Stipulatae* ser. nov.—Rami medullosi. Inflorescentia e pseudo-verticillis 6-floris compluribus sistens. Stylus glaber.—Planta dense lanuginosa.....4. *L. stipulata*

Series 4. *Glaucophyllae* ser. nov.—Rami fistulosi. Inflorescentia e pseudo-verticillis 2-flori 1-2 tantum sistens. Stylus pubescens.—Planta pubescens.....5. *L. glaucophylla*

Subgenus II. *Paralestera* subgen. nov.—Ovarium 8-loculare, glaber. Pseudo-verticilli 2-flori. Bractae minimae, subulatae, ovario breviores.—Corolla ut in Seriebus 1, 3 et 4. Stylus glaber. Pubescentia ut in Sectione i.....6. *L. gracilis*

ARTIFICIAL KEY TO THE SPECIES.

Interpetiolar stipules absent (cf. also sp. 5):

Flowers in pairs; bracts subulate, shorter than the glabrous ovary.....6. *gracilis*

Flowers in sixes; bracts broadly ovate, longer than the glandular-pubescent ovary:

Inflorescence of 6 flowers only.....1. *sinensis*

Inflorescence of 2 or more false whorls of 6 flowers.....

2. *formosa*

Interpetiolar stipules present, sometimes very small (vide sp. 5):

Leaves densely lanuginose beneath; style glabrous.....4. *stipulata*

Leaves pubescent beneath; style pubescent:

Flowers in pairs; corolla whitish.....5. *glaucophylla*

Flowers in sixes; corolla orange.....3. *crocothyrsos*

ENUMERATION.

1. *Leycesteria sinensis* Hemsley in Hook. Ic. Plant. xxvii. t. 2633 (1900); Rehder in Sargent, Pl. Wils. i. 312 (1912), in obs.

Icones. Hooker, *Icones Plantarum* xxvii. t. 2633 (1900).

CHINA: YUNNAN. Mountains to north of Mengtze, 2100 m., Henry 9692 c (Herb. Kew.).

Known only from the above collection. The affinity between this species and the next is the closest obtaining between any two species of the genus. Hemsley contrasted *L. sinensis* with "*L. glaucophylla* Hook. fil.," meaning *L. gracilis* (Kurz), with which it has nothing to do. The calyx in the dried state is brown and almost scarious, with a conspicuous tube and very short teeth.

2. *Leycesteria formosa* Wallich in Roxb. Fl. Ind. ed. Carey & Wall. ii. 182 (1824); DC. Prodr. iv. 338 (1830); Wall. Pl. As. Rar. ii. 21 (1831); Wight, Illustr. Ind. Bot. ii. 70 ("*Leycesteria*"), 72 ("*Leycesteria*") (1850); Brandis, For. Fl. 256 (1874); Gamble, List Trees, etc. Darjeeling, ed. 1, 46 (1878), ed. 2, 46 (1896), ed. 3, 74 (1929); C. B. Clarke in Hook. fil. Fl. Brit. Ind. iii. 16 (1880); Gamble, Man. Ind. Timb. ed. 1, 217 (1881), ed. 2, 398 (1902), ed. 3, 398 (1922); Fritsch in Engl. u. Prantl, Nat. Pflanzenf. iv. Abt. 4, 169 (1891); Brandis, Ind. Trees, 360 (1906); Rehder in Sargent, Pl. Wils. i. 311 (1912); A.M. & J. M. Cowan, Trees N. Beng. 74 (1929).

Hamelia connata Wallich ms. in sched. in Herb. Wall. sub cat. no. 407, et ex DC., Prodr. iv. 338 (1830), in obs.

Icones. Wallich, Pl. As. Rar. ii. t. 120 (1831) (*Leicesteria*); Bot. Reg. xxv. t. 2 (1839); Bot. Mag. lxxv. t. 3699 (1839); Wight, Illustr. Ind. Bot. ii. t. 121 D (1850).

Leycesteria formosa includes within its wide area of distribution the areas of all the other known species of the genus. From the North-West Frontier Province and the Punjab it ranges the whole length of the Himalaya eastwards to south-eastern Yunnan, where it was collected by Henry near Mengtze, and north-eastwards to Szechuan and eastern Tibet, where Rehder's var. *stenosepala* appears to replace very largely the typical form.

It has been considered unnecessary to cite here all the specimens seen: the following is therefore only a representative selection.

INDIA. NORTH-WEST FRONTIER PROVINCE: Shinu Ká Kalthá, Kagán, Hazára, 4 July 1899, *Inayat* in Herb. Duthie; Sachán Dara Panjúl, Hazára, 27 Aug. 1899, *Inayat* in Herb. Duthie; Malkandi, Kagán, J. R. Drummond 20110.

PUNJAB: Chamba State, Bhandal Valley, Chadbaint Reserve, alt. 2400 m., 23 Oct. 1919, R. N. Parker; Chamba State, Gharosan Forest, alt. 1800 m., 9 June 1895, J. H. Lace 748; Bashahr, Kunawar, 1886, J. R. Drummond 22111; Bashahr, Bahli to Taklech, alt. 2100 m., 15 May 1890, J. H. Lace 119; Simla, Mashobra, near the Retreat, alt. 2400 m., 14 June 1877, J. S. Gamble 4374 a; Simla, Mahásu, alt. 2400 m., 29 Sept. 1877, J. S. Gamble 5558 a; Simla, Mahásu, 1885, Nanak Sobha Ram in Herb. J. R. Drummond 22110; Simla, Mahásu, H. Collett 59; Simla and Siwaliks, 1885, J. R. Drummond 22647; Sirmore, Govan in Herb. Wallich, cat. no. 470 c.

UNITED PROVINCES: Kumaon, R. Blinkworth in *Herb. Wallich*, cat. no. 470 (2); Garhwal, June 1845, T. Thomson 1265; Garhwal, Mussoorie, Kidar Kantha, alt. 2700 m., 27 June 1904, J. R. Drummond 22786; Mussoorie, Park Road, alt. 1950 m., June 1915, A. Anderson; Tihri-Garhwal, Jumnotri, alt. 2700-3000 m., 29 Aug. 1883, J. F. Duthie 645 ("vernacular name *Kannel chiro*"); Saharanpur, Deoban, Jaunsar, alt. 2700 m., June 1896, J. S. Gamble 25806; Deota, 15 June 1906, H. H. Haines 2263.

NEPAL: Sheopore, Apr. 1821, Wallich [cat. no.] 470 (1); Domzey, alt. 2400 m., Lal Dhoj 17; sine loc. exact., Gower.

SIKKIM: Choongtam, alt. 2700 m., 23 May 1849, J. D. Hooker; Lachen, alt. 1800-3300 m., 2-4 Aug. 1849, J. D. Hooker; Lachong, alt. 3000 m., 24 Oct. 1849, J. D. Hooker; Kulhait, alt. 2100 m., 11 Oct. 1870, C. B. Clarke 12987; Darjeeling, alt. 2100 m., 11 June 1874, Treutler [cat. no.] 192; Gumpaha, Darjeeling, alt. 2100 m., June 1874, J. S. Gamble 3066 a; Darjeeling, alt. 2100 m., July 1880, J. S. Gamble 8264; Sinchul, Darjeeling, alt. 2400 m., 13 June 1884, C. B. Clarke 35771 a; Lachung, alt. 2700 m., 6 Sept. 1911, Ribu & Rhomoo 5569; Tonglo, alt. 2700 m., 1913, Ribu & Rhomoo 6302; Phallut, alt. 3300 m., 12 Aug. 1913, Rhomoo 1174.

KHASIA: Surureem, alt. 1500 m., 26 June 1850, Hooker & Thomson 1237.

UPPER BURMA: Hpimaw Hill, alt. 2100 m., general in the lower coppice, 7 June 1919, R. Farrer 998.

YUNNAN. Momien (Tengyueh), 22 June 1868, D. J. Anderson. Brousse de Ta-hai, alt. 3000 m., Juillet, Maire 255/1913 (distr. Edin.): "Arbuste cassant à tiges creuses; fl. roses; fruits bleus." Moist open situations by streams in side valleys on the eastern flank of the Tali range, lat. 25° 40' N., alt. 2100-2700 m., May-Sept. 1906, Forrest 4776: "Shrub of 1½-6 ft. Flowers white, tinged rose on exterior; bracts deep rose-purple. Fruit black, edible, flavour strongly resembling burnt sugar."

SZETCHUAN. Sine loc. exact., July 1903, Wilson (Veitch Exped.) 3719: "3 ft.; fls. white."

var. *stenosepala* Rehder in Sargent, Pl. Wils. i. 312 (1912).

Leycesteria Limprichtii H. Winkler (apud Pax, Hoffm. et H. Winkl.) apud Limpricht, Bot. Reise Hochgeb. Chin. Ost-Tib. in Fedde, Rep. Spec. Nov. Beih. xii. 493 (1922).

YUNNAN, W. Le long des ruisseaux, Mt. Mao-kou-tchang au dessus de Ta-pin-tze, 23 Apr. 1883, Delavay 158. Hay-y près Lou-lan, Jul. 1906, Paul Nguen ex Ducloux 208 (584). Teng-yueh district, E. B. Howell 25, 233. Open moist situations on the margins of thickets on the eastern flank of the Lichiang range, lat. 27° 15' N., alt. 3000 m., June 1906, Forrest 2503: "Shrub of 6-10 ft. Flowers whitish, non-fragrant." Moist situations along the base of the Lichiang range, lat. 27° 12' N., alt. 2700 m., June 1910, Forrest 5943: "Shrub of 2-6 ft. Flowers creamy-white, pink on exterior." Sine loc. spec., sed verisimiliter Tsekou, 1907, Monbeig 131. Halliers

des vallées à Sau-kia, alt. 2550 m., Août, Maire 26 (distr. Arn. Arb.): "Arbuste peu rameux; tiges vertes, longues, éparées. Fl. blanches sur grappe violette." Broussailles, mont. derrière Siao-ho, alt. 2800 m., Juin, Maire 329/1913 (distr. Edin.); "Arbuste cassant peu rameux, tout vert; fl. roses." Halliers, vallée de Kiao-mé-ti, alt. 3100 m., Juin, Maire 699/1914 (distr. Edin.): "Arbuste cassant; longs rameaux verts; fl. blanches sur grappe rose." Sine loc., Mai, Maire 2429 (distr. Edin.): "Arbuste; fleurs d'un blanc rosé." Forest undergrowth, open places, Doker-la, alt. 3000 m., Sept. 1913, F. K. Ward 1128: "Shrub, bushy, 3 ft." Doker-la, on granite soils, shady bush-covered hillsides or open places in the forest, alt. 2100-2400 m., 18 June 1914, F. K. Ward 1683: "Loose bushy shrub, the long shoots flopping over when the plant has attained a height of about 5 ft.; flowers cream coloured, bracts purple." In montibus inter flumina Salwin et Irrawadi, alt. 2000 m., Oct. 1914, Schneider 2590. Kou-ty, circa Pe-yen-tsin, 11 June 1918, Siméon Ten 530: "3 m.; floribus albo-rubris."

SZETCHUAN. Near Tachienlu, alt. 2700-4000 m., Pratt 299, 776. Between Tachienlu and Chentu, Oct. 1904, Hosie. Sine loc. exact., June 1908, Wilson (Arn. Arb. Exp.) 3476, 3478; ditto, July 1908, Wilson 3477, 3479. In declivitatibus dumosis in regione Hualu, alt. 2600 m., 30 Mai 1914, Schneider 1394.

TIBET. Kam: vallis fluvii Tung-go-ho, 22 Jul. 1893, Potanin: "flores albi." Tong-kyuk, in pine forest, alt. 2400-2700 m., 11 Aug. 1924, F. K. Ward 6077: "Shrub of 6-10 ft.; flowers white."

Distinguished from the typical plant by the elongation of all 5 sepals, which may be up to 7 or 8 mm. in length, and very narrow. In the type there are usually 3 short and 2 long sepals, the latter about 4 or 5 mm. long.

var. *brachysepala* Airy-Shaw, var. nov. sepalis brevissimis 1 mm. usque raro vix 2 mm. longis glanduloso-pubescentibus.

YUNNAN, W. Moist situations by streams, on lava bed west of Tengyueh, lat. 25° N., alt. 1500 m., May 1912, Forrest 7647: "Shrub of 3-6 ft. Flowers yellowish-white interior, exterior flushed lake. Fruit black."

YUNNAN, S.E. South of Red River from Manmei, alt. 1800 m., Henry 9692; Mengtze, mountains to north, alt. 1650 m., Henry 9692 a; ibid., alt. 1800 m., Henry 9692 b: "Shrub, 6 ft.; white flowers."

Possibly not worthy of varietal recognition, but the sepals are unusually short, not longer than those of *L. sinensis*.

var. *glandulosissima* Airy-Shaw, var. nov. omnibus partibus hornotinis densissime pubescentibus atque glanduloso-pilosis.

Ramuli hornotini brevissimi. Flores praecociore.

YUNNAN. Distr. Yunnan-fu, in collibus bor.-occ., solo sabuloso, 9 Mai. 1916, O. Schoch 43.

No other specimen has been seen in which the indumentum is so markedly developed. The previous year's branches are long, straight, sparingly branched and quite glabrous.

3. *Leycesteria crocothyrsos* *Airy-Shaw*, sp. nov. ab omnibus congeneris corolla aurantiaca basi valde 5-saccata distinctissima; a *L. formosa* Wall., cui quam ceteris forsan propior, stipulis magnis, stylo pubescente statim distinguenda; inter species stipulatas, a *L. glaucophylla* (Hook. fil. et Thoms.) Hook. fil. pseudo-verticillis 6-floris, et a *L. stipulata* (Hook. fil. et Thoms.) Fritsch foliis subtus haud lanuginosis, stylo pubescente diversa.

Frutex parvus, laxus, statura ignota. *Rami* annotini ignoti. *Rami* hornotini fistulosi, teretes, usque 4 dm. longi (inflorescentia terminali inclusa), circiter 4 mm. diametro, sparse breviter glanduloso-pilosi vel glabrescentes, basi perulis scariosis late triangularibus usque lanceolatis 3-10 mm. longis raro apice foliaceis circiter 2 cm. longis cincti; internodia circiter 8 cm. longa. *Folia* iis *L. formosae* similia, ovata usque oblonga raro fere ovato-lanceolata, basi rotundata vel vix angustata, apice acuminata conspicue caudata, usque 12.5 cm. longa (cauda circiter 2 cm. longa inclusa), 5 cm. lata, margine (basi caudaque exceptis) leviter et subremote dentata dentibus glanduloso-apiculatis, sparse ciliata, pagina superiore olivacea pilis persparsis circiter 1 mm. longis praedita, costa densiuscule breviter pubescente, nervis glabris, pagina inferiore glaucescente, tota minutissime pubescente (costa manifestius), nervis utrinque circiter sex; petioli brevissimi, 3-5 mm. longi, plerumque anguste alati, pubescentes praecipue supra pilis plus minus aureis. *Stipulae* interpetiolares magnae, latissime reniformes vel suborbiculares, usque 2 cm. latae et 1 cm. longae, basi utrinque petiolis foliorum breviter adnatae, margine integrae vel indistincte crenulatae, supra olivaceae, subtus glaucescentes. *Inflorescentia* terminalis, elongata, plus minus pendula, usque 12.5 cm. longa, rhachide dense glanduloso-villoso-pubescente. *Flores* sessiles in pseudo-verticillis 6-floris (cymulis binis trifloris) dispositi; pseudo-verticilli circiter 7, omnes bracteis binis late ovatis acuminatis vel acutis integris basi subcordatis vel angustatis usque 2 cm. longis et 1 cm. latis tenuiter membranaceis glabrescentibus dilute purpurascens marginem dense glanduloso-ciliatis suffulti, bracteolis in quoque verticillo 4 bracteis similibus sed subduplo minoribus. *Receptaculum* ovoideum, apice subattenuatum, densissime glanduloso-villoso-hispidum, circiter 5 mm. longum, 3 mm. diametro. *Calycis segmenta* breviter connata, maiuscula, aequalia, ovato-oblonga, subacuta, circiter 5 mm. longa et 3 mm. lata, herbacea, margine glanduloso-ciliata, extra sparse breviter pilosa, intus glabra. *Corolla* actinomorpha, laete aurantiaca (teste lectore), alabastro late clavata circiter 1.5 cm. longa; tubus sub anthesi late infundibuliformis, circiter 1.5 cm. longus, fauce 1.5 cm. diametro, basi truncato-intrusa in sacculos nectariferos 5 sepalis alternantes conspicue gibboso-ampliatus, 4-5 mm. latus, extra dense glanduloso-pilosus, intus ad staminum filamenta et ad

nervos 5 praecipuos glanduloso-pilosus ceterum glaber; lobi imbricati, patentes, ovato-triangulares, obtusi vel rotundati, circiter 5 mm. longi et lati, extra plus minus glanduloso-pilosi, intus glabri. *Staminum filamenta* corollae tubo usque ad basin adnata, circiter 1.3-1.4 cm. longa, dense barbata, parte sexta suprema libera, ipso apice ovoideo-tumida, dein acuta; antherae oblongae, utrinque obtusae, 3-4 mm. longae, 1-1.5 mm. latae. *Stylus* in alabastro circiter 1 cm. sub anthesi usque 1.7 cm. longus, satis validus, parte tertia suprema glabra, ceterum dense pubescens; stigma magnum, capitatum, lobatum, circiter 3 mm. diametro. *Ovarium* quinqueloculare, multiovulatum. *Fructus* non visi.

Icones. Hooker, *Icones Plantarum*, ser. 5, ii. t. 3165 (1932).

ASSAM. Delei valley, 28° 20' N., 96° 37' E., alt. 1800 m., growing on the steep sheltered gneiss face, in dense thickets, 8 May 1928, F. K. Ward 8180. "A small lax shrub. Flowers bright orange."

The genus *Leycesteria* is nothing if not heterogeneous. That a species should be discovered with bright yellow flowers could hardly have been anticipated from a knowledge of those previously described. The no-man's land of north-east Upper Burma, where India, China and Tibet meet, has yielded yet another of its strange botanical treasures, and this is surely not the least beautiful of them. Capt. F. K. Ward informs the writer that the seeds of this species, which he brought home, have germinated "like mustard and cress," yet Capt. Ward saw but one solitary plant in its native habitat.

It would seem, therefore, to be a species of extremely restricted distribution, but it is difficult to suggest whether it is more probably a "young" or a "relict" species. On account of its stem-structure and inflorescence a comparison can be instituted only with *L. formosa*, but a close affinity can scarcely be inferred therefrom.

The chief points of interest, from a morphological point of view, are the following: the stipules, the form and colour of the corolla, and the hairy style. Stipules occur also in *L. stipulata* and *L. glaucophylla*, and the latter has a hairy style. But the great development of the basal nectariferous saccae is unique, and the striking colouring of the corolla—lemon-yellow for the tube, orange-yellow for the limb—is no less so.

The occurrence of stipules in a third species of *Leycesteria* adds still greater weight to Sommier's remarks on the taxonomic value of these organs (in *Nuov. Giorn. Bot. Ital.* xxii. 217-227: 1890).

4. *Leycesteria stipulata* (Hook. fil. et Thoms.) Fritsch in Engl. u. Prantl, *Nat. Pflanzenf.* iv. Abt. 4, 169 (1891); A. M. & J. M. Cowan, *Trees N. Beng.* 74 (1929).

Lonicera stipulata Hook. fil. et Thoms. in *Journ. Linn. Soc.* ii. 165 (1858); [? Lindley] in *Gard. Chron. & Agric. Gaz.* [xviii.] 700 (1858).

Pentaptyxis sp., Hook. fil. in Benth. & Hook. *Gen. Plant.* ii. 6 (1873).

Pentapyxis stipulata (Hook. fil. et Thoms.) Hook. fil. ex C. B. Clarke in Hook. fil. Fl. Brit. Ind. iii. 17 (1880); Gamble, List Trees, etc. Darj. ed. 1, 45 (1878); ed. 2, 46 (1896); Gamble, Man. Ind. Timb. ed. 1, 217 (1881); ed. 2, 399 (1902); ed. 3, 399 (1922); Sommier in Nuov. Giorn. Bot. Ital. xxii. 217-227 (1890), *passim*.

Icones. Gard. Chron. & Agric. Gaz. [xviii.] 700, fig. 1 (1858); Nuov. Giorn. Bot. Ital. xxii. t. 2, fig. C (1890).

SIKKIM. Without precise locality, alt. 1800-3000 m., 29 March, J. D. Hooker 5: "Flowers all white." Rungbee, alt. 1800 m., 13 June 1870, C. B. Clarke 11976 a: "Shrub with complanate pendent branches." Darjeeling, alt. 2100 m., 25 Feb. 1871, C. B. Clarke 13869 a: *ibid.*, 24 June 1875, C. B. Clarke 26746 a: *ibid.*, 10 Apr. 1876, C. B. Clarke 27488 d; *ibid.*, alt. 2250 m., 31 May 1884, C. B. Clarke 34992 b; *ibid.*, alt. 2100 m., June 1875, Gamble 3064 a; *ibid.*, alt. 2100 m., 22 June 1876, Gamble 733 a; *ibid.*, on the 'Calcutta' road, alt. 2250 m., 11 Apr. 1913, C. C. Lacaita: "Flowers white, with very faint blush." Darjeeling to Jorbungalow, alt. 2100 m., J. H. Lace.

Believed, until quite recently, to be confined to Sikkim, where, however, it is said to be locally extremely abundant. Capt. F. K. Ward, writing in May 1931, from North-East Upper Burma, reports the occurrence in quantity of what he takes to be this species in the Adung Valley, lat. 28° 10' N., 97° 40' E. If this is verified, it will be an interesting extension of its range. Every part of the plant, except the inside of the corolla, is densely woolly.

5. *Leycesteria glaucophylla* (Hook. fil. et Thoms.) Hook. fil. ex C. B. Clarke in Hook. fil. Fl. Brit. Ind. iii. 16 (1880), *excl. diagn.*, et ref. "Gard. Chron." pro parte, et synonym. "*Lonicera gracilis* Kurz," et loc. "Simonbong, Kurz" et verbis descriptionis "A much more slender plant . . . ovate-subulate" et "entirely absent or" (p. 17, l. 1); Sommier in Nuov. Giorn. Bot. Ital. xxii. 217-227 (1890), *passim*, *pro maxima parte*.

Lonicera glaucophylla Hook. fil. et Thoms. Praec. Fl. Ind. in Journ. Linn. Soc. ii. 165 (1858); [? Lindley] in Gard. Chron. & Agric. Gaz. [xviii.] 700, *partim* (1858); Rehder in Rep. Miss. Bot. Gard. xiv. 216 (1903).

Pentapyxis sp. Hook. fil. in Benth. & Hook. Gen. Plant. ii. 6 (1873).

Lonicera gracilis Rehder in Rep. Miss. Bot. Gard. xiv. 216 (1903), *non* Kurz.

Leycesteria Belliana W. W. Smith in Trans. Proc. Bot. Soc. Edinb. xxiv. pp. xliii et 173 (1911), et in Rec. Bot. Surv. Ind. iv. 379 (1913); Calder, Narayanaswami et Ramaswami in Rec. Bot. Surv. Ind. xi. 81 (1926); A.M. & J. M. Cowan, Trees N. Beng. 74 (1929).

Icones. Gard. Chron. & Agric. Gaz. [xviii.] 700, fig. 2 dextr., *non* sinistr. (1858); Trans. Proc. Bot. Soc. Edinb. xxiv. t. xiii. (1911).

SIKKIM. Singalelah, alt. 1500-1800 m., 14 Dec. 1848, J. D. Hooker 6; Yoksun, alt. 1500-1800 m., 12 Jan. 1849, J. D. Hooker 6; Karponang, alt. 2850 m., 4 July 1910, W. W. Smith 2996. "East Himalaya," Ribu & Rhomoo, *sine num.*

Apparently confined, like the last species, to Sikkim, but, unlike it, evidently rather uncommon, and reaching somewhat higher altitudes.

The specimen from Tonglo (Anderson 154) cited by Smith (1911, *l.c.* p. 174) has not been seen by the writer. The leaves are described as "subtus . . . praecipue in venis $\pm$ rufescenti-strigillosa." There is no sign of "rufescence" in the specimens of Hooker, Smith or Ribu & Rhomoo. The peculiarity of the indumentum, which appears to have been overlooked, is that each hair of the smaller veins and intervening tissue appears under a low power to arise from a bulbous base or small pustule. Higher magnification shows that this consists of about 4-6 minute oblong or subglobular masses of wax closely surrounding the base of the hair and frequently coalescing with each other. They appear to be definite extrusions from the leaf, and not prominences of the cuticle. A similar phenomenon, to a less degree, can be observed in the case of *L. stipulata*, though, owing to the extreme density of the indumentum in that species, the base of the hairs is not easily exposed without damaging the waxy secretion.

The occurrence of this character in these two species, together with the irregular, non-adpressed arrangement of the indumentum, and the possession of stipules, appears to indicate some degree of affinity between them. They were originally described together under *Lonicera* and later associated to form the new genus *Pentapyxis* (Benth. et Hook. Gen. Pl. ii. 6: 1873), solely because they both possessed stipules.

The confusion in which this species and the next have been involved is due, in the first instance, to Hooker and Thomson having described their *Lonicera glaucophylla* without flowers or fruit, and then to Hooker's identification of Thomson's flowering material of *L. gracilis* (at that time undescribed) with his own sterile material of *L. glaucophylla*. The fact that both gatherings came from Yoksun was apparently considered sufficient ground for regarding them as conspecific, in spite of the fact that Hooker's specimens possessed stipules and a very peculiar indumentum on the undersurface of the leaves, while Thomson's were exstipulate and the extremely sparse indumentum was in no way remarkable.

The result was that Hooker's original specimens of *L. glaucophylla* were gradually lost sight of, their sterility no doubt helping towards this, and Thomson's material was taken as the most representative of *L. glaucophylla* for purposes of identification. Subsequent collectors brought in further material which undoubtedly matched that of Thomson: it was therefore practically inevitable that, when Kurz described some of this material as *Lonicera gracilis*, it should

almost immediately be reduced to *L. glaucophylla*. Even Kurz's remark, that his species differed "in every respect" from Hooker and Thomson's, failed to stimulate further investigation by critical botanists. The references made by Sommier (*l.c.*) to "*Lonicera glaucophylla*" and "*Leycesteria glaucophylla*" show that he, too, shared the common belief that stipules might or might not be present in this species, or rather mixture of species.

Another contributory cause to the persistence of this error was the fact that the true *L. glaucophylla* was apparently not collected again until 1910, when Prof. W. Wright Smith obtained the first known flowering material. He described it in 1911 as a new species, *L. Belliana*, and stated, on the strength of a comparison of material at Kew made by Prof. W. G. Craib, that this was a "species *Leycesteria sinensis* Hems. valde affinis," but, in view of the considerable list of differences enumerated almost immediately afterwards, and the further distinction, not mentioned in the list, that the flowers of *L. glaucophylla* are in pairs, not sixes, the reason for this statement is not quite clear.

6. *Leycesteria gracilis* (Kurz) Airy-Shaw, comb. nov.

Lonicera (*Leycesteria* [sic]) *gracilis* Kurz in Journ. As. Soc. Beng. xxxix. 2. 77 (1870); Gamble, List Trees, etc. Darj. ed. 1, 46 (1878); Rehder in Rep. Miss. Bot. Gard. xiv. 216 (1903), pro syn. *Leycesteriae glaucophyllae*.

Lonicera glaucophylla [?] Lindley in Gard. Chron. & Agric. Gaz. [xviii.] 700, *partim* (1858); non Hook. fil. et Thoms.

Leycesteria glaucophylla Hook. fil. ex C. B. Clarke in Hook. fil. Fl. Brit. Ind. iii. 16 (1880), *excl. synonym.* "*Lonicera glaucophylla* Hook. fil. et Thoms." et "*Pentapyxis* sp.," et loc. "Yoksun, J.D.H.," et *verbis* descriptionis "or more or less developed . . . presence of stipules" (p. 17, lines 1-4); Gamble, List Trees, etc. Darj. ed. 2, 46 (1896); Hemsl. in Hook. Ic. Plant. xxvii. sub t. 2633, in obs. (1900); Gamble, Man. Ind. Timb. ed. 2, 398 (1902); ed. 3, 398 (1922); W. W. Smith in Rec. Bot. Surv. Ind. iv. 379 (1913); A. M. & J. M. Cowan, Trees Northern Bengal 74 (Gamble, List, ed. 3) (1929); non *Lonicera glaucophylla* Hook. fil. et Thoms.

Pentapyxis glaucophylla Hook. fil. ex Gamble, Man. Ind. Timb. ed. 1, 217 (1881), in obs., non *Lonicera glaucophylla* Hook. fil. et Thoms.

Icones. Gard. Chron. & Agric. Gaz. [xviii.] 700, fig. 2 *sinistr.*, non *dextr.* (1858); Hooker, *Icones Plantarum*, ser. 5, ii. t. 3166 (1932).

SIKKIM. Yoksun, [alt. circiter 1500 m.], 1857, T. Thomson. Simonbong, [Anderson in] *Herb. S. Kurz* (type !). Labah, Dumsong, alt. 1800 m., March 1875, Gamble 3073 a: "Very pretty small shrub; fruits 639 blue!" Chota Rimitti, Darjeeling, alt. 2100 m., Nov. 1879, Gamble 7451. Pankasari Ridge, alt. 2250 m., 12 Oct. 1902, J. H. Lace 2401. Labah Ridge, alt. 2100 m., Dec. 1904, H. H. Haines

3B 2002. Above Rhikisum, alt. 2250 m., 25 Apr. 1913, C. C. Lacaita: "Berry oval, purple, tipped with green calyx."

BHUTAN. Sine loc. spec., Booth in *Herb. Nuttall*.

BURMA. Bhamo Div.: Bumrawng, alt. 1650 m., March 1909, E. S. Cubitt 387.—Vernacular name (Kachin): "*Nhkra-la* (?)."

WESTERN YUNNAN. Moist, shady situations amongst scrub, Ku-Tan-Ho Valley, Salwin valley, Salwin-Irrawadi divide, lat. 25° 55' N. alt. 1800-2100 m., Nov. 1905, Forrest 1063: "Spreading semi-trailing shrub of 6 to 10 ft. Flowers yellowish-white." On hills to west of Tengyueh, amongst scrub, lat. 25° N., alt. 1800 m., June 1912, Forrest 8261: "Shrub of 3-6 ft., in fruit." Open situations in thickets on western flank of Shweli-Salwin divide, lat. 25° 20' N., alt. 2100-2400 m., Nov. 1912, Forrest 9377: "Shrub of 3-9 ft. Flowers white." Open scrub in rocky situations, hills to the north of Tengyueh, lat. 25° 20' N., alt. 1800 m., March 1913, Forrest 9723: "Shrub of 3-5 ft. Flowers white, fragrant." Amongst scrub by streams on the Shweli-Salwin divide, lat. 25° 10' N., alt. 2400 m., July 1918, Forrest 17527: "Shrub of 4-7 ft. Flowers white, flushed rose exterior." Open situations by streams on the Shweli-Salwin divide, lat. 25° 45' N., long. 98° 50' E., alt. 2400 m., Nov. 1924, Forrest 26032: "Shrub of 6-9 ft. Branches arched almost from base. Flowers white."

SOUTH-EASTERN YUNNAN. South of Red River from Manmei, alt. 1800 m., Henry 9767: "Shrub, 10 ft.; white flowers."

It is this species, and not the preceding, which is meant whenever "*Leycesteria glaucophylla*" is mentioned in the literature of the genus, the true *glaucophylla* being referred to (since 1911) as *L. Belliana* W. W. Sm. Enough has, it is hoped, been said under that species to make the position clear. Fritsch's cryptic remark (in Engl. u. Prantl, Nat. Pflanzenf., *l.c.*) that "*L. glaucophylla* Hook. f., ausgezeichnet durch 7-8 Carpelle, nähert sich der 2. Section," *i.e.* *Sect. Pentapyxis* (Hook. fil.) Fritsch, with 1 species, *L. stipulata*, is explained when it is remembered that "*L. glaucophylla*" has always been regarded as the correct name for what is really *L. gracilis*, but which, it was thought, occasionally developed stipules on the young barren branches. Fritsch had not disentangled these two species; hence his opinion, that the composite plant "*L. glaucophylla*" with its 7-8 carpels approached *L. stipulata*, contained a germ of truth.

Reference has already been made (p. 164) to the resemblance between the inflorescence of the present plant and that of *Symphoricarpos sinensis* Rehd. The existence of a member of the latter, otherwise exclusively American, genus so far from its "home" as Western Hupeh, Central China, is as unexpected as it is interesting. Taken in conjunction with the fact that a peculiarly "Symphoricarpoid" *Leycesteria* stretches out in this direction as far as Yunnan, it becomes tempting to regard the circumstance as "suggestive." But suggestive of what? The inflorescence of *Symphoricarpos sinensis* is more elongate than that of most of its congeners, though

less so than in *Leycesteria gracilis*, but the latter's very small bracts and bracteoles, subtending the paired flowers, and the two decussate pairs of small bud-scales at the base of the inflorescence, are almost exactly those of the Chinese *Symphoricarpos*. These anomalous characters, and the usually 8-locular ovary, which is unique not only in the genus but in the whole family *Caprifoliaceae*, seem to justify the establishment of the new subgenus here proposed for *Leycesteria gracilis*. As to whether there is, or ever has been, any connection between these two otherwise tribally distinct genera, nothing can be said, apart from pure speculation, until, and unless, the discovery of further species sheds further light on the question.

XXII.—CONTRIBUTIONS TOWARDS A FLORA OF BRITISH NORTH BORNEO: I. C. E. C. FISCHER.

Collections of herbarium specimens from British North Borneo have been received recently from Mr. H. G. Keith of the Forestry Department in that territory. The first sending has proved of such interest, containing as it does four new species and a number of plants new to the area, that it has been deemed advisable to assemble the records in a series under the above title. The notes will be confined strictly to British North Borneo.

As a starting point Merrill's enumeration of the plants of Borneo, published in the Journal of the Royal Asiatic Society, Straits Branch, in September, 1921, has been adopted, and any specimens of species which are not definitely attributed therein to British North Borneo will be cited.

Tetracera Boerlagei Merr. [Dilleniaceae].

Lokan, Kinabatangan, fr. June, *Arsat* in Herb. For. Dept. 1277. "Woody vine; fr. green. Orang Sungei name: *Pampan*"; Batu Puteh, fl. June, *Arsat* in Herb. For. Dept. 1279. "Fl. white. Orang Sungei name: *Karis-karis*."

Crataeva religiosa Forst. [Capparidaceae].

Tanjong Pang, fl. Feb., *Arsat* in Herb. For. Dept. 1206. "Tree 20 ft. high, 4 in. diam., in forest; fl. yellow."

Flacourtia rukam Zoll. et Mor. [Flacourtiaceae].

Tanjong Bulet, fl. Nov., *Arsat* in Herb. For. Dept. 1295. "Tree 25 ft. high, 10 in. diam.; fl. yellow"; Batu Puteh, fl. Jan., *Arsat* in Herb. For. Dept. 1338.

Xanthophyllum Arsatii C. E. C. Fischer, sp. nov. [Polygalaceae]; *X. ancolano* Miq. similis sed foliis petiolis paniculisque multo longioribus, foliorum nervis lateralibus numerosioribus.

A small tree; branchlets greyish-brown, glabrous, twigs sulcate, fuscous-felted. Leaves chartaceous, elliptic, narrowed acutely at both ends, 14–27 cm. long, 3.5–7 cm. wide, midrib prominent below, 18 lateral nerves 9–10 pairs, raised below, arching and uniting 3–5 mm. J. within the entire, slightly undulate margin, glabrous except for the

midrib which is minutely fuscous-puberulous especially near the base, eglandular; petioles 1.2–2.2 cm. long, narrowly channelled above, fuscous-felted, the basal two-thirds rugulose. Panicles axillary and terminal, up to 1 dm. long; rhachis and branches sulcate and reddish when dry, fuscous-puberulous; bracts minute; flowers numerous; pedicels 2 mm. long, slightly enlarged to the apex, fuscous-felted. Sepals broadly ovate to subcircular, obtuse, thick, unequal, 2.5–4 mm. long, densely fuscous-puberulous on both sides except for the nearly glabrous marginal strip, reddish, minutely ciliate. Petals 5, red, 4 of them subequal, oblong-lanceolate, obtuse, base rounded with a short broad claw, 1 cm. long, 0.3 cm. wide, slightly plicate, glabrous, the fifth deeply boat-shaped, obtuse, base truncate and abruptly cuneate to the short broad claw, 0.87 cm. long, 0.65 cm. wide, puberulous without. Stamens 8, 8 mm. long; filaments free, curved, subulate, glabrous except for a patch of greyish pubescence inside about 2 mm. above the widened, flattish base; anthers narrowly oblong, 1 mm. long, united round the stigma, sparsely bearded at the base. Ovary shortly, stoutly stipitate, subglobose, 1.25 mm. long, densely fuscous-hairy, 1-celled; ovules 3; style flattened, curved, 5 mm. long, sparsely set with spreading hairs, reddish; stigma entire. Fruit not seen.

Lukan, fl. March, *Arsat* in Herb. For. Dept. 1213 (type). "Tree 25 ft. high, 5 in. diam.; fl. red"; Sarawak River, G. D. Haviland.

Dipterocarpus oblongifolius Bl. [Dipterocarpaceae].

Lunut, fr. Aug., *Arsat* in Herb. For. Dept. 1252. "Tree 70 ft. high, 15 in. diam.; fr. red. Orang Sungei name: *Kasooy*."

Shorea Gysbertiana Burck [Dipterocarpaceae].

Maraba, near sea-level, fr. June, *Md. Tahir* in Herb. For. Dept. 1289. "Tree 40 ft. high; fr. green, yielding an edible oil. Malay name: *Kawang*."

Shorea leprosula Miq. [Dipterocarpaceae].

Lunut, fr. Aug., *Arsat* in Herb. For. Dept. 1254. "Tree 50 ft. high, 12 in. diam.; fr. green. Orang Sungei name: *Matu*."

Pterospermum diversifolium Bl. [Sterculiaceae].

Kujak, fl. April, *Arsat* in Herb. For. Dept. 1329. "Fl. red"; Loka, fl. June, *Arsat* in Herb. For. Dept. 1282. "Tree 50 ft. high, 10 in. diam.; fl. white. Orang Sungei name: *Litak*."

Pterospermum elongatum Korth. [Sterculiaceae].

Batu Puteh, fl. May, *Arsat* in Herb. For. Dept. 1262. "Tree 50 ft. high, 9 in. diam.; fl. white. Malay name: *Bayur*."

Commersonia platyphylla Andr. [Sterculiaceae].

Pin River, fl. Sept., *Arsat* in Herb. For. Dept. 1242. "Tree 20 ft. high, 7 in. diam.; fl. white. Orang Sungei name: *Meng-kepen*"; Kamangian, fl. June, *T. Goklin* in Herb. For. Dept. 1303. "Fl. yellow. Orang Bisaya name: *Hagis-hagis*."

Columbia serratifolia DC. [Tiliaceae].

Batu Puteh, fl. March, *Arsat* in Herb. For. Dept. 1212; fr. June, *Arsat* in Herb. For. Dept. 1270. "Tree 50 ft. high, 8 in. diam.; fl. white. Orang Sungei names: *Mang Kopan*, *Anggurong*."

Elaeocarpus Griffithii Mast. [Elaeocarpaceae].

Meraba, Weston, fl. Oct., *Md. Tahir* in Herb. For. Dept. 1228. "Tree 20 ft. high, 6 in. diam.; fl. white. Malay name: *Suagam*."

Aglaia lancifolia Harms [Meliaceae].

Ulu Bakan River, fl. July, *Bayak* in Herb. For. Dept. 1236. "Shrub 10 ft. high."

Lophopyxis pentaptera Engl. [Olacaceae].

Tanjong Bulet, fr. Nov., *Arsat* in Herb. For. Dept. 1294.

Zizyphus celtidifolia DC. [Rhamnaceae].

Boras Mainto, fl. April, *Arsat* in Herb. For. Dept. 1327. "Fl. yellow."

Nephelium malaiense Griff. [Sapindaceae].

Linkengen, 30 ft., young fr. June, *Md. Tahir* in Herb. For. Dept. 1288. "Tree 15 ft. high, 6 in. diam.; young fr. green. Malay name: *Mata Kuching*."

Otophora edulis C. E. C. Fischer, sp. nov. [Sapindaceae]; *O. amplifoliae* Pierre similis, sed foliolis numerosioribus linearibus sessilibus, fructuque majore.

A small tree, with angled, glabrous twigs. Leaves membranous, glabrous, crowded at the ends of the twigs, sessile, paripinnate; rhachis 20–30 cm. long, acutely quadrangular, the lateral edges with reticulately veined wings 2–3 mm. wide throughout, very shortly produced beyond the terminal leaflets, the wings narrowed at the insertion of the leaflets, base widened and subamplexicaul. Leaflets 9–10 pairs, including the basal stipuliform pair which are broadly ovate or subcircular, acute, 0.8–1 cm. long, the next pair 5–8 cm. distant with intervals of about 2.5 cm. between all the rest, opposite or alternate, sessile with a broad rugulose attachment to the rhachis, linear, tapering to a blunt apex, abruptly narrowed to a rounded, inequilateral base, 8–16 cm. long, 1.5–2 cm. wide, midrib sharply prominent on both sides, primary lateral nerves about 22, hardly more distinct than the secondary, ultimate reticulations fine. Inflorescence a much-branched open panicle, up to 40 cm. long; rhachis brown, minutely puberulous, the branches angled and densely fuscous-puberulous towards the extremities; flowers fascicled; bracts minute, narrowly lanceolate, deciduous; pedicels slender, 6–8 mm. long, puberulous. Sepals 5, subcoriaceous, obtuse, the 2 outer ovate to rotund, the 3 inner broadly oblong with sub-hyaline margins, 3–5.5 mm. long, the outermost smallest, increasing in size inwards, glabrous or sparsely puberulous at the base. Petals 6–7, orbicular, margins erose, infolded at the base and

simulating scales, 2.6–3.4 mm. long, slightly pubescent outside at the base and up to the centre. Disc fleshy, annular, short, mouth 8–9-crenate. Stamens 8–9, inserted on the edge of the disc; filaments flat, 0.7 mm. long, white-hairy in the upper half; anthers oblong, 1 mm. long. Ovary depressed-globose, sulcate opposite the anthers, 1.8 mm. long, glabrous, 3-celled; style short, stout; stigma peltate, 2.5 mm. diam., faintly 3-lobed, glabrous. Fruit subglobose to obovoid, 3.5 cm. long, brown when dry; stalk stout, woody. Seed fleshy, oblong, 2.5 cm. long, 1.3 cm. diam., basal areola large, slightly oblique.

Banks of the Segama River, 310 ft., fl. and fr. Jan., *P. Orolfo* in Herb. For. Dept. 1319. "Tree 20 ft. high and 3 in. diam.; fl. reddish: seeds eaten by the local people."

Mischocarpus fuscescens Bl. [Sapindaceae].

Bundu, fl. June, *T. Goklin* in Herb. For. Dept. 1305. "Fl. yellow."

Mischocarpus sumatranus Bl. [Sapindaceae].

Kinabatangan, fr. March, *B. Evangelista* in Herb. For. Dept. 1235. "Tree 30 ft. high, 6 in. diam., in forest."

Spatholobus ferrugineus Benth. [Papilionaceae].

Nunuya, fl. May, *Md. Tahir* in Herb. For. Dept. 1300. "Fl. red."

Dalbergia parviflora Roxb. [Papilionaceae].

Pin River, fr. Sept., *Arsat* in Herb. For. Dept. 1243. "Fr. green. Orang Sungei name: *Lake*"; Tanjong Bulat, *Arsat* in Herb. For. Dept. 1299. "Orang Sungei name: *Dorilak*."

Crudia bantamensis Koord. et Val. [Caesalpiniaceae].

Pin River, young fr. Sept., *Arsat* in Herb. For. Dept. 1244. "Tree 50 ft. high, 13 in. diam.; fr. red. Orang Sungei name: *Papereng*."

Saraca lanceolata Merr. [Caesalpiniaceae].

Lunut, fl. Aug., *Arsat* in Herb. For. Dept. 1251. "Tree 50 ft. high, 10 in. diam.; fl. yellow. Orang Sungei name: *Pamparang*"; Lukan, fr. March, *Arsat* in Herb. For. Dept. 1202. "In high forest; fr. green. Orang Sungei name: *Bulanut*."

The legume is narrowly oblong, flat, attenuate at both ends, apex mucronate, glabrous, 15.5–19 cm. long, 3.5–6.5 cm. wide, the dorsal margin undulate.

Terminalia laurinoidea Teijsm. et Binn. [Combretaceae].

Lukan, fl. March, *Arsat* in Herb. For. Dept. 1205. "Tree 50 ft. high, 9 in. diam.; fl. white. Orang Sungei name: *Dam-pirut*."

Leptospermum amboinense Bl. [Myrtaceae].

Sandakan, near the catchment area, 600 ft., fl. Sept., *G. Pascual* in Herb. For. Dept. 1218. "Fl. white. Orang Murut name: *Kandis-kandis*."

Eugenia Foxworthyana Ridl. [Myrtaceae].

Pin River, fl. March, *Arsat* in Herb. For. Dept. 1346. "Tree 20 ft. high, in forest; fl. white. Orang Sungei name: *Paumpung*."

Melastoma malabathricum Linn. [Melastomaceae].

Batu Puteh, fl. May, *Arsat* in Herb. For. Dept. 1261. "Shrub 10 ft. high. Orang Sungei name: *Gasing*."

Homalium caryophyllaceum Bl. [Samydaceae].

Batu Puteh, fl. Feb., *Arsat* in Herb. For. Dept. 1345. "Tree 50 ft. high, 20 in. diam., in forest. Malay name: *Kamuring*."

Timonius mutabilis Walp. [Rubiaceae].

Membakut, fl. July, *Md. Tahir* in Herb. For. Dept. 1221. "Shrub 8 ft. high; fl. golden-yellow. Brunei name: *Rantap*."

Ixora grandiflora Zoll. et Mor. [Rubiaceae].

Batu Puteh, fl. Feb., *Arsat* in Herb. For. Dept. 1340. "Tree 25 ft. high, 12 in. diam.; fl. yellow. Orang Sungei name: *Manpur*."

Randia Keithii C. E. C. Fischer, sp. nov. [Rubiaceae]; *R. urantherae* C. E. C. Fischer proxima, sed foliis multo minoribus nervorum axillis foveolatis, stipulis multo latoribus quam longioribus, floribus pedunculatis, staminibus numerosioribus haud caudatis.

A small tree, glabrous except the inflorescence, twigs terete, hollow, dark-olivaceous when dry, minutely verruculose. Leaves when dry rigidly chartaceous, dark-olivaceous above, paler below, narrowly elliptic to ovate-elliptic, often subfalcate, acute at both ends, 5.5-9 cm. long, 1.5-3 cm. wide, lateral nerves 4-6 pairs, distant, arching and uniting near the slightly revolute margins, slightly impressed above, sometimes obscure, the axils pitted; petioles 2 mm. long, rugulose; stipules 2-3 mm. long, very much wider, abruptly acute. Flowers sessile, axillary, solitary or in pairs, on a stout peduncle 2 mm. long; bracts broadly ovate, acute, usually keeled, semi-amplexicaul, 2.5-3.5 mm. long, fulvous-ciliate; bracteoles similar, 1.5-2.5 mm. long. Calyx narrowly turbinate, 8 mm. long, lobes 5, sometimes with 1-2 smaller ones interposed, triangular, acute or subacute, 1 mm. long, fulvous-ciliate, produced 4 mm. above the ovary, clothed within with appressed, fulvous, ascending hairs. Corolla-tube slender, 5.5-6 cm. long, 2.6 and 7 mm. diam. at base and apex respectively; segments 6-7, oblong, rounded, 3.3 cm. long, 1.6 cm. wide. Stamens 8, included; filaments very slender, 1.5 mm. long, inserted about 1.2 cm. below the mouth of the corolla-tube; anthers narrowly linear, 8 mm. long, versatile, bearing very few setae at the apex, connective produced into a short mucro. Ovary 2-celled, crown shortly produced into the calyx-tube; ovule solitary in each cell; style slender, 2 cm. long, glabrous; stigma narrowly clavate, 3 mm. long. Fruit unknown.

Forest Reserve Sandakan, 500 ft., Feb., *H. G. Keith* in Herb. For. Dept. 1215. "Tree 25 ft. high, 3 in. diam.; fl. white. Second growth forest."

Petunga pentamera C. E. C. Fischer, sp. nov. [Rubiaceae]; *P. gracili* Korth. valde affinis, sed foliis angustioribus, racemis longioribus, bracteolis minoribus, pedicellis longioribus, floribus pentameris.

A tree, glabrous except the inflorescence; twigs dark-brown when dry, the two or three distal internodes sulcate and slightly flattened below the node, 6-10 cm. long. Leaves distichous, chartaceous and brown when dry, paler below, elliptic, acute or shortly acuminate, base acute, inequilateral, 10-17 cm. long, 2.7-5.5 cm. wide, midrib prominent below, lateral nerves 9-11 pairs, ascending, curved and uniting near the margins; petioles narrowly channelled above, 1-1.5 cm. long; stipules ensiform from a wide base, acuminate, 0.8-1.4 cm. long. Racemes axillary, slender, 12-20 cm. long, puberulous upwards, naked for about 2 cm. at the base, angled by the decurrent nodes; flowers solitary or more usually twin, rarely 3 together; bracteoles triangular, minute; pedicels 1-1.2 mm. long. Calyx narrowly campanulate, 2.5 mm. long, more or less 5-angled, produced 0.7 mm. above the ovary, clothed within with appressed ascending hairs; teeth 5, triangular, minute. Corolla fleshy; tube cylindric and 5-fluted below, suddenly much widened at the mouth, 2.5 mm. long; lobes 5, overlapping to the left in bud, ovate, rounded, 2 mm. long, mouth hairy. Stamens 5; filaments very short, attached a short distance below the mouth of the corolla; anthers linear, wider near the acute, shortly exerted apex, 2 mm. long. Ovary 2-celled; ovules 2 in each cell; style slender, 2.2 mm. long, shortly patently hairy except at the base; stigmas 2, ovate-lanceolate, 1.25 mm. long, puberulous without. Fruit (immature) pyriform, crowned by the appressed calyx-teeth, 7.5 mm. long, 3.5 mm. diam., black.

Batu Puteh, fl. May, *Arsat* in Herb. For. Dept. 1268. "Tree 30 ft. high, 6 in. diam." This species with 5-merous flowers requires an amplification of the generic description, all the other species being 4-merous. All other features are so distinctly those characteristic of *Petunga* that it cannot be excluded from that genus.

Payena Suringariana Burck [Sapotaceae].

Kuyuk Kabun, fl. April, *Arsat* in Herb. For. Dept. 1330. "Forest tree 20 ft. high, 8 in. diam.; fl. red. Orang Sungei name: *Ampalang*."

Symplocos superba Brand [Symplocaceae].

Forest Reserve Sandakan, 500 ft., fl. Feb., *H. G. Keith* in Herb. For. Dept. 1216. "Second forest growth shrub 10 ft. high; fl. white."

Linociera pluriflora Knobl. [Oleaceae].

The fruit was unknown when the species was described. Two sheets lying in the Kew Herbarium and others received recently, identified with this species, bear fruit; one sheet has both flowers and fruit. These specimens agree perfectly in the vegetative parts

Drupe obovate-ellipsoid, woody, walls very thick, 0.8-1.5 cm. long, 0.6-1 cm. wide, dark-brown to black when dry, prominently warted, the warts rugulose. The bark of the twigs is whitish or pale-brown. All the specimens are from Borneo.

I suspect that *Linociera verruculosa* Merr. is this species, but I have not seen a specimen.

Tanjong Pang, *Arsat* in Herb. For. Dept. 1207. "Forest tree 40 ft. high, 6 in. diam.; fl. yellow. Orang Dusun name: *Tambirag*."

Tanjong Pang, fl. Feb., *Arsat* in Herb. For. Dept. 1208. "In forest; fl. yellow. Orang Sungei name: *Salimut*."

Kamangian, fl. June, T. Goklin in Herb. For. Dept. 1302.
"Brunei name: *Anjarubi*."

Lunut, fr. Aug., *Arsat* in Herb. For. Dept. 1249.

Scurrula ferruginea *Danser* [Eboranthaceae].
Batu Puteh, Kinabatangan, fl. June, *Arsat* in Herb. For. Dept.
1278.

Sandakan, 120 ft., fl. Dec., *L. Apostol* in Herb. For. Dept. 1311.
 " Kemirih-Malay name : *Buaktas*."

Memampagar, Beaufort, 50 ft., fr. April, Bayak in Herb. For. Dept. 1290. "Tree 40 ft. high, 16 in. diam. Orang Murut name: *Marambokon*."

Kuyak Kabun, fr. March, *Arsat* in Herb. For. Dept. 1325.
"Tree 70 ft. high, 12 in. diam.; fr. green."

Beaufort, 60 ft., fr. May, R. B. Cabiling in Herb. For. Dept. 1312.
"Tree 15 ft. high, 5 in. diam.; fr. green."

Without locality, fl. Sept., *Md. Tahir* in Herb. For. Dept. cond
"Fl. yellow."

Lahad Datu, Tapadeng Hill, 350 ft., fr. Dec., *P. Orolfo* in Herb. For. Dept. 1315. "Fr. blueish."

NEW EUPHORBIACEAE COLLECTED BY THE OXFORD UNIVERSITY
EXPEDITION TO BRITISH GUIANA, 1929.

Pausandra integrifolia Lantj., sp. nov.; ab omnibus speciebus hucusque cognitis floribus trimeris, petalis sicut sepalis liberis distinguitur.

Arbor parva. Ramuli tenues, teretes, glabri. *Folia* alterna, petiolata; petiolus 3-9 cm. longus, supra canaliculatus, apice incrassatus, pilis brevibus rigidis adpressis sparse vestitus, glabrescens; limbus 12-28 cm. longus, 4-9 cm. latus, oblongus vel oblanceolato-oblongus, basi acutus subcuneatus, apice longe cuspidato-acuminatus, acumine fere 1.5-2 cm. longo, rigide membranaceus vel subcoriaceus, ima basi glandulis binis minutissimis praedita, margine integerrimo vix revoluta, utrinque glaber, supra subnitidus olivaceo-brunneus, subtus opacus olivaceo-viridis, nervis utrinque praesertim subtus prominentibus costae arcuatae utrinque 12-14 nervatura tertiaria reticulata. *Flores* monoici. *Paniculae masculae* terminales, 20-35 cm. longae, rhachi gracili adpresse flavescenti-pilosa parte inferiore longiuscule ramosa, floribus in axillis bractearum parvarum intus glabrarum extus pilis flavis brevibus dense vestitarum glomerulatis, breviter pedunculatis, ramulis superioribus 1.5-4 cm. distantibus; pedicelli fere 5 mm. longi, pilis brevibus flavis adpressis dense vestiti. *Sepala* 3, 4 mm. longa, late ovata, imbricata, apice et margine a vicinis tecto tenuia glabra imperfecta, ceterum extus pilis brevibus flavis adpressis dense vestita, intus fusca glabra. *Petala* 3, libera, fere 5 mm. longa, suborbicularia, concava, apice recurva, late truncata, margine revoluta, extus adpresse pilosa, intus glabra. *Discus* brevis, cupulatus, pilis longis flavis erectis dense vestitus. *Stamina* 8, quorum unum centrale, filamentis longis discum multo superantibus, gracilibus, atro-fuscis, glabris; antherae oblongae, introrsae, longitudinaliter dehiscentes, apice lato obtuso subtruncato. *Fructus* pedicello 14-37 mm. longo crasso sulcato pubescente apice incrassato suffultus, subglobosus,

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7-8 mm. diametens, pubescens, apice subapplanatus et reliquiis stylorum probabiliter indivisorum brevissimorum fortasse 1 mm. longorum coronatus, basi reliquiis disci ut in flore masculo probabiliter brevis cupulati pilis longis vestiti circumdatus, 3-locularis, seminibus statu sicco valde applanatis.

BRITISH GUIANA. Cuyuni River: plentiful in mixed hilly forest on right bank below Akaio Falls, November 22nd, *Sandwith* 650 (type); a low tree with pale green petals. Duplicates are distributed to Utrecht, New York, Rio de Janeiro and Berlin.

This species differs widely from the species which are at present known in the genus *Pausandra*, though the plant certainly belongs to it. The flowers are trimerous, and the petals as well as the sepals are free. By these characteristics alone one can distinguish the species from all the others. There is in this respect some similarity with *P. Martinii* Baill. but the latter species has different leaves and much smaller flowers (Mr. Eyma was so kind as to compare the plant with the specimen of *P. Martinii* in the Paris Herbarium). It is impossible to say whether the floral characteristics of *P. Martinii* resemble those of the new species, because there was no opportunity of studying flowers.

The characteristics by which the new species differs from all the others are, however, important enough to divide the genus *Pausandra* into two sections, of which descriptions and species follow beneath.

Sect. I. **Eupausandra** Lanj., sect. nov.

Flores sympetali, lobis 5. Sepala connata. Folia dentata vel serrata.

P. Morisiana Radlk.; *P. megalophylla* Müll. Arg.; *P. Trianae* Baill.; *P. quadriglandulosa* Pax et K. Hoffm.; *P. macropetala* Ducke; *P. macrostachya* Ducke; *P. extorris* Standley; *P. flagellorhachis* Lanj.

Sect. II. **Pausandrella** Lanj., sect. nov.

Petala 3, libera. Sepala 3, libera. Folia integra (an interdum dentata?).

P. integrifolia Lanj.; (?) *P. Martinii* Baill.

Sandwithia Lanj., gen. nov.; *Euphorbiacearum* genus incertae sedis, probabiliter *Cluytieis* attribuendum, *Sagotiae* fortasse affine.

Flos masculus in alabastro globosus. *Sepala* 2 vel 3, valvata (an semper?), ovata, concava. *Petala* 3 vel 4, in alabastro valde imbricata, oblonga vel suborbicularia. *Disci glandulae* 2-4, episepalae, *Stamina* ultra 20, filamentis liberis, petalis subaequilonga; antherae erectae, oblongae vel ovato-oblongae, longitudinaliter dehiscentes. *Ovarii rudimentum* nullum. *Flos femineus* in alabastro oblongus. *Calyx* tubulosus, lobis 4, oblongis. *Petala* 4, parva, decidua. *Discus* tenuis, cupulatus, undulatus. *Ovarium* 3-loculare; styli 3, erecti, filiformes, basi connati, 2-partiti. *Ovula* in loculis solitaria, carunculis magnis coronata. *Capsula* tridyma, in coccos bivalves

a columella persistente dissiliens. *Semen* ovoideum carunculatum; testa crustacea; albumen carnosum; cotyledones latae, planae.—*Arbores* glabrescentes. *Folia* alterna, petiolata, stipulata, integra, penninervia. *Flores feminei* in racemos terminales breves dispositi, pedicellati, bracteis mediocribus subtenti, ebracteolati. *Flores masculi* in paniculas racemos simulantibus terminales breves dispositi, pedicellati, bracteis minutis vel nullis.

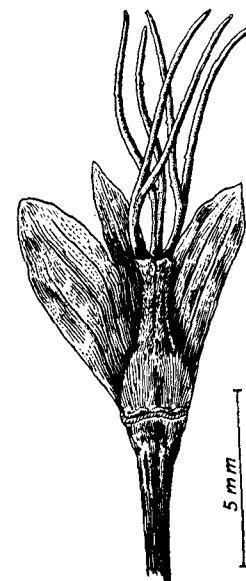


Fig. 1. *Sandwithia guyanensis* Lanj. Female flower (without petals).

S. guyanensis Lanj., sp. nov.

Arbor parva, 6 m. alta vel altior, in silvis variis abundans. *Ramuli* juveniles sicut petioli pilis minutissimis adpressis sparse vestiti, mox glabrescentes, cinerascens, lenticellati. *Petioli* supra canaliculatus, 1.5-3.5 cm. longus, paulo incrassatus et rugis transversis praeditus. *Stipulae* extus sparse praesertim in nervo mediano intus dense pilis flavis adpressis, eodem modo ut gemmae, vestitae, triangulari-ovatae, longe acuminatae. *Foliorum limbus* (4.5) 8.5-25 cm. longus, (1.5) 2.5-9.5 cm. latus, oblongus vel obovatus vel obovato-lanceolatus vel ellipticus, basi rotundatus vel acutus vel cuneatus, apice acuminatus vel cuspidato-acuminatus, integer, subchartaceus, glaberrimus, supra glaucescens, subtus brunneo-olivaceus; costae secundariae utrinque praesertim subtus prominentes. *Flores masculi* in paniculas terminales dispositi. *Panicula* formis, pilosa, e pedunculis unifloris fere 2 cm. longis composita. *Ramuli* parte lignescens 1 vel 2 gemmas ferentes, anno proximo paniculam secundariam procreantes. *Bractae* parvae, triangulares, pilosae, deciduae. *Pedicelli* sparse pilosi, 5-7 mm. longi. *Sepala*

2 vel 3, valvata (an semper?), ovata, concava, 2-3 mm. longa, acuta, apice pilis penicillatis praedita. *Petala* 3 vel 4, alba, imbricata, oblonga vel suborbicularia, utrinque brevissime pubescentia, margine ciliata. *Disci glandulae* 2-4, episepalae, breves, crassae, squamiformes. *Receptaculum* pilosum. *Stamina* 23-26, filamentis liberis glabris petalis subaequilongis; antherae erectae, oblongae vel ovato-oblongae, connectivis basi dilatatis, longitudinaliter dehiscentes. *Flores feminei* in racemos terminales breves 2-3 cm. longos dispositi, rhachi pedicellisque sparse pilosis. *Bractae* mediocres, 4-5 mm. longae, triangulari-lanceolatae, acutae. *Pedicelli* 8-10 mm. longi. *Calyx* viridis, circiter 7 mm. longus, tubulosus, utrinque praesertim margine pilis minutis sparse vestitus, usque ad tertiam partem fere a basi incisus, lobis 4 oblongis obtusis. *Petala* 4, lanceolata vel oblonga, margine pilosa, minuta, decidua. *Discus* tenuis, cupulatus, undulatus. *Ovarium* 1.25 mm. longum, 3-loculare, densissime pilosum; styli 3, 9 mm. longi, basi 1.5 mm. connati, apice bipartiti, sparse pilosi. *Ovula* in loculis solitaria, carunculis magnis coronata. *Capsula* subglobosa, circiter 12 mm. longa. *Semen* ovoideum, 8-10 mm. longum, 5-6 mm. latum, brunneum, carunculatum.

BRITISH GUIANA. Moraballi Creek, Essequibo River, near Bartica, fl. and fr. August 26th, *Sandwith* 125a (type female), 125b (type male): a low tree, up to about 20 ft. high, plentiful in various types of forest; petals of male flowers pure white; female flowers green. Demerara River, fl. June, *Jenman* 6650 (male and female). On hills, Waini River, N.W. District, fl. November, *Anderson* (Forestry Department) 961 (male). Weri-Werai-Kuru Creek, Essequibo River, fl. August 1930, *Martyn* 197 (male). Bartica, fl. and fr. November 1888, *Jenman* 4817.

Mr. Paul Richards, who studied the ecology of the forests by the Moraballi Creek, writes that this small tree "occurred in all types of forest, but only very sparingly in Mora and Wallaba (one and three individuals over 4 ins. diam., respectively, on plots 400 ft. square); the greatest abundance was in Greenheart (52 individuals over 4 in. diam. on this plot), but the tree was also fairly abundant in Mixed and Morabukea."

This genus ought to be placed with the *Chrozophoreae*, and there somewhere near *Grossera*, by reason of its valvate male calyx, according to Pax and Hoffmann in *Natürliche Pflanzenfamilien*, Band 19 c (1931), though the species has not many other characteristics in common with this group. However, the importance of the valvate calyx should not be over-estimated, as is indicated by the following quotation from Bentham.* "No character, however important on some occasions, should be allowed to override all others on all occasions. The valvate male calyx, for instance, to which Mueller gives on most occasions so absolute a tribal value as to make the

*G. Bentham, Notes on Euphorbiaceae in Journ. Linn. Soc. Bot. xvii. 188 (1878).

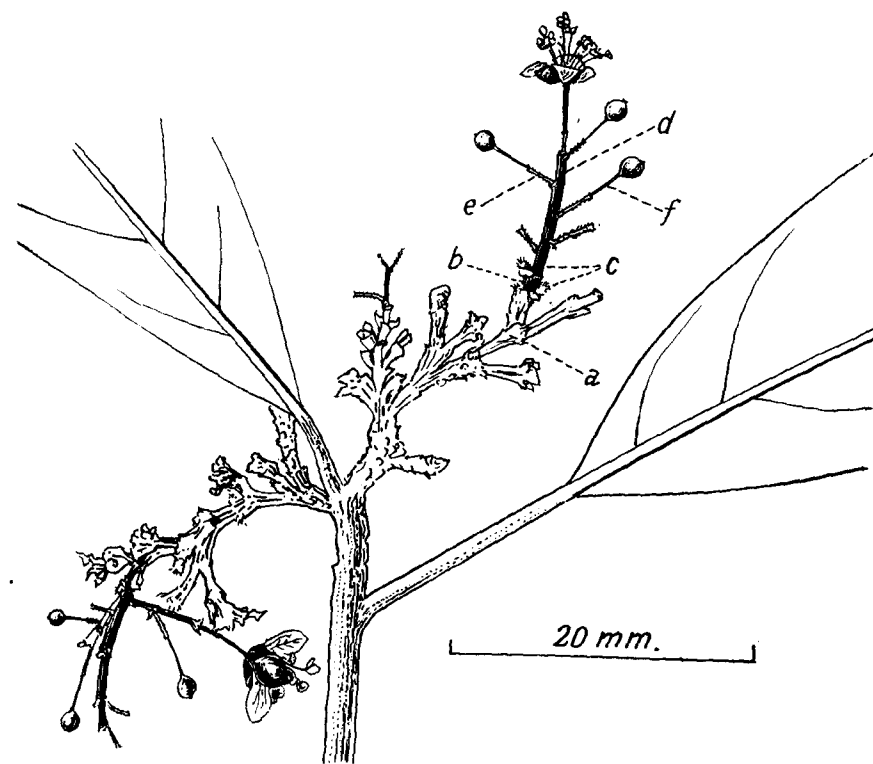


Fig. 2. *Sandwithia guyanensis* Lanj. Inflorescence. a, short shoot of some years ago; b, short shoot of the last year; c, inflorescence-buds; d, axis; e, peduncle; f, pedicel.

most unnatural combinations, is never allowed even generic value by Baillon, because of its inconstancy in *Croton*, whereas in many cases it certainly has no exceptions." Besides, there seemed to be a slight indication of an imbricate calyx in a few cases. It will therefore be better to place the genus with the *Cluytieae* and, within this tribe, near *Sagotia*, though important differences still remain which distinguish this genus, as may be seen from the generic diagnosis. However, a better position could not be found.

The genus has been named after Mr. N. Y. Sandwith, who has done much work on the Guiana flora in general, and who also collected the type of this plant and traced several specimens which belong to this genus among the indeterminatae in the Kew Herbarium.

Duplicate material is available for the Herbaria of Utrecht, Rio de Janeiro, New York, Berlin and Paris.

XXIV.—AFRICAN ORCHIDS: III.* V. S. SUMMERHAYES.

Habenaria (§ Diphyllae) Lelyi Summerhayes, sp. nov.; ex affinitate *H. Nicholsoni* Rolfe, *H. odoratae* Schltr. et *H. Debeerstinae* De Wild., a quibus petalis late lanceolatis subacuminatis a sepala dorsali liberis, labelli lobis lanceolatis medio lateralibus paulo latiore, brachiis stigmatiferis subfusiformibus differt.

Herba terrestris. *Folium* singulum, radicale, humistratum, suborbiculare, 2.5 cm. longum, 4.5 cm. latum, subcarnosum. *Scapus* erectus, 36 cm. altus, teres, cataphyllis acutis vel acuminatis vaginantibus instructus. *Racemus* ad 9-florus, 10 cm. longus; bracteae lanceolatae, acuminatae, usque 2.5 cm. longae. *Flores* suberecti, albi. *Sepalum* intermedium lanceolato-ovatum, acutum, 7 mm. longum, 3.5 mm. latum, concavum, trinervium; sepala lateralibus oblique lanceolata, subacuminata, 8.5 mm. longa, 4 mm. lata. *Petala* late lanceolata, subfalcata vel fere recta, subacuminata, 7 mm. longa, 3 mm. lata. *Labellum* trilobum, parte basali indivisa 2.5 mm. longa; lobus intermedius anguste lanceolatus, acutus, 7 mm. longus, 2.25 mm. latus; lobi laterales lineari-lanceolati, acuti, intermedio aequilongi, 1.5 mm. lati; calcar dependens, gracile, apicem versus leviter ampliatus, fere 3 cm. longum. *Anthera* erecta, 2.5 mm. alta, canalibus brevibus circiter 0.5 mm. longis; brachia stigmatifera subfusiformia.

NORTHERN NIGERIA. Ropp, 1380 m., July 1921, *Lely* 457.

This species belongs apparently to a small group in sect. *Diphyllae* possessing simple petals. Nine other species have been described but it is doubtful if they are all distinct. *H. Lelyi* is apparently rather isolated in this group, the free petals being a distinctive character. In addition it differs from all the other species in having the middle lobe of the lip wider than the lateral lobes.

Habenaria Johnsoni Rolfe in Dyer, Fl. Trop. Afr. vii. 571 (1898).

A re-examination of the type specimen shows that there are several very serious errors in the original description of this species.

In the first place Rolfe states that the petals are simple, and by assigning it to No. 33b in the Flora suggests that its affinity is with *H. Nicholsoni* Rolfe or perhaps *H. vaginata* A. Rich. Now the general structure of the flower is totally at variance with these species, but on the other hand agrees very closely with that of *H. stylites* Rchb. f. et S. Moore, *H. subarmata* Rchb. f., *H. armatissima* Rchb. f. and other allied species, all of which possess bipartite petals. The rather poorly preserved flower available for dissection from the type of *H. Johnsoni* also was found to possess an anterior segment to one of the petals, the corresponding segment on the other petal having been broken off. The segment found is very narrow and was obviously overlooked by Rolfe.

In the second place the spur is described as being 1 lin. (2 mm.) long in the original description. This is evidently a typographical error for 11 lin. (23 mm.), as an examination of the flower shows.

*Continued from K.B. 1931, 390.

The description should therefore be amended as follows:—

"*Petala* bipartita; partitio posterior lineari-lanceolata, falcata, 9 mm. longa, 1.5 mm. lata; sepalo intermedio agglutinata; partitio anterior linearis, subacuta, 8.5 mm. longa, 0.4 mm. lata. *Calcar* cylindricum, rectum, 23 mm. longum."

H. Johnsoni is very closely allied to *H. stylites* and indeed may yet prove to be conspecific with the latter, representing merely a small under-developed specimen. In the material at present available they differ in the following points. In *H. Johnsoni* the plant is much smaller while the perianth segments are smaller. The lip is, however, about the same length, but whereas in *H. stylites* it is divided for three-quarters of its length, in *H. Johnsoni* the lobes and undivided part are equal in length. Moreover the lobes are all considerably wider in Rolfe's species than in *H. stylites*. The gynostegium agrees very well in the two species. In view therefore of the considerable geographical remoteness of the two species and the above features it seems desirable for the present to keep them distinct.

Habenaria cirrhata Rchb. f. in Flora, 1865, 180. *H. Schweinfurthii* Rchb. f. Oti Bot. Hamburg. i. 58 (1878). *H. Zenkeriana* Kraenzl. in Engl. Jahrb. xix. 247 (1894). *H. longistigma* Rolfe in Dyer, Fl. Trop. Afr. vii. 248 (1898). *H. Dawei* Rolfe in Kew Bull. 1912, 154. *H. megistosolen* Schltr. in Engl. Jahrb. liii. 512 (1915).

A careful examination of the type specimens of all the above species except *H. Schweinfurthii* convinces me that it is impossible to separate them by any constant characters. Indeed there is considerable variation in the length of the parts, particularly the spur, and in the shape and size of the leaves. I have been fortunate in being able to examine a number of different gatherings from a relatively limited area (Northern Nigeria), and among these, coupled with considerable constancy in the reproductive organs, I have found even greater variety in the other floral members and vegetative parts than can be found in all the "species" cited above.

Schlechter states that *H. cirrhata* is confined to Madagascar, without indicating in any way how it differs from the Tropical African species he recognises; there seem to be no significant differences between them. It should be noticed that Rolfe's description in the Flora of Tropical Africa, which, judging from his comments, was drawn up from Madagascar specimens, is wrong in several particulars. Among others the lengths of the anterior and posterior segments of the petals have been transposed; it is the anterior lobe which is the longer.

I have been unable to examine the type specimen of *H. Schweinfurthii* Rchb. f., which is apparently at neither Berlin nor Vienna, but from the description I think there is no doubt that it is the same as *H. cirrhata* Rchb. f.

As a result of the above reductions the distribution of *H. cirrhata* Rchb. f. is seen to extend from Togoland in the west to Madagascar in the east and from Abyssinia in the north to Nyasaland and Rhodesia in the south, practically the whole of Tropical Africa south of the Sahara.

Habenaria Holubii Rolfe in Dyer, Fl. Trop. Afr. vii. 249 (1898). *H. rhopaloceras* Schltr. in Warb. Kunene Samb. Exped. 207 (1903). *H. valida* Schltr. in Engl. Jahrb. xxxviii. 148 (1906). *H. Hennigiana* Schltr. in Engl. Jahrb. liii. 511 (1915).

On examination of the type specimens of the above "species" it is clear that they are all conspecific and the oldest epithet, *Holubii*, must therefore be adopted for the species. It is not clear in what ways Schlechter considered his species to differ from one another, and indeed I have been unable to find any satisfactory differences. The shape of the leaves differs in individuals, while the relation between the lengths of the middle and side lobes of the lip is also a variable character; the middle lobe, however, is always distinctly longer than the lateral ones. In a series of specimens from Northern Nigeria the variation in this respect is well shown.

The key on page 211 of the Flora of Tropical Africa is extremely misleading since it reads:—

"Side lobes of lip twice as long as the front lobe

105 *H. rhopalostigma*

106 *H. Holubii*."

A comparison with the description on page 249 and with the specimen shows that in *H. Holubii* it is the front lobe which is much the longer. The species is thus distributed from Togoland and Nigeria through the Belgian Congo into southern Tanganyika Territory, Angola and Bechuanaland.

Habenaria (§ Ceratopetala) phylacochaera Summerhayes, sp. nov.; verosimiliter *H. Holubii* Rchb. f. affinis, a qua foliis floribusque minoribus, petali lobo posteriore lanceolato, anteriore polliciformi quam posteriore triplo brevioris facile distinguenda.

Herba terrestris, 30–45 cm. alta. *Folia* dua infima ad vaginas reducta, superiora 6–7 lanceolata, acuta, basi vaginantia, usque 8 cm. longa et 2 cm. lata, sursum sensim decrescentia summo caule in bracteas abeuntia. *Racemus* pauciflorus, floribus inclusis usque 8 cm. longus; bracteae lanceolatae, acutae vel acuminatae, 2–4 cm. longae, ovario pedicellato multo breviores. *Flores* satis magni, suberecti, partim virides, partim albi, glabri. *Sepalum* intermedium oblongo-ovatum vel elliptico-ovatum, obtusum, 11–12 mm. longum, 7 mm. latum; sepala lateralalia oblique semi-obovata, apiculata, 12–14 mm. longa, 7–8 mm. lata. *Petala* tribus quartis superioribus bifida, in toto 9–10 mm. longa; lobus posterior lanceolatus, acutus, 6 mm. longus, 2–2.5 mm. latus; lobus anterior curvato-polliciformis, apice rotundatus, 2 mm. longus, 1 mm. latus. *Labellum* trifidum; pars indivisa 2.5–4.5 mm. longa, 2 mm. lata; lobus

intermedius linearis, acutus, 10–12 mm. longus, 1–1.75 mm. latus; lobi laterales intermedio similes, 3–5 mm. longi, 0.5 mm. lati; calcar dependens, medio gracile, apice valde inflatum, 3–4 cm. longum. *Anthera* erecta, 5–6 mm. alta, canalibus leviter incurvatis 8.5 mm. longis. *Brachia* stigmatifera porrecta, apice valde incrassata connata, 9–10 mm. longa; rostellum lobus intermedium elongato-triangularis, 3 mm. longus, basi 1.5 mm. latus. *Ovarium* 2.5–3 cm. longum.

NORTHERN NIGERIA. Ropp, 1380 m., July 1921, *Lely* 451 (type). Vom, Bauchi Plateau, 800–1350 m., *Dent Young*.

It is difficult to say from inspection whether this remarkable species bears in addition radical leaves or not, although the cauline ones certainly seem inadequate. Probably the nearest relative of the species is *H. Holubii* Rchb. f. in which, however, the petal segments are totally different, while the flowers are considerably larger. The almost complete suppression of the anterior petal-lobe, which in sect. *Ceratopetalum* is usually so long and fleshy, is a striking feature of *H. phylacochaera*. The name, which is derived from *φύλαξ*, a guard and *χείρ*, a hand, is given in allusion to the position of the peculiarly shaped petals on each side of the anther.

Habenaria obovata Summerhayes, sp. nov.; *H. epipactideae* Rchb. f. similis, sed foliis pro rata latioribus, floribus bene minoribus, labelli lobis lateralibus intermedio paulo longioribus facile distinguenda.

Herba terrestris 15–30 cm., rarius usque 40 cm., alta. *Folia* 3–4, caulis basin versus exorientia, lanceolata vel oblongo-lanceolata, acuta, basi vaginantia, usque 9 cm. longa et 1.7 cm. lata, superne in bracteas decrescentia. *Racemus* anguste cylindricus, 5–11 cm. longus, usque 2 cm. diametro, subdense pluri- vel multi-florus; bracteae lanceolatae, acuminatae, 7–17 mm. longae. *Flores* adscendentes, virides. *Sepalum* intermedium oblongo-ovatum, subacutum, 5 mm. longum, 2.5–3.5 mm. latum; sepala lateralalia oblique semiovalata, subacuta vel obtusa, acuminata, 5–6 mm. longa, 2.5–3 mm. lata, reflexa. *Petala* oblique obovata, obtusissima, margine anteriore dilatata, distincte venosa, 3.5–5 mm. longa, supra medium 3–4 mm. lata. *Labellum* ex ungue 2.5–3 mm. longo tripartitum; partitio intermedia linearis, 5–6 mm. longa, 0.8–1 mm. lata; partitiones laterales lineares, plus minusve falcatis recurvatae, 5.5–6.5 mm. longae, 0.6–0.8 mm. latae; calcar dependens, apice unilateraliter valde inflatum, 10–13 mm. longum. *Anthera* inclinata, 2.75 mm. longa, canalibus brevibus. *Brachia* stigmatifera apice valde incrassata, 2.5–3 mm. longa. *Ovarium* circiter 1 cm. longum.

CAMEROONS. Cameroons Mountain: upper slopes, 2400 m., *Johnston* 29 (type); 2100–3000 m., very frequent, Dec. 1929, *Maitland* 804; no precise locality, comm. 1896, *Miss Kingsley*.

A remarkable species without any near relative known to me. The obovate very broad petals are also found in *H. epipactidea*

Rchb. f. and its allies, but there is otherwise little in common between the two species. *H. obovata* seems to be confined to the upper slopes of the Cameroons Mountain.

The structure of the column, with its two somewhat diverging arms bearing the anther loculi at each end, is reminiscent of the structure in sect. *Multipartitae* and indeed there is nothing fundamental in the flower at variance with the characters of that section. In this connection it is interesting to note that in *H. rhombocorys* Schltr. the side lobes of the lip are entire, but the structure is otherwise that of sect. *Multipartitae*. *H. obovata* differs so much, however, from the species of the section that it seems scarcely advisable to include it.

Habenaria Walleri Rchb. f. in Otia Bot. Hamburg. 98 (1881). *H. Soyauxii* Kraenzl. in Engl. Jahrb. xvi. 93 (1892).

Examination of the type specimens of the two species leaves no doubt that they are the same. The species is widely distributed in Tropical Africa, occurring from Northern Nigeria through the Cameroons to Uganda and the Sudan in the north and Nyasaland and the Zambesi in the south-east.

Habenaria longirostris Summerhayes, sp. nov.; species valde insignis perianthii segmentis angustis elongatis linearibus vel lanceolatis acuminatis, petalis longiuscule ciliatis, rostellum lobo intermedio elongato truncato apice leviter 3-dentato supra antheram valde eminente, stigmatibus pro rata brevibus distinctissima.

Herba terrestris, usque 60 cm. alta. *Folia* 4-7, 2-3 infima ad vaginas reducta, intermedia lanceolato-ovata usque late ovata, acuta vel subacuminata, basi vaginantia, usque 13 cm. longa et 5 (rarius 7-5) cm. lata, infra inflorescentiam subito descrentia, suprema bracteis similia. *Racemus* cylindricus, subdense vel dense multiflorus, 12-30 cm. longus, circiter 6 cm. diametro; bractae late lanceolatae vel lanceolatae, acuminatae, 1.5-3.5 cm. longae, ovarium pedicellatum aequantes vel superantes. *Flores* adscendentes vel erecto-patentes, magni, petalis et sepalo intermedio albidis exceptis virides, saepe virides. *Sepalum* intermedium lanceolatum, acutum, concavum, 12-18 mm. longum, 2.5-3 mm. latum, trinervium; sepala lateralibus oblique falcatis lanceolata, basi margine antice rotundata dilatata, acuminata, 16-20 mm. longa, 4-5 mm. lata. *Petala* duobus trientibus superioribus biloba, dimidio inferiore cum sepalo intermedio conglutinata, marginibus praesertim superne dense longiuscule ciliata, in toto 13-18 mm. longa, basi 1.25-2 mm. lata; lobi lineares, acuti, posterior 9-12 mm. longus, 0.75 mm. latus, anterior 7-10 mm. longus, posteriore angustior. *Labellum* ex ungue 4-5 mm. longo et 2 mm. lato tripartitum, partitionibus anguste linearibus acutis plus minusve incurvatis, intermedia 17-23 mm. longa, lateralibus 15-18 mm. longis; calcar basi tenue, superne modice ampliatus, subacutum, 15-20 mm. longum. *Anthera* erecta, 2.5-3 mm. alta, canalibus gracilibus leviter incurvatis

2.5-3 mm. longis, staminodiis oblongis brevibus circiter 0.7 mm. longis. *Brachia* stigmatifera crassiuscula, apice incrassata, 3-4 mm. longa; rostellum lobi intermedii basi triangularis, superne anguste oblongum, apice truncatus leviter 3-dentatus, 4-5 mm. longus, antheram valde superans, dense papillatus. *Ovarium* 10-16 mm. longum, saepius curvatum.

NORTHERN NIGERIA. Naraguta, July 1921, *Lely* 462 (type); Vom, Bauchi Plateau, 900-1350 m., *Dent Young*; plains, August 1930, *Lely* P630; no locality, August 1912, *Nelson* 13.

Vernacular name: *Karren daji* (Hausa).

A remarkable species for which I can find no near relative. Especially noteworthy are the densely ciliate petals, the remainder of the flower being completely glabrous.

XXV.—ON THE FLORA OF THE NEARER EAST: XI.* A CONTRIBUTION TO THE FLORA OF ALBANIA. W. B. TURRILL.

The mountainous kingdom of Albania, situated about the centre of the western part of the Balkan Peninsula, with an area of 27,538 sq. km. (The Near East Year Book, 1931-32, p. 9), is still one of the botanically lesser-known areas of south-eastern Europe. In spite of several valuable post-war botanical investigations, much more information is needed concerning the composition of its flora and the distribution of the component species before it is possible to solve many of the interesting phytogeographical problems which puzzle botanists familiar with the Balkan Peninsula. The replacement from north to south of an Alpine by a Greek high-mountain flora is one of the more important of those problems whose solution must be sought in Albania.† It has, therefore, been thought advisable to publish a list of the plants collected in various parts of Albania, especially on the mountains, by Dr. P. L. Giuseppi, during two journeys in 1929 and 1930. The specimens on which the list is based have been presented to the Herbarium by Dr. Giuseppi. In addition he has cultivated in his garden many species which I have been allowed to study alive, and has very generously presented several living specimens to Kew.

A few specimens collected in the neighbouring districts of Yugoslavia (N. Macedonia, etc.) and Epirus are included.

Clematis Viticella L. Between Scodra and Antivari, 200 m., 4.7.1929, No. 15A.

Ranunculus Wettsteinii Dörf. Chafa Jamit, Albanian-Serbian frontier (Kapa Jamit in Serbian), 2460 m., 12.7.1930, No. 66.

Alyssum murale W. et K. ? (material incomplete). Hillsides on way to Mal i Dejs, 155 m., 20.6.1930, No. 12.

Aubrieta sp. Smolika, 2150-2770 m., 2.7.1930, No. 49. Only a very small flowering specimen, unmatched with any species previously

*Continued from K.B. 1931, 455.

†See Turrill, The Plant Life of the Balkan Peninsula (Oxford, 1929), 406-413.

known from the Balkan Peninsula but either *A. olympica* Boiss., Flor. Or.i.251 (1867), or a species closely allied and possibly new.

It seemed probable from the Kew material that *A. olympica* Boiss., as originally described, might be a mixture. Prof. Chodat of Geneva very kindly lent us Boissier's types and our suspicion was confirmed. Boissier's own material has glabrous fruits and nearly glabrous vegetative parts. Specimens now in Herb. Kew., collected "above the plateau, 1862 June," on the Bithynian Olympus by J. Stuart Mill, have been matched with Boissier's material. Clementi's collecting "in rupestribus alpinis Olympi bith." consists of a very different plant with longer, narrower fruits covered with stellate or forked hairs, and all the vegetative parts are also provided with numerous stellate hairs. A plant at Kew, collected by Noé on the Bithynian Olympus, agrees with Clementi's material except that it has relatively long simple hairs, in addition to stellate ones, on the stems and leaf bases. Boissier's own material is taken as the type of *A. olympica* and his original description has to be modified so far as to exclude Clementi's plant; thus the plant should be described as "glabrescens" and the fruits as "oblongis 4-6 lin. longis (excl. stylis) glabris." Boissier's own specimens have no flowers.

Giuseppi's plant is very similar indeed to Mill's and differs only in having a few stellate hairs on the flower stalks, a very few on the ovary, and slightly broader laminae to the petals.

Barbarea bracteosa Guss. Mal i Dejs, 2150 m., 22.6.1930, rocks, No. 24.

Thlaspi praecox Wulf (?). Smolika, 2610 m., 2.7.1930, No. 52.

Viola albanica Hal. Smolika, 2300 m., 2.7.1930, No. 50A.

Viola dukadjinica W. Becker e descr. Chafa Shtetgut, 1940 m., 15.6.1930, alpine meadows, No. 8.

Viola gracilis S. et S. Mal i Dejs, 2150 m., 22.6.1930, alpine meadows, No. 34.

Viola heterophylla Bertol. var. *graeca* W. Becker. Smolika, 2460 m., 2.7.1930, No. 50.

Viola odorata L. Chafa Valbone, 1700 m., 16.6.1930, No. 3.

Viola saxatilis Schmidt subsp. *aetolica* Hayek. Woods on way to Mal i Dejs, 155 m., 20.6.1930, shady glens, No. 16. Not typical, the leaves somewhat broader than usual and the stipules very narrow. The identification is somewhat doubtful.

Dianthus deltoides L. var. *motinensis* Degen e descr. Ljubeten, N. Maced., 2150 m., 8.7.1930, meadows, No. 59.

Dianthus integer Vis. Ljubeten, N. Maced., 2210 m., 8.7.1930, meadows, flowers snow white, No. 62.

Dianthus sylvestris Wulf. subsp. *eusylvestris* Hayek. Near Antivari, 200 m., 4.7.1929, No. 3A; Mali Krag, Scutari, 200 m., 3.7.1929, No. 5A.

Kohlrauschia prolifera Kunth. Near Rijeka, Montenegro, 100 m., 7.6.1929, No. 8A.

Minuartia Baldaccii (Hal.) Mattf. Smolika, 2.7.1930, 2300 m., No. 53.

Silene Armeria L. Hillsides on way to Mal i Dejs, 300 m., 20.6.1930, No. 17. A rather lax form, recalling plants received from Thrace, but evidently coming within the range of fluctuation shown by this species.

Silene quadridentata Pers. subsp. *albanica* Neum. Ljubeten, N. Maced., 2150 m., 2.7.1930, meadows, No. 60.

Linum capitatum Kit. Ljubeten, N. Maced., 2150 m., 8.7.1930, meadows, No. 88.

Linum tenuifolium L. Near Rijeka, Montenegro, 100 m., 4.7.1929, white-flowered, No. 6A.

Geranium bohemicum Torn. On way to Oloman, 1410 m., 23.6.1930, woodland, No. 37.

Rhamnus fallax Boiss. Korab, N. Maced., 1500 m., 29.6.1929, small tree, No. 16A.

Lathyrus grandiflorus S. et S. On way to Chafa Jamit, 1080 m., 12.7.1930, in fields, No. 67.

Geum coccineum S. et S. Ljubeten, N. Maced., 1840-2150 m., 8.7.1930, meadows, No. 61.

Rosa pendulina L. sensu lato (specimen without fruit). Oloman, 1350 m., 23.6.1930, on rocks, about 8-18 inches high, No. 42.

Saxifraga porophylla Bertol. var. *montenegrina* Engl. et Irmsch. Chafa Valbone, 1990 m., 16.6.1930, on alpine rocks, No. 7.

Saxifraga porophylla Bertol. var. *Sibthorpiana* Engl. et Irmsch., forma *thessalica* Engl. et Irmsch. Mal i Dejs, 1990-2090 m., 22.6.1930, on rocks, No. 33.

Saxifraga porophylla Bertol. var. ? Treska Gorge, N. Maced., 370 m., 7.7.1930, cliff sides, No. 87.

Saxifraga taygetea Boiss. et Heldr. Oloman, 1900 m., 23.6.1930, shady rocks, No. 40.

Punica Granatum L. Mati bridge, 100 m., 3.7.1929, No. 14A.

Bunium montanum Koch (?). Mal i Dejs, 2150 m., 6.1930, meadows, No. 28.

Trinia glauca L. Chafa Valbone, 1840 m., 16.6.1930, No. 1.

Putoria calabrica Pers. Near Struga, N. Maced., 280 m., 1.7.1929, No. 19A.

Valeriana montana L. Mal i Dejs, 2030 m., 22.6.1930, rocks, No. 26.

Achillea Aizoon Griseb. Mali Hat, N. Maced., 450 m., 26.6.1929, No. 10A.

Leontodon asper Poir. Hillsides on way to Mal i Dejs, 308 m., 20.6.1930, No. 14.

Scolymus hispanicus L. Roadsides through Albania, 3.7.1929, No. 4A.

Scorzonera austriaca Willd., dwarf form. Smolika, 2600 m., 2.7.1930, No. 54.

Senecio abrotanifolius L. On an unnamed mountain one mile south of Chafa Jamit, 2460 m., 12.7.1930, fields, No. 69.

Taraxacum laevigatum DC. Chafa Valbone, 16.6.1930, 1550 m., No. 3A.

Xeranthemum annuum L. Roadside, Babuna Pass, N. Maced., 770 m., 19.6.1929, No. 12; gorge of Struma, N. Maced., 400 m., 1.7.1929, No. 18A.

Asyneuma limonifolium Janch. Mali Hat, N. Maced., 1450 m., 26.6.1929, No. 9A; road below Oloman, 920 m., 24.6.1930, wet meadows, No. 44.

Campanula Hawkinsiana Hausskn. et Heldr. Smolika, 2150 m., 3.7.1930, No. 47.

Campanula hemschinica C. Koch (?). Ljubeten, N. Maced., 1230 m., 8.7.1930, meadows, No. 63.

Hedraeanthus graminifolius DC. Krstac, Yugoslavia, 2370 m., 16.7.1930, limestone screes, No. 70.

Hedraeanthus tenuifolius DC. Ljubeten, N. Maced., 2150 m., 8.7.1930, meadows, No. 64; near Rijeka, Montenegro, 100 m., 4.7.1929, No. 7A; Ljubeten, 2150 m., 8.7.1930, meadows, No. 64 (a depauperated form).

Pyrola chlorantha Sw. Smolika, 1840 m., 2.7.1930, in woods, No. 55.

Androsace hedraeantha Griseb. Chafa Jamit, 2460 m., 12.7.1930, screes, No. 48; Korab, N. Maced., 2300 m., 11.7.1930, screes, No. 65.

Molikia petraea Griseb. Roadside between Oloman and Chafa Moreze, 1080 m., 24.6.1930, on rocks, No. 43.

Linaria peloponnesiaca Boiss. et Heldr. Road below Oloman, 920 m., 24.6.1930, wet meadows, No. 45.

Pedicularis brachyodonta Schloss. et Vuk., subsp. *Grisebachii* (Wettst.) Hayek. Mal i Dejs, 1990 m., 22.6.1930, meadows, No. 35.

Veronica austriaca L., subsp. *Jacquinii* Maly. Chafa Valbone, 1550 m., 16.6.1930, No. 5.

Veronica saturejoides Vis. Mal i Dejs, 2150 m., 22.6.1930, alpine rocks, No. 37.

Wulfenia Baldaccii Degen. Chafa Stogut, 1940 m., 15.6.1930, alpine rocks, No. 9; Chafa Shtetgut, 1470-1700 m., 17.6.1930, alpine rocks, No. 10. See also Nos. 76, 76A (*Kew Bull.* 1930, p. 124).

Pinguicula hirtiflora Ten. Near Elbasan, 123 m., 1.7.1929, No. 20A. Pale blue flower with white centre.

Ramondia Nathaliae Panč. et Petrov. Treska Gorge, N. Maced., 370 m., 7.7.1930, cliffs.

Ramondia serbica Panč. Near Dibra, N. Maced., 215 m., 29.6.1929, No. 21A.

Globularia cordifolia L. Chafa Valbone, 2000 m., 16.6.1930, No. 6.

Lamium garganicum L. var. *glabratum* Briq. Mal i Dejs, 1840 m., 22.6.1930, meadows, No. 27.

Salvia ringens S. et S. Intermediate between the varieties *macedonica* and *Baldacciana* Briq. (in Ann. du Cons. et du Jard.

Bot. Genève ii. 123-4, 1898). These, together with the var. *olympica*, are doubtfully distinct even as varieties. Hillsides on way to Mal i Dejs, 308 m., 20.6.1930, No. 15.

Sideritis Roeseri Boiss. et Heldr. Mali Hat, N. Maced., 1450 m., 26.6.1929, No. 11A.

Stachys germanica L. Road below Oloman, 1230 m., 24.6.1930, wet meadows, No. 46.

Stachys scardica Griseb. Hillsides on way to Mal i Dejs, 308 m., 20.6.1930, No. 13.

Teucrium Polium L. Albania, 200 m., 3.7.1929, common by roadside, No. 17A.

Daphne oleoides Schreb. var. *glandulosa* (Bert.) Keissl. Oloman, 1940 m., 23.6.1930, alpine meadows, No. 38; Mali Hat, N. Maced., 1600 m., 22.6.1930, No. 2A. Small bush 1½-2 ft. high with sweet-smelling white flowers.

Himantoglossum hircinum Spreng. On road to Chafa Dejs, 150 m., 20.6.1930, No. 11.

Orchis sambucina L. Mal i Dejs, 1990 m., 22.6.1930, purple flowers, No. 30.

Crocus veluchensis Herb. Mal i Dejs, 2150 m., 22.6.1930, No. 29.

Narcissus radiiflorus Salisb. Mal i Dejs, 2150 m., 22.6.1930, rocks and meadows, large white flowers, No. 25.

Narcissus tubulosus Baldacci, e descr. Smolika, 2400 m., 2.7.1930, rocky slopes, tepals white with yellow-orange corona, No. 71.

Erythronium Dens-canis L. Oloman, 1970 m., 23.6.1930, No. 41.

Fritillaria macedonica Bornm. e descr. Mal i Dejs, 2610 m. (summit) and down to 1990 m., 22.6.1930, No. 32.

Fritillaria neglecta Parl. Chafa Valbone, 1990 m., 16.6.1930, No. 2.

Lilium carniolicum Bernh. var. *albanicum* (Griseb). Mal i Dejs, 1840-2150 m., 22.6.1930, meadows and rocks, flowers brown (?), No. 36; Smolika, 2150 m., 5.7.1930, flowers yellow, No. 48; Korab, N. Maced., 1600 m., 29.6.1929, No. 13A (probably this variety).

Lilium Martagon L. var. *cattaniae* Vis. Near Dibra, N. Maced., 730 m., 29.6.1929, No. 12A. Very dull purple colour.

Tulipa australis Link. Smolika, 2300 m., 5.7.1930, No. 51.

Scilla albanica Turrill, sp. nov.; a *S. messeniaca* Boiss. bulbis elongatis, floribus minoribus, ovario late obpyramidato differt.

Bulbi elongati, 3.5 cm. longi, 1.1 cm. diametro, tunicis pallide brunneis. *Folia* 3, synanthia, linearia, plana, apice breviter subabrupte acutata, basi longe attenuata, 10 cm. longa, 4-8 mm. lata, glabra, nervis 13-19. *Scapus* gracilis, glaber, 10.5 cm. longus, racemo ovoideo 12-floro, pedicellis erecto-patulis 3-5 mm. longis, bracteis minutissime deltoideis 0.5 mm. longis. *Perigonii phylla* subpatentia, oblongo-elliptica, apice subobtusata et papillosa, 5 mm. longa, 1.5-2 mm. lata, caeruleo-violacea (?). *Filamenta* 3 mm. longa, apicem versus attenuata, basi vix dilatata, caeruleo-violacea;

antherae atro-violaceae, 1.5 mm. longae. *Ovarium* late trigono-obpyramidatum, 1.75 mm. longum, 1.75 mm. diametro; stylus 2.5 mm. longus.

ALBANIA. Oloman, 1900 m., 23.6.1930, on rocks, *P. L. Giuseppi* 39.

The species, *S. messeniaca* Boiss., with which *S. albanica* has been contrasted, is known only from the Peloponnese (Messenia, Laconia, and Arcadia). The more widely spread *S. bifolia* L. [with its varieties *nivalis* (Boiss.) Baker, and *polyphylla* Boiss.] is the only other species calling for immediate comment. *S. albanica* differs from *S. bifolia* in the shape of the bulb, the larger number of smaller flowers, the shorter pedicels, and the reduced number of ovules.

It should be remarked that two ovaries were dissected in drawing up the description. In one a single ovule was found, in the other no trace of ovules could be discovered.

XXVI.—PLANTS NEW TO ASSAM: IV.* C. E. C. FISCHER.

***Impatiens puberula* DC.** [Geraniaceae].

Known from Sikkim and Nepal.

S. Lushai, near Lungleh, 4000 ft., flowers cream and pink, Nov., *W. J. L. Wenger* 388. "Found only in one damp, shaded spot." The colour of the corolla diverges from that of the type.

***Acer Forrestii* Diels** [Aceraceae].

Known from Yunnan.

Delei Valley, 10,000 ft., fruit Sept., *Kingdon Ward* 8648. "A small (?) tree of the rain-forest in dense thickets on N. slope."

***Acer Wardii* W. W. Smith** [Aceraceae].

Previously from Upper Burma.

Delei Valley, 8000–9000 ft., flowers May, *Kingdon Ward* 8138. "A medium-sized tree of the Rhododendron-Tsuga forest. Deciduous; young foliage copper-red; buds red."

***Desmodium oblongum* Wall.** [Papilionaceae].

Reported from Burma.

S. Lushai Hills, 5000–6000 ft., flowers dark-blue, and fruit Dec., *W. J. L. Wenger* 361. "Whole plant very light and fairy-like. In open forest on edges of cliffs." Naga Hills at Shibong, 3000 ft., *A. Meebold* 6181.

***Pueraria yunnanensis* Franch.** [Papilionaceae].

Described from Yunnan.

Lohit Valley, 3000–5000 ft., flowers Oct., *Kingdon Ward* 8720. "A climber in thickets and clearings along the edge of the jungle. Flowers white, tipped with violet."

***Sonerila khasiana* C. B. Clarke** [Melastomaceae].

When describing this species in 1879, C. B. Clarke had four collections comprising a number of plants of uniform character

*Continued from *K.B.* 1931, 285.

before him. His description, therefore, was limited in scope. Further material from another locality, and departing somewhat from the type, being now available, an amplified description based on all the material will be useful, in view of the rather meagre account given by C. B. Clarke. One point calls for special remark. The original description states that the plant is stemless, but even among those specimens collected by Hooker and Thomson there are several with a distinct stem up to 1 inch long.

***Sonerila khasiana* C. B. Clarke** in *Fl. Brit. Ind.* ii. 539; amplified description by *C. E. C. Fischer*.

Small herb. Roots fibrous. Stem usually solitary, succulent or wiry, slender, from very short to 3.5 cm. long, puberulous. Leaves fascicled at the apex of the stem and mixed with rufous bristles up to 8 mm. long, with sometimes one or two additional leaves and a tuft of bristles near the base and a puberulous but otherwise naked section between; blade ovate, usually acute, base cordate, 1.6–4.4 cm. long, 1–2.7 cm. wide, palmately 5-nerved, with 2 more nerves arising a little higher and curving into the apex, all slightly prominent below, upper surface with scattered bristly hairs, lower rather more hairy, especially on the nerves, margins ciliate, more or less crenate-serrate; petioles slender, 1.5–5.5 cm. long, glabrous or more or less crisped-rufous-hairy, often purplish. Peduncle terminal, slender, 1.5–7 cm. long, glabrous. Flowers 1–7 in an umbel with 1–3 minute linear-ensiform bracteoles at the base. Pedicels 1–1.4 cm. long, glabrous. Calyx narrowly turbinate, more or less trigonous, glabrous or with a very few spreading bristles, 4–5 mm. long, teeth small, triangular, acute. Petals broadly ovate, acute, 8 mm. long, mauve. Stamens equalling the petals, filaments slender, as long as the attenuate yellow anthers. Capsule narrowly oblong, 6–7 mm. long. Seeds minute, oblong, minutely papillose.

Khasia Hills: Mamloo and Kalapani, 4000–5000 ft., *J. D. Hooker and T. Thomson*; Boga Pani Bridge, 3000 ft., flowers Sept., *C. B. Clarke* 40,340; Vale of Rocks, 5000 ft., fruit Sept., *C. B. Clarke* 45,454. Jaintea Hills at Jarain, 4000 ft., fruit Nov., *C. B. Clarke* 18,329. S. Lushai Hills, 4000 ft., flowers and fruit Sept., *W. J. L. Wenger* 345.

***Sonerila tenera* Royle** [Melastomaceae].

From subtropical Western Himalayas and Chota Nagpur.

S. Lushai, Blue Mountain, 3000–4000 ft., flowers pale-pink, Nov., *W. J. L. Wenger* 395. "In thin grass at edges of dry hill-rice fields."

***Sonerila villosa* C. E. C. Fischer**, sp. nov. [Melastomaceae]. *S. khasianae* C. B. Clarke peraffinis, caulibus petiolis pedunculis pedicellis albo-villosis, floribus minoribus.

Small herb. Roots fibrous; rhizome creeping. Stem slender, very brittle, solitary, stems 2–3 fascicled, up to 3 cm. long, deep-crimson, more or less white-villous. Leaves few to many, aggregated at the apex of the stem, mixed with tufts of rufous bristles; blade

broadly ovate to orbicular, apex rounded or narrowed and obtuse or subacute, base shallowly cordate, 1-3 cm. long, 0.5-1.8 cm. wide, palmately 5-nerved, with 2 more nerves arising a little higher and curving into the apex, upper surface with scattered crisped hairs from bulbous bases, lower more softly hairy, more densely so on the nerves, margins minutely crenate-serrate; petioles slender, 1-4 cm. long, more or less white-villous. *Peduncles* 1-2, terminal, slender, up to 5 cm. long, more or less white-villous. *Flowers* solitary, or 2-3 in an unbel. *Pedicels* 4-6 mm. long, with a few white hairs. *Bracts* 1-3 at the base of the pedicels, minute. *Calyx* narrowly turbinate, 3-4 mm. long, more or less spreadingly white-villous, teeth small, triangular, acute. *Petals* elliptic or elliptic-obovate, acute or cuspidate, 5-6 mm. long, mauve. *Stamens* slightly exceeding the petals, anthers attenuate, deep-yellow, 3-4 mm. long. *Capsule* campanulate, smooth, truncate, 4-6 mm. long.

S. Lushai Hills, from Lungleh to 70 miles South, 2500-4000 ft. flowers and fruit (seeds escaped) July-Aug., *W. J. L. Wenger* 323 (typus in Herb. Kew.). "Growing on wet rocks in deep shade, often clinging to the underside of overhanging rocks."

Begonia Wengeri C. E. C. Fischer, sp. nov. [Begoniaceae]; *B. alaecidae* C. B. Clarke affinis, foliis minoribus supra haud puberulopunctatis subtus crispule pilosis, bracteis majoribus distincta.

Erect herb. *Rootstock* small, fibrous. *Stem* terete, wiry, sometimes rooting at the lower nodes, more or less densely clothed with crisped, fuscous or rufous hairs, 5-10 cm. high, usually forked near the base. *Leaves* membranous, rotund-ovate, inequilateral, acute, base shallowly cordate, 1.5-5.5 cm. diam., dark-green and sparsely hairy above, pale below and crisped-rufous-hairy on the nerves, especially near the base, 7-8-nerved, margins simply or doubly crenate with cilia between the crenatures and sometimes at their apices; petioles slender, 0.6-5 cm. long, crisped-fuscous- or rufous-hairy. *Stipules* ensiform, acuminate, sometimes toothed. *Peduncle*, its branches and pedicels densely hairy with crisped, multicellular, rufous hairs, often bearing reduced, petiolate leaves at the forks; bracts foliaceous, ovate to orbicular in outline, more or less deeply and sharply toothed or lobed, ciliate, up to 4 mm. long; pedicels capillary, up to 8 mm. long, lengthening in fruit. ♂ *flowers* with a perianth of 4 white segments, the 2 outer broadly obovate, obtuse, 3 mm. long, the 2 inner smaller, subacute. *Stamens* about 12, united below for 0.6-0.7 mm., filaments short, anthers oblong, 0.6-0.7 mm. long, connective shortly produced, conical. ♀ *flowers* with a perianth of 5 white, elliptic-oblong, obtuse segments, 2.5-3.5 mm. long, the innermost smallest. *Ovary* trigonous, 3.5 mm. long, puberulous on the angles; styles 4, shortly united at the base, minutely fuscous-puberulous; stigmas densely fuscous-hairy. *Capsule* 3-winged, 1 cm. long, 1.2 cm. across the wings at the truncate apex, its faces with a vertical median rib, green, glabrous or the margins of the wings with a few short hairs, one wing wider than the

other two, outer angles obtuse, faces splitting along the edge or the midrib. *Seeds* minute, oblong-ellipsoid, brown.

S. Lushai Hills, about 60 miles South of Lungleh, 1500-2000 ft., flowers and fruit Aug., *W. J. L. Wenger* 324 (typus in Herb. Kew.). "In dense patches on shady banks."

Lactuca macrorhiza Hook. f. [Compositae].

Known from the Himalayas from Kashmir to Sikkim.

S. Lushai, Blue Mountain, 6500 ft., flowers clear pale-blue, Dec., *W. J. L. Wenger* 378. "Forming beautiful patches in crevices of rocks near the summit; the persisting decaying leaves give the plant an untidy appearance."

Embelia Clarkei Bedd. [Myrsinaceae].

Found previously in Tenasserim.

Delei Valley, Chibaon, 5000-6000 ft., flowers April, *Kingdon Ward* 8035. "A climber of the temperate rain-forest (twiner); flowers green."

Embelia myrtiflora Hemsl. et Mez [Myrsinaceae].

Known from China.

Delei Valley, 3000-4000 ft., fruit April, *Kingdon Ward* 8122. "A scrambling plant, sometimes ascending big trees and hanging down in flat, wave-like expansions. In thickets in open forest on steep slopes and banks."

Swertia nervosa Wall. [Gentianaceae].

Described from temperate Nepal and Sikkim.

S. Lushai, Darjow Mountain, 5000 ft., *W. J. L. Wenger* 364. "In grassy glades in forest on summit."

Swertia paniculata Wall. [Gentianaceae].

Known from the Himalayas from Kashmir to Nepal.

S. Lushai, Blue Mountain, 6000 ft., flowers blue, Dec., *W. J. L. Wenger* 362. "In grassy glades in forest."

Lepidagathis hyalina Nees, var. *aristata* C. E. C. Fischer, var. nov. [Acanthaceae]; var. *semiherbaceae* C. B. Clarke similis sed foliis minoribus, bracteis bracteolisque aristatis.

Stems wiry, up to 25 cm. long. *Leaves* linear to narrowly elliptic, 1.6-5.5 cm. long, 0.3-1.2 cm. wide, glabrous, shining, dark-green above, pale below, narrowed at both ends, apex obtuse or acute, base decurrent into the short petiole, midrib and 7-9 pairs of lateral nerves prominent below, the latter uniting close to the slightly undulate margin. *Spikes* dense, up to 2.5 cm. long. *Bracts* and *bracteoles* aristate, brown or green, about 1 cm. long. *Corolla* white, spotted with brown.

Garro Hills: Siju, 2000 ft., flowers Nov., *Mrs. N. E. Parry* 1044 (typus in Herb. Kew.); Baghmara, 500 ft., *Mrs. N. E. Parry* 1046. Garo name: *Byiradimat Mengo Kime* (=plant resembling wild-cat fur).

Strobilanthes trichophorus C. E. C. Fischer, sp. nov. [Acanthaceae]; ex affinitate *S. monadelphii* Nees foliis brevissime petiolatis basi rotundatis vel leviter cordatis, inflorescentiae pilis longis albis, bracteis spathulato-obovatis recedit.

Undershrub. Stems woody, slender, erect, 15-35 cm. long, terete below, quadrangular upwards, sharply so and almost winged near the apex, hairy with long white spreading hairs above. *Leaves* membranous, elliptic-lanceolate, acute, base rounded or slightly cordate, 6-8 cm. long, 2-3 cm. wide, becoming smaller near the inflorescence, midrib and 5-9 pairs of lateral nerves slightly raised on both faces, pellucid-dotted, upper surface with numerous punctiform and shortly linear cystoliths, white-hairy and dark-green above, more sparsely hairy and pale below, margins undulate-crenate; petioles less than 2 mm. long. *Spikes* axillary, simple or with a short branch near the base, interrupted, up to 13 cm. long; rhachis sharply quadrangular, pubescent and beset with long, spreading, soft, white, septate hairs. *Bracts* in opposite pairs 5-6 mm. apart, spathulate-obovate, subacute, thick, green, 1.3 cm. long, 0.8 cm. wide, 5-ribbed, densely hairy on both faces with mixed short and long hairs, many of them gland-tipped, and with longer soft, white hairs. *Flowers* solitary in each bract. *Calyx* sessile, 1.1 cm. long, tube very short; segments 5, lorate, obtuse, green and with the same indumentum in the apical half as the bracts, brownish and glabrous below. *Corolla* ventricose with a very short narrowly cylindrical base, 1.6 cm. long, blue, sparsely hairy with gland-tipped hairs without, glabrous within except for a brush of white hairs behind the anthers and a few hairs at the insertion of the stamens. *Disc* annular. *Stamens* 4, in pairs. *Style* slender, as long as the corolla, apex recurved, undivided. *Ovary* oblong, glabrous; ovule 4. *Fruit* not seen.

Garro Hills, Emangiri, 2000 ft., flowers Nov., Mrs. N. E. Parry 1076 (typus in Herb. Kew.). Garro name: *Samboda*.

Strobilanthes glutinosus Nees (Acanthaceae).

From the Himalayas as far east as Nepal.

S. Lushai Hills, spur of Blue Mountain, 4000 ft., flowers Dec., W. J. L. Wenger 401. "In open grassy spaces."

Elsholtzia communis (Coll. et Hemsl.) Diels [Labiateae].

Found in W. China.

Lushai Hills, Tawipui, 2000 ft., flowers Jan., Mrs. N. E. Parry 462. "Flowers dull mauve." Lushai name: *Lengmasher*.

Dalechampia Kurzii Hook. f. [Euphorbiaceae].

Known from Burma.

S. Lushai Hills, 69 miles S. of Lungleh, 2500 ft., flowers Aug., W. J. L. Wenger 327. "Bracts palest green. Apparently rare, as it is unknown to the local people."

Rhynchanthus longiflorus Hook. f. [Zingiberaceae].

Originally from Burma.

S. Lushai Hills, 4000 ft., flowers deep-red, Sept., W. J. L. Wenger 353. "Stem 4 ft. high. Growing in crevices and forks of trees."

This plant was figured and described in 1886 in Bot. Mag. t. 6861 as the type of a new genus. It had been obtained from Burma by the nurserymen Messrs. Low, who presented it to Kew, where it flowered in a hot-house. Unfortunately the precise locality in Burma was not recorded. Since this first discovery the plant apparently had not been found again till now.

Polytoca Wallichiana Benth [Gramineae].

Reported from Burma.

S. Lushai Hills, 3000 ft., W. J. L. Wenger 354. "In open forest."

XXVII.—MISCELLANEOUS NOTES.

MISS MARIANNE HARRIET MASON.—We record with deep regret the death at her home at Rondebosch, Cape Town, on April 7th, of Miss M. H. Mason, whose African flower and landscape studies, which she presented to the Nation, are exhibited in Museum No. 4.

Miss Mason was an old and valued correspondent of Kew, her earliest communication being with Sir William Thiselton-Dyer when she sent a collection of dried North African flowers for the Herbarium. It was after her retirement from Government service in 1910 that her interest in the South African flora commenced, for shortly afterwards she went out to stay with her brother, Canon Edward Mason, Principal of St. Bede's College, Umtata, where she quickly set to work collecting seeds and specimens of the flora of the region, and making water-colour studies of the native vegetation. She did not confine her attention to the Umtata region alone, but travelled widely in the Cape peninsula, Pondoland, Rhodesia, Uganda and elsewhere, making sketches of the scenery and detailed studies of the plants wherever she went. A large number of her letters, preserved here, refer to consignments of seeds and bulbs which she sent to Kew. She was especially interested in the genus *Oxalis*, of which she sent many living specimens and she was also of great assistance in sending *Chironias* when the *Gentianaceae* were being studied for the Flora Capensis.

During one of her visits to England she brought over her large collection of plant studies and sketches, which were exhibited on several occasions in London, and suggested that they should be placed on exhibition at Kew. Though there was no very suitable place for the proper housing of her large series of drawings, arrangements were made for their display on the first floor of Museum No. 4 (Cambridge Cottage). A selection was made from the large number which she brought to Kew and these are now on exhibition in the Museum. Eventually Miss Mason most generously presented the whole of her collection of drawings to Kew as a gift to the Nation.

The larger pictures and some of the smaller plant studies are on exhibition in the Museum, but the majority of the smaller pictures are preserved in the Herbarium and Library. Her gift included one hundred and ten large pictures and five books of small plant studies, some of which are exhibited from time to time. Among the large pictures there are several paintings of the neighbourhood of Umtata, scenes in the Transkei and in the garden of St. Bede's College, all of which give a very vivid impression of the South African landscape. Her flower studies are particularly clear and convincing, some of the most striking being those of the Aloes, *Gladioli* and *Ixias*. In all her work she gave a very faithful impression of the plant she was drawing. Though she was in no sense a professional botanist and though her drawings may lack accuracy of detail, yet they represent in a remarkably effective way the plant she was studying, and probably give a better impression of the flowers than careful botanical drawings would have done; clean and vivid in their colouring they form a most interesting series of plant studies. She presented her last picture, painted when she was eighty-six years old, on her visit to England last autumn. This picture, now hanging in the Museum, shows seven species of *Protea* in flower, which were growing in the National Botanic Garden, Kirstenbosch, in July 1931. The species were sent to her on board ship at Cape Town and she painted them during her last voyage home.

Miss Mason was as keenly interested in gardening as she was in painting and her letters to Kew were always concerned with plants of both horticultural and botanical interest. Her energy and enthusiasm in many different directions were unbounded. Fearless and untiring, she pursued her numerous activities with her usual vigour, despite her advanced years, until the end of her useful life.

Miss Mason was born in February 1845 at Morton Hall, Nottinghamshire, and here she carried on her gardening activities and constructed a rock garden in the days when rock gardens were a novelty.

Outside botanical circles her name will live for the wide interest she took in social problems and for her work as first official Woman Inspector of boarded-out children. She will be remembered as the Doyenne of all the Women Inspectors in the Civil Service and the Children's Friend.

HARVEY MONROE HALL. The death of Dr. H. M. Hall in his fifty-eighth year will be widely regretted both on personal and scientific grounds. Dr. Hall graduated in the University of California in 1901 and became Assistant Botanist at the Experimental Station (1902-3), and eventually Professor at the University of California. At the time of his death he had been for some years on the staff of the Carnegie Laboratory, Stanford University. His earlier published work consisted largely of taxonomic studies on Californian plants. "A Yosemite Flora" (1912), written jointly with Mrs. Hall, was regarded by his fellow workers as a model of a

popular flora. His "Phylogenetic Method in Taxonomy," written in collaboration with F. E. Clements, employed statistical methods in the discrimination of subspecies and included phylogenetic charts indicating the author's views as to their inter-relationships. Hall's most important work was a monograph of "The genus *Haplopappus*" (1928), which is well illustrated and includes discussions of the relationships and ecology of each species.

Hall was a firm believer in international co-operation and interested himself greatly in type material preserved in the various herbaria of Europe. At the International Botanical Congress held at Cambridge in 1930 he provided a paper entitled "Proposals for an International Bureau of Plant Taxonomy."

In connection with his Transplant experiments Hall came into close touch with Kew, and it was as a result of a study of his work and methods, when the Director was lecturing at the University of California in 1926, that the Kew-Potterne Transplant experiments were initiated in collaboration with the British Ecological Society, and Hall was keenly interested in the English work. His own experiments, undertaken at first in association with F. E. Clements, were concerned with the transplanting of identical plants at different altitudes in several localities in Western California. Outline accounts of the methods employed and of some of the results obtained are given in the Carnegie Institution Year Books from No. 17 (1918) onwards.

Hall was always a welcome visitor and his untimely death in the prime of an active life is a great loss to botany and Kew is deprived of a valued friend and stimulating colleague.

The Cultivation of Geraniums for Essential Oil.—Owing to the interest at present taken in some of the Colonies in the cultivation of pelargoniums (geraniums) for essential oil, the following notes have been prepared from an article by A. Rolet which appeared in "L'Éclairer Agricole et Horticole" of November 1st, 1931.

Geraniums grown for perfumery should be propagated by cuttings in nursery beds. The practice of planting cuttings directly into the fields, such as is observed in Algeria and Italy, is not to be recommended, as the unrooted cuttings have little chance of surviving a period of drought. Cuttings may be made from August to October, the time depending on the climate, region and material available.

If protection, such as straw matting or frames, can be afforded they may be put in until February.

Healthy, well ripened shoots should be selected, for these ultimately give the greatest yield of leaves and essential oil. As it is difficult to get cuttings with a "heel" from young plants, ordinary cuttings, about 6 ins. long and $\frac{1}{4}$ in. across the base are used. The secondary branches and all the leaves except three below the terminal bud are removed and the base of the stem cut off a little

If cultivation lasts for many years, fertilizers which decompose slowly and potassic manures should be applied in autumn. The stems, and especially the new growths, should be earthed up, and in spring, when growth commences, the ground may be hoed and dressed with quickly assimilated manures, such as sulphate of ammonia and nitrates.

J. H. T.

The Coconut.*—Previous editions of this work were reviewed in the Kew Bulletin (*K.B.* 1921, 288 and *K.B.* 1914, 396). The book is based largely on the investigations carried out in the Philippines by the author and his colleagues and applies specially to the cultivation of the coconut in those islands. The expansion of the Philippine coconut industry, since the first edition was published in 1914, bears ample testimony to the value of the work on which this book is based.

The present edition has been revised, more especially the chapter devoted to diseases and pests. Literature connected with recent research on the coconut palm is freely quoted, in particular that which has been done in Malaya, Ceylon and the Philippines since the last edition was published.

In this edition, both in the title and the text, the author has adopted the more generally used method of writing the word coconut.

Flora of Tropical Africa.—In ascertaining the priority of publication of new names it is essential to know the exact dates of publication of books and journals. For this reason the dates of publication of the parts of Volume IX of the Flora of Tropical Africa are recorded below:—

Part 1. July 1st, 1917.

„ 2. January 29th, 1919.

„ 3. June 24th, 1919.

„ 4. August 5th, 1920.

„ 5. August 12th, 1930.

**The Coconut*, by Edwin Bingham Copeland. Third Edition, revised pp. xviii + 233, with 28 illustrations. Macmillan & Co., Ltd., St. Martins Street, London, 1931. Price £1.

BULLETIN OF MISCELLANEOUS INFORMATION No. 5 1932 ROYAL BOTANIC GARDENS, KEW

XXVIII.—CONTRIBUTIONS TO THE FLORA OF TROPICAL AMERICA: XII.* N. Y. SANDWITH.

NEW AND NOTEWORTHY SPECIES FROM BRITISH GUIANA, MAINLY
COLLECTED BY THE OXFORD UNIVERSITY EXPEDITION, 1929
(CONTINUED).

BURSERACEAE.

Tetragastris phanerosepala Sandwith, sp. nov.; *T. balsamiferae* (Sw.) Kze. affinis, bracteolis multo majoribus, calyce majore extra puberulo vel subtomentello, lobis perconspicuis, antheris extrorse distincte puberulis nec glabris, ovario et stylo distincto manifeste longiuscule piloso nec glabro differt.

Arbor ramulis summis minute pubescentibus. *Folia* imparipinnata, maxima, usque circiter 45 cm. longa, omnino glabra, petiolo rhachique purpurascente striato angulato 1.5–2.5 mm. lato; petiolus 8–10 cm. longus; internodia rhacheos 4–6 cm. longa, internodium terminale 2.5–3 cm. longum; petioluli canaliculati, 3–5 mm. longi; foliola 4–5-juga, opposita, oblonga, ima nonnunquam ovato-oblonga, terminale nonnunquam obovato-oblongum, apice conspicue abrupte acuminata vel cuspidata, basi cuneata acuta obliqua in petiolulum decurrentia, 8–15.5 cm. longa, 3–5.3 cm. lata, firme chartacea, utrinque nitidula, nervis primariis utroque costae latere 12–16 forma atque reticulatione eis *T. balsamiferae* simillima. *Inflorescentia* paniculata, furfuraceo-puberula, usque 14 cm. longa; rami primarii inferiores 2–4 cm. longi, compositi, summi brevissimi, triflori; pedicelli brevissimi, tomentelli, 1–2 mm. longi; bracteolae late ovatae, 2.5 mm. longae, 2.2–2.5 mm. latae, extra tomentellae, intus puberulae. *Flores* maturi fere 5 mm. longi. *Calyx* cupularis, extra furfuraceo-puberulus vel subtomentellus, intus glaber; tubus vix 2 mm. longus, apice 4.5 mm. latus; lobi conspicui, late triangulares, 1–1.5 mm. longi, 2–2.75 mm. lati. *Corolla* campanulato-cylindrica, vix 4.5 mm. longa, apice 4 mm. lata, circiter in medio in 4–5 lobos 2 mm. longos vix 2 mm. latos divisa, lobis marginibus apiculoque inflexis, extra tomentella intus basi excepta puberula atque minute cinereo-pulverulenta. *Stamina* 8–10, filamentis glabris 0.4–0.6 mm. longis; antherae 1.2 mm. longae, extrorse minute sed distincte puberulae. *Discus* glaber, 1 mm. altus, margine undulato-sinuato. *Ovarium* quinqueloculare, subglobosum, vix

*Continued from *K.B.* 1932, 187.

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2 mm. longum, circiter 2 mm. diametro, sparse longiuscule pilosum, 1 stylum pilosum cum stigmate 5-lobulato ad 1 mm. longum ransiens. *Fructus* non visus.

BRITISH GUIANA. Demerara River, May 1889, *Jenman* 4928.

This very distinct species was identified long ago as "*Hedwigia* p. nov.?" by the late Mr. W. B. Hemsley.

ANACARDIACEAE.

Thyrsodium dasytrichum *Sandwith*, sp. nov.; *T. Schomburgkiano* (Bth.) Engl. et *T. giganteo* (Engl.) Engl. affinis, foliis utrinque pilis longioribus (fere 1 mm. longis) crispulis ubique praecipue subtus dense molliter vestitis, praeterea floribus femineis quam eis *T. Schomburgkiani* majoribus, laciniis calycinis petalisque longioribus differt.

Arbor parva usque mediocris, lactescens; ramuli hornotini teretes, validi, 6-8 mm. diametro, dense fulvo-tomentosi. *Folia* imparipinnata, gigantea, petiolo internodiis rhacheos petiolulisque dense crispule fulvo-tomentosis; petiolus 9-12 cm. longus, 3-4 mm. diametro; internodia rhacheos 4-8 cm. longa; petioluli 3-7 mm. longi; foliola 2-4-jugata, opposita, vel fere opposita, ima ovato-oblonga, cetera oblonga, apice abrupte conspicue cuspidata, basi rotundata obtusa obliqua, 12-22 cm. longa, 6-9 cm. lata, subcoriacea, supra pilis pallide fulvis crispulis satis longis costa nervisque dense mesophyllo sparsius sed regulariter adpresse induta, subtus pilis similibus densis passim mollia velutina, nervis primariis utrinque conspicuis utroque costae latere circiter 14-20, reticulatione supra impressa obscura subtus manifesta. *Inflorescentia feminea* tantum visa; panicula longissima, usque 45 cm. longa, ubique pilis pullo-purpurascensibus demum fulvis dense sublanato-tomentosa; rhachis valida, prope medium 5-7 mm. diametro; rami primarii satis pauci, descendentes, inferiores 7-12.5 cm. longi, compressi, angulato-obscure laticati, parte nuda saepius 3-5 cm. longa; ramuli floriferi 1.5-2.5 cm. longi, simplices, vel basi compositi, congestiflori; pedicelli 2-3 mm. longi; bracteae lanceolatae, circiter 3 mm. longae, 1 mm. latae (bracteae longiores latioresque). *Flores* campanulati, 7 mm. longi, 1 mm. diam. apice 5-6 mm. lati. *Calycis* tubus 2.5 mm. longus, triangularis, extra dense purpureo-tomentosus, intus glaber; lobi basi 1.8-2.2 mm. lanceolati, acuti, 3.5 mm. longi, igitur tubum superantes, oblonga, obtusi, 4 mm. lati, utrinque tomentosi. *Petala* anguste lanceolata, utrinque tomentosa, 4 mm. longa, igitur calycem superantia, 1.5 mm. circiter 1.1 mm. diam. calyce pallidiora. *Staminodia* filamentis brevibus, 0.5 mm. longis, antheris rudimentariis 0.5 mm. longis. *Stylus* ferrugineo-villosus, globosus, 2 mm. longus, 2.5-3 mm. diam. *Fructus* non visus, stylus villosus, cum stigmate 2.5-3 mm. longus.

BRITISH GUI.

1931, *J. R. Lockie* in *Forestry Department* record no. 2019. "A small tree, 60 ft. high, 9 in. diam., in greenheart forest on hill on brown

sand. Latex white, abundant in leaves, twigs and flowers, but not in main stem. Flowers odourless."

Vernacular name (Arawak), Uluballi.

This is the first genuine record of the occurrence of this genus in British Guiana, since *Robert Schomburgk* 892 was almost certainly collected on the Rio Negro, where *T. Schomburgkianum* was later gathered by Spruce. In Robert Schomburgk's manuscript notes preserved at Kew numbers 891 and 893 are definitely stated to have been collected on the Rio Negro.

MYRTACEAE.

Eugenia essequiboensis *Sandwith*, sp. nov.; *E. seriato-ramosae* Kiaersk. ut videtur affinis, pedunculis saepe bifloris, bracteolis subulatis, nervis foliorum primariis paucioribus differt.

Arbor excelsa, circiter 30 m. alta, cortice rubro-brunneo; ramuli novelli ferrugineo-tomentosi. *Folia* elliptica, ovato-elliptica vel oblanceolata, apice sensim breviter acuminata, basi attenuata cuneata, 2-9.5 cm. longa, 1-3.5 cm. lata, rigide chartacea vel subcoriacea, utrinque satis nitida, viridia, pagina inferiore carnosa rugulosa quam superiore pallidior, novella pubescentia, adulta utrinque glaberrima, glanduloso-punctata, novella saepe fere evenia, adulta nervis primariis utroque costae latere vulgo 12-14 patulis parallelis plus minusve rectis tum in nervum marginalem a margine 2-3.5 mm. distantem anastomosantibus, cum costa venulisque supra plus minusve impressis subtus laxe haud conspicue reticulatis; petiolus primo ferrugineo-pubescent, adultus glaber, 4-12 mm. longus. *Inflorescentiae* axillares, solitariae, pedunculis unifloris vel bifloris, nonnunquam in axillis foliorum, saepius basi ramulorum brevium in axillis cataphyllorum ita dispositae ut racemum simulent; pedunculi pedicellique ferrugineo-tomentosi, 4-10 mm. longi; bracteolae sub floribus ferrugineo-tomentosae, subulatae, 1.5 mm. longae. *Hypanthium* turbinato-campanulatum, circiter 2 mm. longum atque latum. *Calycis* lobi 4, ovati, obtusi, 3 mm. longi, 3 mm. lati, extra ferrugineo-pubescentes, intus cinerei sericeo-pilosi. *Petala* 4, pallide albo-viridia, suborbicularia, venosa, ciliata, ceterum glabra, 4.5 mm. longa, ad 5 mm. lata. *Stamina* glabra, 7 mm. longa; discus hic illic pilosulus. *Stylus* glaber, 6-7 mm. longus. *Fructus* pyriformis, nigrescens, pubescens, 1.1-1.5 cm. longus, 4-8 mm. latus, apice lobis calycinis coronatus.

BRITISH GUIANA. Moraballi Creek, Essequibo River, Oct. 21st, 1929, *Sandwith* 500. Tall tree, 103 ft. high, 17 in. diam. in mixed forest. Bark reddish-brown and lined, like that of Asipoko (*Pouteria* spp.). Petals and stamens pale whitish-green.

Duplicates are distributed to the following herbaria: Georgetown (Forestry Department), New York, Rio de Janeiro, Utrecht, Berlin, Paris, Washington and Stockholm.

Eugenia Arawakorum *Sandwith*, sp. nov.; ex affinitate, ut videtur, *E. Ferreiraeanae* Berg., foliis longioribus magis obovatis

basi acutis subtus reticulatis, indumento inflorescentiae cinereo pubescente vel sericeo nec rufo-tomentoso statim distinguenda.

Arbor, satis excelsa; ramuli annotini cinerei glabri, hornotini cinnamomei pubescentes. *Folia* oblanceolata, obovato-oblonga usque obovato-elliptica, apice abrupte 2–10 mm. acuminata vel cuspidata, basi attenuata cuneata acuta, 4–15.5 cm. longa, 1.7–6.2 cm. lata, rigide chartacea usque subcoriacea, supra nitida siccitate nigrescentia juventute pubescentia demum glabra, subtus subopaca pallidiora olivacea vel siccitate purpurascens sparse pubescentia punctato-glandulosa, nervis primariis utroque costae latere numerosis circiter 20–25 patulis parallelis subrectis in nervum marginalem a margine ad 1.5 mm. tantum distantem anastomosantibus supra impressis inconspicuis subtus cum costa venulisque elevatis conspicuis laxe reticulatis; petiolus resinoso-corrugatus, plus minusve pubescens, 0.6–1.3 cm. longus. *Inflorescentiae* axillares, saepius nodis defoliatis visae, 1–3-nae, brevissime ad 1 cm. umbellato-racemosae, multiflorae, rhachi cicatricibus pedicellorum bracteisque oblecta; bractee ovatae, vix ad 1 mm. longae; pedicelli brunneo-glandulosi atque cinereo-pubescentes, 3–8 mm. longi; bracteolae sub flore positae, indumento pedicelli indutae, ad 1.5 mm. longae atque 1 mm. latae. *Hypanthium* subgloboso-campanulatum, ad 2.5 mm. longum atque diametro, extra dense cinereo-sericeum. *Calycis* lobi 4, late rotundato-ovati, obtusi, circiter 2.25 mm. longi, ad 2.75 mm. lati, extra plus minusve pubescentes atque ciliati, intus glabri. *Petala* alba, de exemplis siccis delapsa. *Stamina* glabra; discus pilosulus. *Stylus* glaber, circiter ad 5 mm. longus. *Fructus* non visus.

BRITISH GUIANA. Moraballi Creek, Essequibo River, Oct. 16th, 1929, *Sandwith* 462. A tall tree in mixed forest. Petals white.

Vernacular name (Arawak), Baniaballi; but this is applied to other Myrtaceae.

***Calycorectes Bergii* Sandwith**, nom. nov.—*C. latifolius* Berg in Linnaea, xxx. 701 (1860), quoad descr., non *Eugenia latifolia* Aubl. Hist. Pl. Guianae, 502, t. 199 (1775).

BRITISH GUIANA. Moraballi Creek, Essequibo River, Nov. 5th, 1929, *Sandwith* 558: small tree, 43 ft. high, 5 in. diam., in morabukea forest; flowers large, snow-white.

FRENCH GUIANA. Karouany, 1857, *Sagot* 272. Godebert, Nov. 1919, *Wachenheim* 32. Maroni River, 1862, *Mélinon*. The last two collections were distributed from Paris under the name *C. grandifolius* Berg. which, to judge from the description, is at once distinguished by the venation of the leaves.

The above material agrees very well with Berg's description of his *C. latifolius* which he based on *Eugenia latifolia* Aubl. Aublet's species is, however, a very different plant, as is proved by his specimens in Herb. Mus. Brit., which agree well with his figures and description. It suggests a true *Eugenia* rather than a *Calycorectes*, and differs from *C. latifolius* Berg in the shape and venation

of the leaves, the thin black glabrescent pedicels and hypanthium, and the very small sepals which are only 2 mm. long. By the International Rules of nomenclature, the combination *C. latifolius* Berg must be applied to Aublet's species; the above name is accordingly proposed for Berg's plant.

LECYTHIDACEAE.

***Lecythis Davisii* Sandwith**, sp. nov.; e grege *L. Pohlii* Berg, *L. biserratae* Miers, *L. crassinodae* Miers, *L. Coxianae* Miers, *L. tuberculatae* Miers, pedicellis crassis, bracteolis satis magnis longe persistentibus distincta; a *L. crassinoda* Miers, cuius flores nondum sunt reperti, foliis plerumque minoribus, fortius reticulatis, marginibus profundius serrulatis, petiolis brevioribus differt.

Arbor excelsa, circiter 30 m. alta; ramuli summi annotini valde ramulosi, teretes, corrugato-striati, lenticellis crebris aurantiacis praediti; hornotini crebri, breves, angulati, brunnei, minute hirtelli, internodiis vulgo 0.3–1.5 cm. longis. *Folia* oblongo-lanceolata vel minora ovata, apice conspicue acuminata acumine 3–8 mm. longo, basi saepius obtusa sed in petiolum attenuata decurrentia, parva, 2.5–9 cm. longa, ad 3.8 cm. lata, chartacea, utrinque nitida, glabra, concoloria, vel siccitate supra nigrescentia, subtus lepidoto-glandulosa, margine conspicue serrulata serrulis 1–1.75 mm. distantibus, utrinque fortiter reticulata, nervis primariis utroque costae latere circiter 14 vulgo 2.5–7 mm. a margine anastomosantibus; petiolus alatus, minute hirtellus, 2.5–6 mm. longus, cum alis ad 1.5 mm. latus. *Inflorescentiae* plurimae, simpliciter racemosae, multiflorae, saepius in axillis denudatis ramulorum annotinorum solitariae vel binae, ad 7 cm. longae; rhachis crassa, hirtella, corrugato-striata atque lenticellata, brunnea; pedicelli cum hypanthio minute hirtelli, crassissimi atque sursum ampliati, 5–8 mm. longi, prope basim articulati, ibi circiter 2 mm. lati, demum ad 6 mm. ampliati; bracteolae articulo affixae conspicuae, persistentes, rotundato-ovatae, minute hirtellae, 1.5–2 mm. longae atque latae. *Flores* pulcherrimi, mediocres, 2.5–3.5 cm. diametro. *Sepala* suborbicularia, ad 3.5 mm. longa, 3–4 mm. lata, ciliolata, ceterum extra glabrescentia vel parce minute hirtella. *Petala* dimidio inferiore albo-flavida, superiore purpurea, glabra, obovata, inaequalia, majora ad 2.1 cm. longa, ad 1.4 cm. lata. *Androphorum* glabrum, explanatum circiter 3.5 cm. longum, super annulo ad 1.3 cm. latum, galea intus staminodiis dense echinata ad 1.6 cm. diametro. *Stamina* aurea, circa annulum numerosissima, filamentis apice ampliatis ad 1.5 mm. longis, antheris globosis vix 0.5 mm. diametro. *Staminodia* aurea, 2.5–3.5 mm. longa, summa ananthera, cetera antherifera. *Ovarium* vertice siccitate nigro striatulo glabro 3 mm. diametro, disco ochraceo addito ad 6 mm. diametro, quadriloculare, ovulis numerosis; stylus crasse cylindrico-conicus, brevis, ad 1.5 mm. longus. *Fructus* verosimiliter giganteus.

BRITISH GUIANA. Moraballi Creek, Essequibo River, Sept. 7th, 1929, *Sandwith* 188 (type): large tree in mixed forest, 109 ft. high,

2 ft. diam., 40 ft. to the first fork, trunk shallowly fluted, not buttressed; flowers very handsome; petals cream in lower half, purple in upper half; stamens and staminodes gold. Bartica Grove, Aug. 1884, *Jenman* 2157. "Guyane anglaise, no. 90, donné par M. H. Stone" (Herb. Mus. Paris).

Vernacular names (Arawak): Wadaduri; Monkey Pot.

It will be noticed that the vernacular names are the same as those recorded by Appun for *L. crassinoda* Miers, which was also collected in British Guiana. This species was described from leaves and fruit only, and the leaves, as pointed out above, differ widely from those of *L. Davisii*, although it is possible that future collections may show that such leaves may be produced on trees of the latter.

Forestry Department no. 56A, from the Pomeroon River, July 1918, coll. *Hohenkerk*, is another Wadaduri, with leaves very similar to those of *L. Davisii*, up to 10 cm. long, and up to 4.5 cm. wide. There are no flowers or calyces on the specimen, but a fruit was forwarded which was collected from the same tree, and which is extremely distinct from that of *L. crassinoda* and *L. tumefacta*. This fruit may be described as follows: pyxidium sublaeve, scrobiculatum, rhomboideo-turbinatum, 13.5 cm. altum, 14 cm. diametro, "zona calyculari" supra medium (8.5 cm. e basi) obscure sinuata obsolete lobata, "vitta interzonalis" angulo circiter 40° adscendente 4-5 cm. longa, operculo extra convexo vix 7 cm. diametro vix 2 cm. alto apice umbonato, intus ("columella") late conico fibroso ad 3 cm. longo; semina anguste ellipsoidea, 2.5-3.3 cm. longa, vulgo 1 cm. diametro, brunnea, rugulosa, costata, costis pallidioribus, funiculis membranaceis albis 2 cm. vel ultra longis.

Eschweilera (§ Chytroma) decolorans *Sandwith*, sp. nov.; ob calycem corollamque magnam, pedicellos insignes articulatos, petala nivea post florem lapsam contusa colore viridi-caeruleo insigni tincta valde distincta; faciem *Lecythis grandiflorae* Aubl. atque *L. persistentis* Sagot praebens, ab illa foliis minoribus angustioribus minus crassis minus obsolete crenulatis, petiolis brevioribus minus crassis, racemi rhachi minus crassa, floribus minoribus differt; a *L. persistente* Sagot, quae pedicellos similiter articulatos exhibet, inter alia foliis haud coriaceis petiolis brevioribus, sepalis duplo majoribus differt.

Arbor mediocris usque excelsa, saepius 15-30 m. alta, ramulis summis novellis glabris siccitate nigrescentibus. *Folia* oblonga usque elliptica vel lanceolata, apice conspicue acute acuminata vel abrupte cuspidata, acumine 0.8-2 cm. longo, basi obtusa vel abrupte cuneata, 5-21.5 cm. longa, 1.8-8.3 cm. lata, chartacea, utrinque nitida, glabra, siccitate olivacea, margine obsolete sed distincte crenulato, utrinque intricatissime subaequaliter reticulata, nervis primariis utroque costae laterae 10-16 a margine satis longe (saepius 6-10 mm.) anastomosantibus; petiolus supra profunde canaliculatus, 0.3-1.2 cm. longus, raro ad 2 mm. (vulgo 1.75 mm.) crassus.

Inflorescentia vulgo simpliciter racemosa, 3-12 cm. longa, ad 12-flora; rhachis glabra, 1-2.5 mm. crassa, flexuosa, angulata; pedicelli glabri, 0.6-2.2 cm. longi, sub flore dilatati, ad 2.5 mm. crassi, infra medium vel basim versus conspicue crasse articulati, parte inferiore crassiore post florem lapsam persistente, parte superiore saepius nutante; bracteolae ex articulo orientes, magnae, oblongae, ad 9 mm. longae (saepius breviores), ad 3 mm. latae, mox caducae. *Alabastra* matura saepe ad 1.5 cm. diametro. *Flores* magni, circiter 6-7 cm. diametro. *Sepala* magna, late rotundato-ovata, obtusissima, glabra sed glanduloso-punctulata, margine fimbriatula, ad 1 cm. longa, ad 1 cm. lata. *Petala* inaequalia, late oblonga, 2.5-3.2 cm. longa, 1.7 usque fere 2.5 cm. lata, glabra, parce fimbriato-ciliolata, nivea sed mox contusione hic illic viridi-caerulea vel colore indici conspicue maculata. *Androphorum* luteum, glabrum, explanatum ad 5 cm. longum, super annulo circiter 1.5 cm. latum, tum in galeam incurvatam staminodiis dense echinatum 2 cm. diametro expansum. *Stamina* circa annulum et paullo supra valde numerosa; filamenta circiter 1.8 mm. longa, sub filo antherifero brevissimo ampliata; antherae 0.5 mm. diametro. *Staminodia* ad 7 mm. longa, basi saepius 2-3 mm. lata, vulgo subfalcata, acuta, ananthera. *Ovarium* semisuperum, vertice elevato rotundato corrugulato 5 mm. diametro, in stylum brevem conicum 2 mm. longum contractum, quadriloculare, ovulis in quoque loculo e basi erectis paucis ut videtur 4. *Fructus* non visus.

BRITISH GUIANA. Moraballi Creek, Essequibo River, Aug.-Oct. 1929, *Sandwith* 348 (type), 2, 414, 460: tree 50-115 ft. high, 4-24 in. diam., in mixed forest; petals pure white, always bruising a dark bluish-green; androphorum yellow. Yarikita River, Northwest District, April 1929, *Forestry Department* record no. 920. Near Bartica, Nov. 1886, *Jenman* 2474.

Vernacular name (Arawak), Smooth-leaved Kakaralli.

Eschweilera Wachenheimii (*R. Benoist*) *Sandwith*, comb. nov., descr. ampl.—*Lecythis Wachenheimii* R. Benoist in Bull. Mus. Hist. Nat. Paris, xxix. 594 (1923).

Arbor satis parva vel mediocris; ramuli summi tenues, graciles, novelli puberuli. *Folia* lanceolata, elliptica usque oblanceolata vel fere obovata, apice longe conspicue acute anguste acuminata vel cuspidata, acumine vulgo 1-2.5 cm. longo, basi attenuata acuta, 4-18 cm. longa, 1.3-5.7 cm. lata, tenuiter chartacea, glabra, nitidula, margine paullum revoluta obsolete crenulato, supra pallide olivacea intricatissime reticulata, subtus siccitate pallide grisea vel fere glaucescentia valde sed minus intricate reticulata, nervis lateralibus utroque costae latere 8-12 patuli-adscendentibus distantia conspicua (3-10 mm.) a margine anastomosantibus; petiolus glaber, corrugulatus, gracilis, supra canaliculatus, vulgo 4-8 mm. longus. *Inflorescentia* racemosa, simplex vel basi ramosa; racemi rigidi, multiflori atque densiflori nodis incrassatis, ad 6 cm. longi, 2-3 mm. crassi, dense puberuli. *Flores* subsessiles, 2.5 cm. diametro attingentes.

Calyx siccitate brunneus, crassus, puberulus atque verruculosus, limbo post anthesin cupulari 6-8 mm. diametro; hypanthium 2 mm. longum, 3 mm. latum; lobi late ovati vel semiorbiculares, rotundati, ciliolati, post anthesin suberecti, ad 1.75 mm. longi, ad 2.5 mm. lati. *Petala* albo-flavida, inaequalia (interiora majora), extra (praesertim exteriora) plus minusve minute cinereo-puberula, intus glabra, eciliata, 0.8-1.2 cm. longa, 7-9 mm. lata. *Androphorum* flavum, totum ad 2.5 cm. longum, basi ultra annulum 6 mm. latum, glabrum, galea 1 cm. longa 1.7 cm. lata, appendiculis anantheris lineari-falcatis ad 4.5 mm. longis oblecta. *Stamina* circa annulum numerosissima, filamentis 0.7 mm. longis; majora etiam triente androphori inferiore filamentis ad 2.5 mm. longis reperiuntur. *Ovarium* semisuperum, biloculare, loculis pauciovulatis, demum post anthesin turbinatum circiter ad 7 mm. longum atque diametro; stylus brevis, crassus, saepius subfalcatus, ad 2 mm. longus. *Fructus* non visus.

BRITISH GUIANA. Moraballi Creek, Essequibo River, Aug.-Sept., 1929, *Sandwith* 106, 169, 280; a tree of middle size or sometimes only 45-50 ft. high, in morabukea and mixed forest; petals creamy-yellow; androphorum darker yellow.

FRENCH GUIANA. Godebert and crique Sainte Marguerite, *Wachenheim* 283, 359 (typi in Herb. Mus. Paris). These specimens agree perfectly with the British Guiana material.

Vernacular name (Arawak), Fine-leaved Black Kakaralli.

Eschweilera grata *Sandwith*, sp. nov.; *E. micranthae* Meirs forsitan affinis, ob inflorescentias omnino glabras, rhachin pedicellosque graciles saepius flexuosos, flores parvos flavidos distinctissima.

Arbor mediocris, circiter 21 m. alta; ramuli glabri, novelli siccitate olivaceo-nigrescentes, parce lenticellati, internodiis 0.8-3 cm. longis. *Folia* lanceolata usque elliptica, apice ad 1.2 cm. conspicue acute acuminata, basi cuneata, satis parva, 5-13.5 cm. longa, 1.2-5.2 cm. lata, rigide chartacea, integra, nitidula, coloria, glabra, margine revoluta, utrinque praesertim supra reticulata, nervis primariis utroque costae latere 12-16 adscendentibus arcuatis vel subrectis 2-8 mm. a margine anastomosantibus; petiolus glaber, gracilis, corrugulatus, 3-8 mm. longus, circiter 1.2 mm. crassus. *Inflorescentia* paniculata vel simpliciter racemosa, rhachi pedicellisque flavo-olivaceis omnino glaberrimis gracilibus atque saepius conspicue flexuosis, nodis incrassatis; rami ad 10 cm. longi; pedicelli 0.4-1.5 cm. longi, saepius vix 0.5 mm. crassi. *Alabastra* flava, globosa, 4-6 mm. diametro. *Flores* aperti parvi, ad 2.5 cm. diametro. *Sepala* ovata usque oblonga-ovata, obtusa, glabra sed parce inconspicue ciliolata, ad 2.5 mm. longa, ad 2 mm. lata. *Petala* laete flavida, inaequalia, late obovato-elliptica, 1.1-1.4 cm. longa, 8-10 mm. lata. *Androphorum* luteum, totum 2.2 cm. longum, super annulo 8 mm. latum, tum galea appendiculis anantheris linearibus ad 3.5 mm. longis dense echinata ad 1 cm. lata. *Stamina* lutea, filamentis 0.7 mm. longis, antheris globosis 0.3 mm.

diametro. *Ovarium* biloculare, vertice ad 2.5 mm. diametro, stylo conico brevissimo ad 0.7 mm. longo; ovula in quoque loculo pauca, ut videtur 2. *Fructus* non visus.

BRITISH GUIANA. Cuyuni River; in hilly mixed forest near the right bank below the Akaio Falls, Nov. 22nd, 1929, *Sandwith* 651. A middle-sized tree, about 70 ft. high, 8 in. diam. Inflorescence very pretty, with slender green to reddish pedicels, small yellow buds, small flowers up to 1 in. diam., with rich creamy-yellow petals, and a darker yellow androphorum.

Eschweilera simplex *Miers* in Trans. Linn. Soc. xxx. 264 (1874) is ***Cymbopetalum brasiliense*** (Vell.) Bth. (Annonaceae). This identification has been confirmed by Prof. R. E. Fries, who also examined the solitary type specimen (Cayenne, *Martin*) in Herb. Mus. Brit., see Acta Horti Bergiani, x. 186 (1931). *Miers* (l.c.) wrote "As there is only a single flower glued to the sheet, I could not ascertain its structure." But the androecium is visible and, added to the unusual facies, should have saved the author from this curious and unnecessary error.

Couratari pulchra *Sandwith*, sp. nov.; *Allantomae subramosae* *Miers* affinis, foliis simillimis, sed inflorescentiis laxis, pedicellis multo longioribus, lobis calycinis magis ovatis corollaque majoribus, petalis conspicue ciliatis, ovulis paullo angustius obovoideo-spathulatis differt.

Arbor excelsa, ad 45 m. alta, foliis fere omnibus simul deciduis, inflorescentiis roseis creberrimis per ramulos summos defoliatos gestis, insignis atque pulcherrima; ramuli corrugato-striati, juvenile brevissime tomentelli, demum glabrati purpurascences lenticellati; ramuli summi laterales brevissimi, apice foliis binis terminati. *Folia* adulta oblonga usque obovato-oblonga, apice truncato-rotundata vel breviter late cuspidata, basi rotundata vel raro cuneata, 7-15 cm. longa, 4-7.8 cm. lata, coriacea, integra sed marginibus undulatis revolutis, supra glabrata vel pubescentia nitidula nervis costaque impressis sed conspicuis, subtus dense conspicue arachnoideo-stellato-pubescentia nervis costaque tomentellis, reticulata, nervis primariis utroque costae latere vulgo 18-22 basi folii excepta adscendentibus subrectis parallelis marginem versus anastomosantibus; petiolus dense minute tomentellus, profunde canaliculatus, 1-1.7 cm. longus. *Inflorescentiae* per totum verticem defoliatum creberrimae, paniculatae, pyramidales, saepius 10-20 cm. longae, ramis longis adscendentibus dense fusco-tomentellis laxae racemosis; pedicelli siccitate purpurei, dense tomentelli, graciles, flexuosi, 2-3.7 cm. longi. *Alabastra* purpurea, petalis basi viridescenti-pruinosis. *Calyx* hypanthio subgloboso-campanulato purpureo tomentello 2-3 mm. longo ad 3.5 mm. lato; lobi late ovati, purpurei, utrinque pubescentes, 2.5-3.5 mm. longi atque lati. *Petala* statu vivente pulcherrime rosea, spathulata; extimum cucullatum, siccitate apice excepto intense purpureum,

Indumento rigidulo, subsetuloso in innovationibus, petiolis, foliorum costis, foliis magnis oblongo-ellipticis costa excepta glabris breviter acuminatis fere in dimidio latissimis, inflorescentiis ♀ haud spectabilibus, pedunculo piloso debiliore plus minusve arcuato portatis, subbiumbellatis, floribus ♀ vivo albis, infra cuproso-hirtulis, in limbo fere elobatis recognoscenda.

Pisonia glabra Heimerl, sp. nov.; glabritie fere omnium partium imprimis ramificationum, foliorum, inflorescentiarum, perianthiorum, foliis dense et prominenter utrinque reticulatis, perianthiis anguste infundibuliformibus, staminibus fere semper 8 distincta.

Arbor vel frutex, circiter 14 m. alta. *Rami* vel divaricato- vel irregulari-ramificati, griseobrunnei, omnino (etiam in innovationibus) glabri, gemmis solum paululum cuproso-hirtulis. *Folia* (minora breviter elliptica, cito in petiolum usque 10 mm. longum contracta, 2.2-4.5 cm. longa, 1.4-2.6 cm. lata, antice obtusa vel rotundata) pleraque petiolo 1.4-2.8 cm. longo, usque 2 mm. crasso, glabro suffulta, late elliptica vel oblongo-elliptica vel elliptico-lanceolata (rarius in formam obovatam leviter vergentia), usque 14.2 cm. longa et 6.2 cm. lata, vulgo in dimidio latissima, saepe utrinque fere aequae angustata ad subacuminata, apice ipso plus minusve acuto breviter prominente, in sicco brunnea, concoloria, coriacea, supra nitida, infra opaca, etiam prima evolutione glabra, costa validiuscula, infra magis prominente, nervis secundariis 6-15 utrinque, leviter arcuatis, sub angulo 70-80° abeuntibus, frequentissime ramificatis, nervatura itaque eximie reticulata et utraque facie (supra fere acute) prominente. *Inflorescentiae* ♂ pedunculo stricto, 3-8.5 cm. longo, glabro suffultae, breviter corymboso-paniculatae, usque 5.4 cm. latae et 4 cm. longae, plus minusve floribundae, plus minusve densae, pallide virides, glabrae (raro in ramulorum angulis sparsissime pulverulenter hirtae), ramificationibus strictiusculis, haud tenuibus, ramis primariis usque 5, varie ordinatis, 1-2 cm. longis, vel apice paucos flores directe gerentibus vel iterum varie ramificatis, ramis secundariis vel flores singulos vel flores 2-4 plus minusve dense confertos praebentibus, floribus vel sessilibus vel pedicello usque 2.5 mm. longo minus tenui suffultis. *Flores* ♂ vivo pallide virides, basi bracteolis 3-4, vix 1 mm. longis, lanceolatis, subaequalibus, acutiusculis, fere glabris induti. *Perianthia* ♂ anguste infundibuliformia, 6-6.5 mm. longa, superne 3-3.5 mm. lata, fere aequaliter a basi in limbum ampliata, glabra, limbo (initio supra papilloso) levissime lobulato, lobulis valde brevibus obtusis. *Stamina* 8 (raro 9), 6.5-10.5 mm. longa, partim bene exserta, filamentis albis, antheris 0.75 mm. longis. *Germinis rudimentum* 4-5.5 mm. longum, ovario ellipsoideo, breviter stipitato, stylo paullo crassiore, apice truncato, vix papilloso.

BRITISH GUIANA. Upper Demerara River, shrub, Sept. 1887, *Jenman* 3978. Moraballi Creek, Essequibo River, Oct. 1929, *Sandwith* 533: low tree, 45 ft. high, in wallaba forest on sandy

ridge; inflorescence wholly pale green; perianth slightly frilled at the edge; filaments white.

POLYGONACEAE.

Coccoloba gymnorrhachis *Sandwith*, sp. nov.; *C. striatae* Benth. forsan affinis, costis ochrearum haud conspicue persistentibus, inflorescentiis longioribus rhachi glabra neque minute tomentella, ochreolis bractea subduplo longioribus differt.

Frutex altissime scandens, ramulis summis cinereis corrugatis, hornotinis nigrescentibus striatis lenticellatis. *Ochreae* caducae, adpresse pilosae, 4-7 mm. longae. *Folia* obovato-elliptica usque elliptica, apice 0.5-1 cm. abrupte acuminata vel cuspidata, basi leviter sed semper distincte cordata, 6-14.5 cm. longa, 3-7 cm. lata, glabra, rigide chartacea vel seniores subcoriacea, utrinque nitidula, utrinque subtilissime reticulata venulis in foliis senioribus supra impressis sed in junioribus prominulis, nervis primariis utroque costae latere vulgo 10-14 in medio folio costam angulo 45-60° relinquentibus sursum longe arcuantibus atque marginem versus anastomosantibus; petiolus nigrescens, glaber, 0.7-2 cm. longus. *Inflorescentiae* apice ramulorum brevium terminales, solitariae, simplices, foliis longiores, saepius 14-23 cm. longae, rhachi omnino glabra sulcata haud (vel in planta surinamensi sparse) lenticellata, pedunculo 1-2 cm. longo prope basim nonnunquam florifero, nodulis bifloris. *Bractea* parva, ovata, obtusa, glabra, sub flore aperto pallide flavescens, vix ad 1.5 mm. longa atque lata. *Ochreolae* 2, bractea fere duplo longiores, bilobae, glabrae, 2.5-2.8 mm. longae; exterior pedicellum vetustum jam disarticulatum ac ochreolam secundam floriferam includens. *Pedicelli* glabri, ochreolis paullo superati. *Perianthium* albo-viride; tubus campanulato-obconicus, sparse pilosulus, vix 1 mm. longus, vix 1.5 mm. latus; lobi ovati, obtusi, minutissime ciliolati, ad 1.75 mm. longi, ad 1.3 mm. lati. *Stamina* exserta, glabra, filamentis inaequalibus e basi lata 1.3-1.8 mm. longis. *Ovarium* glabrum, cum stylis 3 ad 2 mm. longum. *Fructus* (plantae surinamensis) ovoideo-fusiformis, apice obtusus, vulgo 1-1.2 cm. longus, 8 mm. diametro, glaber, verruculosus, siccitate brunneus, lobis perianthii apice adpressis, pedicellis ad 6 mm. longis.

BRITISH GUIANA. Moraballi Creek, Essequibo River, Sept. 3rd, 1929, *Sandwith* 168 (type in Kew Herb.; dupl. in Herb. New York, Rio de Janeiro, Utrecht). A bush-robe in mixed forest; flowers whitish-green.

SURINAM. Forest reserve, Brownsberg, fr. Nov. 1924, *Herb. Boschwizen* no. 6773 (Utrecht, Kew). This collection was compared at Utrecht with the type collection by Mr. P. J. Eyma, and fragments have been presented to the Kew Herbarium. It is satisfactory to be able to include a description of the fruit.

PODOSTEMONACEAE.

The following species, only recently described and previously unrepresented at Kew, have kindly been identified by Mr. G. Taylor, of the British Museum Herbarium:—

Marathrum Jenmanii Engl. in Engl. Jahrb. lxi. Beibl. 138, 5 (1927).

Cuyuni River; in depressions on the flat rocky shore of an islet at the Akaio Falls, Nov. 25th, 1929, *Sandwith* 694: scapes short and thick, reddish-mauve, shorter than the olive-brown sheath; filaments whitish-mauve; anthers greenish-pink; ovary and style dark reddish-violet; stigma uncloven, blackish.

Jenmaniella varians Engl. l.c. 7.

Essequibo River; on low flat rocks on the right bank at the first Falls, Oct. 14th, 1929, *Sandwith* 446; plants light red and green, very small and densely crowded, flowering when still damp but just not submerged; stamens 1-2, with filaments much longer than the gynaecium; anthers greenish.

MYRISTICACEAE.

Iryanthera paraënsis Huber in Bol. Mus. Pará, v. 358 (1909).

Moraballi Creek, Essequibo River, Oct.-Nov. 1929, *Sandwith* 429 ♂, and 542 ♀. A small tree, 30-50 ft. high, in mixed forest; branchlets ferrugineous; male flowers white, female pinkish-cream with green stigma; the female inflorescences are much shorter than the male, which are remarkably long.

Vernacular name (Arawak), Kirikowa.

Distr. Pará. The first record from British Guiana.

Kindly confirmed by Dr. Ducke, who remarks that *I. elongata* Huber is only a form of this species.

MONIMIACEAE.

Siparuna decipiens (Tul.) DC. Prodr. xvi. pt. 2, 643 (1868).—*Citriosma decipiens* Tul. Monogr. 368 (1855).

Moraballi Creek, Essequibo River, Sept.-Oct., 1929, *Sandwith* 346, 412: a small tree, 25-40 ft. high, 6 in. diam., in mixed forest; leaves and inflorescence silvery-lepidote. Previously collected in the Colony by *Mansfield* and *Kortright*, Herb. no. 8737, at Bonasika, Essequibo River, in 1909.

Distr. French Guiana to Rio Acre (Bolivia).

LAURACEAE.

Aniba (subgen. *Ajoueopsis* Mez) **hypoglaucha** *Sandwith*, sp. nov.; in hoc subgenere foliis subtus glaucis, inflorescentia pseudoterminali, ovario glaberrimo quam stylo multo brevior distiguenda.

Arbor mediocris in eperuetis crescens, cortice pallide brunneo squameo in laminas verticales decorticante; ramuli summi sulcato-angulati, indumento pallide fulvo tomentelli, demum glabrati cinerei. *Folia* lanceolata, elliptica, usque obovato-elliptica, apice

sensim satis longe (ad 1.5 cm.) conspicue acuminata, basi attenuata cuneata, 3-13.5 cm. longa, 1.3-4.3 cm. lata, supra glabra olivacea nitidula nervis impressis atque subtilissime areolata, subtus (siccitate saltem) glauca pilis adpressis satis dense pubescentia costa nervisque primariis utroque latere 10-12 elevatis venulis haud conspicuis; petiolus debilis, saepe curvatus, supra canaliculatus, 6-12 mm. (vulgo 10 mm.) longus. *Inflorescentiae* pyramidalithyrsoideae, apice ramulorum complures pseudo-terminales, racemose dispositae, passim dense tomentellae; bractae bracteolaeque subfoliaceae, caducae, 3-10 mm. longae. *Flores* flavescentes; pedicelli nutantes, nonnunquam penduli, sulcati, 1.5-5 mm. longi. *Perianthii* tubus conspicuus, urceolatus, sub lobis constrictus, 1.5 mm. longus, 1 mm. latus, extra griseo-tomentellus, intus longe dense sericeo-pilosus; lobi subaequales, exteriores majores, ovati, 0.5-0.7 mm. longi atque lati, utrinque plus minusve tomentelli, siccitate brunnescentes, flore maturo stylo necnon saepe androecio superati. *Staminum* series duae exteriores antheris glabris introrsis, filamentis pilosis antheris paulum longioribus aequilatis; series tertia staminodialis, in medio biglandulosa, filamentis pilosis, tum supra glandulas contracta liguliformis pilosa. *Ovarium* ellipsoideum, glabrum, circiter 0.75 mm. longum, sensim in stylum glabrum multo longiorem ad 1.75 mm. longum transiens. *Fructus* ovoideo-ellipsoideus, 2.2 cm. longus, 1.5 cm. diametro; cupula nigrescens, pubescens, corrugata, haud multum verrucosa, hemispherica, 7-8 mm. alta, 1.1-1.5 cm. diametro.

BRITISH GUIANA. Warimia Creek, Essequibo River, June 6th, 1929, *Forestry Department* record nos. 941 and 942 (type). "Middle-sized tree, 18 in. diam., in wallaba forest on gentle slope on white sand. Slightly buttressed. Bark light brown, scaly, peeling off in vertical stripes. Blaze pale yellow, very aromatic. Flowers yellowish."—T. A. W. Davis.

Vernacular name (Arawak), Yellow or Gale Silverballi.

Ocotea rubra Mez in Jahrb. Bot. Gart. Berlin, v. 258 (1889).

Moraballi Creek, Essequibo River, Oct. 11th, 1929, *Sandwith* 24. A large tree, over 100 ft. high, 23 in. diam., in greenheart forest; also seen in mixed and wallaba forest. Wood very fragrant, recalling the scent of *Angelica*. Buds white.

Vernacular name, Determa.

Distr. French Guiana. Apparently first record for British Guiana.

O. oblonga (Meissn.) Mez, l.c. 367.—*O. Hartiana* Mez in Urb. Symb. Antill. ii. 251 (1900) reducenda, fide Mez in sched. in Herb. Mus. Berol. *Mespilodaphne? oblonga* Meissn. in DC. Prodr. xv. pt. 1, 107 (1864).

Moraballi Creek, Essequibo River, Sept. 15th, 1929, *Sandwith* 264. A large tree in morabukea forest; buds greenish-yellow.

Distr. Trinidad, French Guiana. Apparently first record for British Guiana.

Nectandra (subgen. **Synandrodaphne** Meissn.) **praeclara** *Sandwith*, sp. nov.; *N. dioicae* Mez affinis, indumento ramulorum arcte adpresso sericeo, foliis oblongis apice saepe rotundatis oblique cuspidatis, inflorescentiis longis laxioribus, pedicellis longioribus valde distincta.

Arbor excelsa, circiter 30 m. alta, 20–30 cm. diametro, in eperuetis crescens; ramuli subteretes, obscure angulati et striatuli, pilis arcte adpressis flavicantibus dense subnitenti-sericei. *Folia* oblonga vel oblongo-elliptica, apice in cuspidem vel mucronem angustum acutissimum ad 5 mm. longum saepe obliquum abrupte attenuata vel rotundata, rarius in exemplis male evolutis truncata emarginata, basi cuneata saepe obliqua, 5–20 cm. longa, 3–7 cm. lata, coriacea, supra nitida olivacea sparse pubescentia vel glabra, subtus opaca glaucescentia passim arcte minute sericeo-pubescentia, utrinque praesertim subtus valde intricatissime reticulata, nervis primariis utroque costae latere 4–7 supra cum costa venulisque immersis subtus valde elevatis sursum longissime sensim arcuatis atque margine ipso demum anastomosantibus; petiolus indumento ramulorum indutus, valde corrugato-sulcatus, 1–3 cm. longus. *Inflorescentiae* numerosae, speciosae, axillares, laxae thyrsoidaeae, foliis superatae, saepius 9–17 cm. longae, totae flavicanti- vel cinereo-sericeae; rami primarii vulgo 1–2.3 cm. longi; cymae satis laxae, floribus haud stipatis; pedicelli vulgo 2–5 mm. longi. *Flores* dioici, masculi tantum visi, flavi, 4–5 mm. diametro. *Perianthium* siccitate extra cinereo-sericeum, intus brunneum atque cinereo-tomentellum; tubus conspicuus subglobosus, ad 2 mm. longus, ad 2.5 mm. latus; lobi ovati, obtusi, subaequales, ad 1.75 mm. longi atque lati. *Antherae* exteriores perfectae quadratae, sessiles, apice truncato maturitate inflexo, glabrae, basi sericea excepta. *Ovarii rudimentum* anguste ellipsoideum, dense albo-pilosum, cum stylo brevi glabro ad 1.2 mm. longum.

BRITISH GUIANA. Moraballi Creek, Essequibo River, Oct. 7th, 1929, *Sandwith* 387 (type): tall tree, 101 ft. high, 8½ in. diam., on ridge in wallaba forest; branches of inflorescence peach-bloom colour; pedicels orange-red; perianth-lobes creamy-yellow; anthers green. *Ibid.*, Oct. 29th, 1929, *Sandwith* 535: tall tree, 92 ft. 7 in. high, 1 ft. diam., in wallaba forest on sandy ridge; floral parts exactly as in no. 387. Near Monkey Creek, Anarika Line, Demerara-Essequibo Railway, March 1910, C. W. Anderson 62: a female tree, bearing fruit; berry ovoid-subglobose, about 1 cm. long, shortly apiculate; cupules 8–9 mm. long, up to 1.3 cm. wide, greyish-tomentellous round the margin at the apex, otherwise blackish and glabrescent, gradually narrowed into a thickened pedicel about 7 mm. long and 5 mm. wide at the apex.

Vernacular names (Arawak), Shirua; Broad-leaved Soft Silverballi (Anderson).

HERNANDIACEAE.

Sparattanthellium guianense *Sandwith*, sp. nov.; forma fructus ad *S. amazonum* Mart. approximans, indumento foliorum statim distinguenda; *S. Burchellii* Rusby foliis membranaceis subtus velutinis, fructu latiore differt; *S. tarapotanum* Meissn. fructu multo longiore, *S. Botocudorum* Mart. et *S. Tupinambazum* Mart. forma fructus ipsa, toto caelo discrepant.

Frutex ingens, altissime scandens; ramuli summi striati, apicem versus dense pilosuli, inferne brunnescentes glabrescentes. *Folia* forma atque magnitudine valde variabili, lanceolato- vel ovato- vel obovato-elliptica, apice nonnunquam sensim longe conspicue (1–2 cm.) acuminata, nonnunquam rotundata plus minusve abrupte breviter cuspidata, basi rotundata vel saltem obtusa, 4–16.5 cm. longa, 2–8 cm. lata, rigide chartacea usque coriacea, margine revoluta, supra siccitate olivaceo-nigrescentia lucida juventute secus nervos pubescentia mox glabrata, subtus pallidiora olivacea vel grisea juventute passim crispule pilosula senectute praeter nervos venulasque sparse sed regulariter pilosulas glabrata, basi trinervia nervis primariis ceteris lateralibus e costa supra medium exorientibus, nervis venulisque supra impressis obscuris vel haud prominulis, subtus praesertim in foliis majoribus vetustis valde intricate pulchre reticulatis, nervis secundariis plus minusve rectis parallelis e primariis angulo recto exorientibus; petiolus dense pilosulus vel senectute glabratus, satis brevis, 0.5–3 cm. longus. *Inflorescentiae* numerosae, generis typicae, maturitate ad 20 cm. longae, laxae atque late divaricatae, pedunculis ramisque pubescentibus, floribus pedicellisque cinereo-villosulis; partes masculae densiflorae, femineae pauciflorae; pedunculus primarius saepius 5–8 cm. longus. *Perianthium masculum* pedicello filiformi flexuoso 2–3 mm. longo, 4–5-partitum; lobi elliptici vel obovato-elliptici, 2–2.5 mm. longi, ad 1.25 mm. lati; stamina 4–5, antheris circiter 1 mm. longis, filamentis glabris brevissimis circiter 0.25 mm. longis; stylus pilosus, fere ad 2 mm. longus. *Perianthium femineum* pedicello longiore 5–8 mm. longo, 5-partitum; tubus cum ovario primum 1.25 mm. longus 1 mm. latus, mox nigrescens pilosulus ad 3 mm. longus; lobi linearilongi, ad 2.5 mm. longi, ad 0.75 mm. lati; stylus pilosus, 2 mm. longus. *Inflorescentia fructifera* habitu insigni generis typico, ossea, argenteo-candida, nodosa, pubescens vel glabrata. *Fructus* argenteo-griseus, glaber, rugulosus, haud conspicue costatus, angustus, ellipsoideo-oblongus, 1.5–1.6 cm. longus, 6–7 mm. diametro, vertice reliquiis floralibus haud ad 1 mm. longis coronatus.

BRITISH GUIANA. Moraballi Creek, Essequibo River, Oct. 17th, 1929, *Sandwith* 470 (type): bush-robe in mixed forest; young inflorescence very pale pinkish-brown; old inflorescence and fruit silvery-grey. Demerara River, May 1889, *Jenman* 4889.

The lower inflorescences of any given branch are often predominantly female and the upper predominantly male, but they are sometimes entirely of one sex or the other. As the comparatively

few-flowered female inflorescences or inflorescence-branches develop the earlier, they have a very different facies from the male by the time the latter have reached maturity, since only their long-stalked terminal flowers remain.

In the course of writing up the material of this genus in the Kew Herbarium, a Mexican sheet was discovered which cannot be assigned to any known species and may be described here as follows:

Sparattanthelium septentrionale *Sandwith*, sp. nov.; indumento *S. tarapotani* Meissn. sed foliis pro rata latioribus, filamentis duplo longioribus, stylo longiore differt.

Frutex? scandens, ramulis summis dense conspicue pilosis. *Folia* ovata vel elliptica, apice conspicue (1-1.5 cm.) acuminata, basi obtusa vel rotundata, 6-12 cm. longa, 2-5 cm. lata, chartacea, nitidula, supra nervis dense mesophyllo sparse pilosa, subtus densius pilosa praesertim juniora subvelutina, basi trinervia, nervis primariis ceteris lateralibus e costa supra medium exorientibus, matura utrinque laxae satis conspicue reticulata; petiolus dense flavescens-pilosus, velutinus, 1.3-2.2 cm. longus. *Inflorescentia* generis typica, circiter 5 cm. longa, passim cinereo-pubescent, pilis patulis apice falcato-uncinatis inter minores magis adpressos conspicuis; rami ramulique gracillimi, intricati, multiflori. *Alabastra* minima, vix ad 1 mm. diametro; pedicelli maturi ad 4 mm. longi, gracillimi, flexuosi. *Perianthium* masculinum 5-6-partitum; lobi elliptici, obtusi, inaequales, 1.5-2 mm. longi, ad 1 mm. lati. *Stamina* 5, antheris 1 mm. paullum excedentibus, filamentis glabris 0.5 mm. longis. *Stylus* pilosus, 1.75 mm. longus. *Fructus* ignotus.

MEXICO. "Yucatan and Tabasco," Dr. E. P. Johnson 129 in Herb. Benth., comm. Torrey, 1850.

The only other species hitherto recorded from Central America, *S. guatemalense* Standley, is said to have glabrous leaves and branchlets, and a 4-lobed perianth. The Jurgensen specimen from South Mexico referred to by Hemsley in Biol. Centr.-Amer. i. 405 (see Standley, Trees and Shrubs of Mexico, p. 1656) is certainly not *S. guatemalense* but agrees well with Brazilian specimens of *S. Botocudorum* Mart., and it is conceivable that the label has been misplaced. *S. Botocudorum* has a much finer and, on the mature leaves, sparser indumentum than *S. septentrionale*, while its inflorescence-branches and pedicels are less slender, and its buds larger; the floral parts of the two species are very similar.

PROTEACEAE.

Panopsis sessilifolia (Rich.) *Sandwith*, comb. nov.—*Roupala sessilifolia* Rich. in Act. Soc. Hist. Nat. Par. i. 106 (1792). *R. hameliaefolia* Rudge, Pl. Guian. 22, t. 31 (1805). *Panopsis hameliaefolia* Knight, Proteaceae, 104 (1809); Ducke in Arch. Jard. Bot. Ric de Janeiro, v. 103 (1930). *Andriapetalum sessilifolium* Klotzsch in Linnaea, xv. 53 (1841).

Moraballi Creek, Essequibo River, Oct. 1929, *Sandwith* 472, 483. Small to middle-sized tree, frequent in mora forest on the bank of the creek, also in mixed forest. Inflorescence creamy-green to pale mauve, open perianth sometimes white within; stigma violet.

Vernacular name (Arawak), Mahoballi.

Distr. Guiana, Amazonian Brazil.

LORANTHACEAE.

Phthirusa monetaria *Sandwith*, sp. nov.; *P. Myrsinites* Eichl. affinis, forma foliorum, venatione distincta, ternationibus distincte pedunculatis; forma staminum differt.

Frutex parasiticus. *Ramuli* fusci usque fusco-purpurei, squamuloso-furfuracei, senectute glabrescentes, crebre foliosi, internodiis 1-3 cm. longis. *Folia* opposita, orbicularia vel suborbicularia, late elliptico-oblonga vel nonnunquam obovata, apice late rotundata, raro leviter emarginata, basi rotundata vel obtusa vel rarius acuta, 1-6.5 cm. longa, 0.7-5.2 cm. lata, apicem ramulorum versus valde decrescentia, coriacea, opaca, siccitate purpurascens rugulosa, satis conspicue 5-7-plinervia, nervis ramosis ac apicem versus anastomosantibus; petiolus furfuraceus, crassus, 2.5-5 mm. longus. *Glomeruli* axillares ut ramuli squamuloso-furfuracei, e ternationibus 2-6 conspicue pedunculatis compositi, ad 7 mm. longi; pedunculi ternationum 1-3 mm. longi; bractearum cupulae circiter 1 mm. altae, ad 2.5 mm. latae, lobis late triangularibus. *Flores* hermaphroditi, flavo-virides. *Hypanthium* cupulare, 1 mm. altum, 1.2 mm. latum, apice irregulariter lobatum minutissime ciliolatum. *Petala* 6, lineari-oblonga, 1.8-2 mm. longa, 0.5 mm. lata. *Stamina* longiora duos petali trientes saepe excedentia, breviora vix attingentia, infra medium inserta, filamentis parte libera ad 0.3 mm. longa; longiora filamentis latis incrassatis, basi ac apice petalo aequilatis, medio utroque latere profunde excavatis; breviora filamentis e basi usque antheras sensim angustatis; antherae utriusque seriei subsimiles, sed eae staminum longiorum magis triangulares, omnes locellis subaequalibus, connectivis brevissime obscure obtuse productis. *Ovarium* obovoideo-subglobosum, disco minute lobulato; stylus ad 1.25 mm. longus, lineari-clavatus, tum prope apicem subito contractus ac utroque latere excavatus. *Bacca* ovoideo-ellipsoidea, ad 4 mm. longa, circiter 2 mm. diametro.

BRITISH GUIANA. Moraballi Creek, Essequibo River, Sept.-Oct., 1929, *Sandwith* 313 (type) and 421: parasite on the crowns of large trees in wallaba and mixed forest; flowers yellowish-green; filaments reddish-brown; anthers yellowish. Near Bartica, Essequibo River, 1886-7, *Jenman* 2534, 3635, 3639. Demerara River, 1889, *Jenman* 5344.

Duplicates are distributed to New York, Rio de Janeiro, Utrecht and Berlin.

MORACEAE.

Ficus Parkeriana (Miq.) *Sandwith*, comb. nov.—*Pharmacosycea Parkeriana* Miq. in Hook. Lond. Journ. Bot. vii. 71 (1848).

BRITISH GUIANA. Without locality, *Parker* (type). Demerara River, July 1907, *F. C. Foote*. Moraballi Creek, Essequibo River, Oct. 1929, *Sandwith* 473: epiphytic shrub at 80-100 ft., sending down thick laticiferous roots; receptacles pink.

Wrongly referred by the Index Kewensis to *F. Parkeri* Miq., which is a totally different species.

The following account of a new species of *Ogcodeia* is kindly contributed by Dr. J. Mildbraed of Berlin:

***Ogcodeia guianensis* Mildbr.** in Notizbl. Bot. Gart. Berlin, xi. 422 (1932).

Small tree, about 50 feet high. *Young branchlets* glabrous, chestnut-brown when dry, a little shining, 2 mm. thick. *Leaves* shortly petioled, petiole 3-6 mm. long, 1 mm. thick; lamina oblong, obtuse and nearly always inaequilateral at the base, acuminate at the apex, acumen 10-12 (in the smaller ones 5) mm. long, very obtuse, 6-14 (mostly about 12) cm. long and 1.7-4.5 (mostly 3-4) cm. broad, quite glabrous; midrib prominent on both sides, on the upper more than on the lower, lateral nerves 12-16 at each side of the midrib, nearly straight, arcuately united at about 2 mm. from the margin, with the reticulated veins not very conspicuous on the upper surface, more prominent on the lower. *Female receptacles* in the fruiting stage depressed-globose, about 4 cm. diam., not surrounded by perianth-like large bracts at their base, subsessile; tubercles of the receptacle (the free tips of the perianth-leaves) nearly as broad at their base as high (4-5 mm.), irregularly 3-5-gono-pyramidal, obtusely apiculate at the apex, almost woody, gradually changing towards the base into smaller and smaller, bract-like, but always thick and woody, appressed scales; styles in a younger receptacle only half as long as the tubercles, divided into two branches about 5 mm. long. *Male inflorescences* at present unknown.

BRITISH GUIANA. Cuyuni River; on the right bank below the Akaio Falls, Nov. 26th, 1929, *Sandwith* 698. (Herb. Kew., Berol., Novobor., Rio de Janeiro.) The inflorescences exude a very sticky, creamy-white latex.

Easily distinguished from all other species of the genus by not having the female receptacles surrounded by large perianth-like bracts at their base.

TRIURIDACEAE.

***Sciaphila* (§*Soridium*) *guianensis* Sandwith**, sp. nov.; *S. Spruceanae* (Miers) Engl. affinis, pedicellis gracilibus fructiferis multo longioribus, segmentis florum epapillosis, forma antherarum, stylo ovarium superante apice haud obvie incrassato, statim distinguitur; a *S. albescente* Benth. stylo multo brevior apice haud penicellato-piloso differt.

Herba saprophytica, caule sulcato simplici ad 18 cm. alto. *Folia* caulina lineari-subulata, ad 3 mm. longa. *Racemus* 2-4.5 cm. longus; bracteae foliis similes, ad 2.5 mm. longae; pedicelli

loriferi graciles, saepe flexuosi, patuli, 3-5 mm. longi, fructiferi descendentes vel patuli, 7-10 mm. longi. *Flores* albi, inferiores mineae; segmenta 4, ovata, inaequalia, circiter 1.5 mm. longa, 0.5-1 mm. lata; carpella glabra, 0.3-0.4 mm. longa atque diametro, stylo laterali vel subbasali ovarium paullo superante vix duplo longiore apice vix incrassato haud penicellato-piloso. *Flores superiores* masculae; segmenta 4, ovata, inaequalia, 1-1.2 mm. longa, 0.5-1 mm. lata, epapillosa; stamina 2, magna, reniformi-semicircularia, 0.6 mm. alta, 0.8 mm. lata. *Fructus* in capitulis semicircularia, 0.6 mm. alta, 0.8 mm. lata. *Fructus* singulus obovoideo-oblongus, 3 mm. diametro aggregati; fructus singulus obovoideo-oblongus, circiter 1.2 mm. longus, 0.6 mm. diametro, epapillosus.

BRITISH GUIANA. Tinamu Fall, Cuyuni River, March 1931, *Martyn* 304. "Among dead leaves on the forest floor. Flowers white."

Apparently the first record of the occurrence in the Colony of this interesting family.

MARANTACEAE.

***Calathea zingiberina* Koern.** in Bull. Soc. Nat. Mosc. xxxv. pt. 1, 122 (1862); K. Schum. in Engl. Pflanzenreich, Marantac. 110 (1902).

Moraballi Creek, Essequibo River, Nov. 8th, 1929, *Sandwith* 575. Matope Line, Cuyuni River, Feb. 1931, *Forestry Department* record no. 1084.

Distr. Surinam, Brazil (Pará). The first records from British Guiana.

A herb, 3-5½ ft. high, characteristic of bare forest floor on dry hills of mixed forest. The inflorescence is produced from the rhizome and is almost hidden among the dead leaves of the forest floor, so that it is rarely noticed. The colour of the large flowers is a beautiful lemon-yellow. It is interesting to note that Spruce writes of this species, which he discovered by the Rio Aripecurú, Rio Trombetas, that it bore "yellow *Crocus*-like flowers from the root: it covered the top of a sandy hill, under the trees, where the cutias and agoutis had burrowed extensively." (See Notes of a Botanist on the Amazon and Andes, i. 97.)

XXIX.—RESEARCHES ON *SILENE MARITIMA* AND *S. VULGARIS*: VIII.* E. M. MARSDEN-JONES AND W. B. TURRILL.

GENETICS OF ANTHOCYANIN INHERITANCE AND OF OTHER CHARACTERS IN *S. MARITIMA*.

In the third paper of this series (*K.B.* 1929, 171) we refer to the occurrence, in a wild population of *S. maritima*, of plants devoid of anthocyanin in all their parts. Two such plants were collected opposite Wyke Regis and described as Stock-Plants A.7 and A.12 in the paper quoted (pp. 147, 150). Another plant, collected near Porlock, Somerset, was described as A.20 (l.c. 153). The last plant

*Continued from *K.B.* 1931, 397.

had pink immature seeds, but was otherwise devoid of anthocyanin, being of a yellow-green colour. The essential characters of these three plants can be summarized as follows (l.c. 168) :—

A.7. L.2.4.6. K.1. C.1.3.5.7.9.12.13. A.1. G.2.4. F.2. Se.1.
A.12. L.1.4.6. K.1. C.1.3.5.7.9.12.13. A.1. G.2.4. F.2. Se.1.
A.20. L.2.4.6. K.1. C.2.4.5.8-9.10-11.12.13. A.1-2. G.2.3. F.2. Se.1.

These three plants were crossed in pairs mainly with the object of investigating the genetic behaviour of anthocyanin development and distribution in the various organs. The results of experiments, including selfings and crossings carried on to F_2 generations, are given below.

SELFINGS OF PARENT STOCK-PLANTS.

N.15. Stock-plant 7 selfed, 49 plants in generation, uniform for all characters studied except where stated.

Habit prostrate, stems 2-3.4 dm. long; with barren stems; whole plant absolutely devoid of anthocyanin.

Leaves oblanceolate or narrowly oblong-elliptic to narrowly ovate or obovate, glaucous green.

Inflorescence of 1-3 flowers, erect when in bloom, actinomorphic.

Calyx broad in flower.

Corolla of 38 plants with petals and segments contiguous or overlapping, of 11 with petals overlapping and segments not overlapping, lamina lobed $\frac{3}{4}$, scales well developed, no anthocyanin blotch.

Androecium with filaments white; 47 plants with hermaphrodite, 2 with female flowers.

Gynaeceum with stigmata and immature seeds white.

Ripe capsules obloid with strongly recurved teeth.

Mature seeds armadillo.

Result.—Stock-Plant 7 on selfing bred true for all characters except for divergence of petal segments in 11 plants and in the throwing of 2 females. It would appear that this plant was heterozygous for overlapping or otherwise of petal segments and segregated in a 3.45 : 1 ratio.

N.20. Stock-plant 12 selfed, 79 plants in generation, uniform for all characters studied, except where stated.

Habit prostrate, stems 2.3-4 dm. long; with barren stems; whole plant absolutely devoid of anthocyanin.

Leaves oblanceolate or narrowly oblong-elliptic to narrowly ovate or obovate, glaucous green.

Inflorescence of 1-3 flowers, erect when in bloom, actinomorphic.

Calyx broad in flower.

Corolla with petals and segments contiguous or overlapping, lamina lobed $\frac{3}{4}$, scales well developed, no anthocyanin blotch.

Androecium with filaments white; 65 plants with hermaphrodite, 14 with female flowers.

Gynaeceum with stigmata and immature seeds white.

Ripe capsules of 2 plants broadly ovoid, of 65 obloid, of 12 not scorable, with strongly recurved teeth.

Mature seeds armadillo (5 not scorable).

Result.—Stock-plant 12 on selfing bred true for all characters studied, except in the throwing of 14 females and 2 plants with obloid capsules.

N.18. Stock-plant 20 selfed, 16 plants in generation, uniform for all characters studied, except where stated.

Habit prostrate, stems 2.2-3.2 dm. long; with barren stems; whole plant absolutely devoid of anthocyanin.

Leaves linear to narrowly linear-lanceolate, yellowish green.

Inflorescence of 1-7 flowers.

Calyx of 11 plants broad, of 5 narrow.

Corolla with petals and segments scarcely contiguous, lobed $\frac{3}{4}$, scales not well developed, no anthocyanin blotch.

Androecium with filaments white (?), anthers purple (?); all hermaphrodite.

Gynaeceum with stigmata white, immature seeds pink.

Ripe capsules obloid.

Mature seeds armadillo.

Result.—Stock-plant 20 on selfing bred true for all characters studied, except for a fluctuation or segregation (?) in calyx shape.

F_1 GENERATIONS.

N.21. Stock-plant 7 (seed parent) $\times$ Stock-plant 12 (pollen parent), 93 plants in generation, uniform for all characters studied.

Habit prostrate, stems 1.7-4 dm. long; with barren stems; whole plant absolutely devoid of anthocyanin.

Leaves, *Inflorescence*, and *Calyx* as in generations of parents selfed.

Corolla as in generation of S.-P. 12 selfed (N. 20).

Androecium with filaments white; all hermaphrodite.

Gynaeceum with stigmata and immature seeds white.

Ripe capsules obloid.

Mature seeds armadillo.

Result.—Phenotypically, for the characters considered, the separately collected stock-plants 7 and 12 were alike. On selfing each bred true, except for divergence or overlapping of petal-segments (S.-P. 7) and capsule shape (S.-P. 12). On crossing together their offspring produced no anthocyanin in any organ. In characters of leaves, inflorescence, and calyx they were as the parents. In all corollas the petals and segments overlapped and it would appear that this character dominates over divergence, as, indeed, was expected from the results of selfing S.-P. 7 (see N. 15, above).

N. 19. Stock-plant 20 (seed parent) $\times$ Stock-plant 12 (pollen parent), 23 plants in generation, uniform for all characters studied, except where stated.

Habit prostrate, stems 3-3.5 dm. long; with barren stems₁, medium amount of anthocyanin in stems and calyces.

Leaves in general oblanceolate-linear.

Inflorescence as in generations of parents selfed.

Calyx of 19 plants broad, of 4 narrow.

Corolla in 19 plants with petals and segments contiguous or overlapping, in 4 scarcely contiguous, no anthocyanin blotch.

Androecium with filaments pink, anthers purple; all with hermaphrodite flowers.

Gynaecium with stigmata white, immature seeds pink.

Ripe capsules of 1 broadly ovoid, of 22 obloid.

Mature seeds armadillo.

Result.—Phenotypically the separately collected stock-plants 20 and 12 were alike in being free from anthocyanin, except in the immature seeds of S.-P. 20. On selfing S.-P. 20 bred true for anthocyanin characters and S.-P. 12 also. On crossing together their offspring produced anthocyanin in stems, calyces, filaments, and immature seeds, but not in the stigmata.

N. 22. Stock-plant 20 (seed parent) × Stock-plant 7 (pollen parent), 2 plants in generation, uniform for all characters studied, except where stated.

Habit prostrate, stems 3.5-4 dm. long; with barren stems; medium amount of anthocyanin in stems and calyces.

Leaves, *Inflorescence*, and *Calyx* as in N. 15, except plant No. 1 yellow green, plant No. 2 glaucous green.

Corolla in No. 1 petals and segments overlapping, in No. 2 petals overlapping, segments not overlapping, no anthocyanin blotch.

Androecium with filaments pink, anthers purple; hermaphrodite.

Gynaecium with stigmata white, immature seeds pink.

Ripe capsules obloid.

Mature seeds armadillo.

Result.—The separately collected stock-plants 20 and 7 were alike phenotypically in being free from anthocyanin except in the mature seeds of S.-P. 20. On selfing S.-P. 20 bred true and S.-P. 7 also for anthocyanin characters. On crossing together their offspring produced anthocyanin in stems, calyces, filaments, and immature seeds, but not in the stigmata.

F₂ GENERATIONS.

N. 57. Plant 2 of N. 19 selfed (i.e. F₂ from S.-P. 20 × S.-P. 12), 66 plants in generation.

Habit prostrate, stems 1.3-3.3 dm. long; with barren stems; 28 plants with medium amount of anthocyanin in stems and calyces, 38 with no anthocyanin in these organs.

Leaves as in immediate parent.

Calyx of 59 plants broad, of 7 narrow.

Corolla of all plants with petals and segments overlapping or contiguous, none with anthocyanin blotch. Two plants had each one petal of one flower multilobed.

Androecium with filaments in 24 plants pink, in 37 white; anthers in 23 purple, in 38 yellow-green; 50 plants with hermaphrodite flowers only, 11 with hermaphrodite and female, 5 with female flowers only.

Gynaecium with stigmata of 11 plants pink, of 55 white; immature seeds of 36 pink, of 33 white. The combination pink stigmata and white immature seeds did not occur.

Ripe capsules of 49 broadly ovoid, of 15 obloid.

Mature seeds armadillo.

N. 58. Plant 23 of N. 19 selfed (i.e., F₂ of S.-P. 20 × S.-P. 12), 71 plants in generation.

Habit prostrate, stems 2.4-3.9 dm. long; with barren stems; 29 plants with medium amount of anthocyanin in stems and calyces, 42 with no anthocyanin in these organs. One plant was distinct in having deep yellow-green stems, foliage, and calyces.

Leaves as in immediate parent.

Calyx of 13 plants broad, of 58 narrow.

Corolla in 39 plants with petals and segments overlapping, in 32 petals overlapping and segments not overlapping, none with anthocyanin blotch; in all good scale; in all bilobed.

Androecium with filaments in 10 plants pink, in 33 white; anthers in 20 plants purple, in 23 yellow-green; 26 plants with hermaphrodite flowers only, 17 with hermaphrodite and female, 28 with female flowers only.

Gynaecium with stigmata of 12 plants pink, of 59 white; immature seeds of 39 pink, of 32 white.

Ripe capsules of 36 broadly ovoid, of 13 obloid.

Mature seeds armadillo.

N. 59. Plant 1 of N. 22 selfed (i.e. F₂ of S.-P. 20 × S.-P. 7), 52 plants in generation.

Habit prostrate, stems 1.4-2.4 dm. long; with barren stems; 30 plants with medium amount of anthocyanin in stems and calyces, 22 with no anthocyanin in these organs.

Leaves as in immediate parent.

Calyx of 45 plants broad, of 6 narrow, of 1 unscorable.

Corolla of all plants with petals and segments overlapping or contiguous; none with anthocyanin blotch; in all good scale; in all petals bilobed.

Androecium with filaments in 28 plants pink, in 24 white; anthers in 29 purple, in 23 yellow-green; all hermaphrodite.

Gynaecium with stigmata in 15 plants pink, in 34 white, in 3 unscorable; immature seeds in 40 pink, in 11 white, in 1 unscorable.

Ripe capsules obloid.

Mature seeds armadillo.

N.60. Plant 2 of N.22 selfed (i.e. F_2 of S.-P.20 $\times$ S.-P.7), 56 plants in generation.

Habit prostrate, stems 2-3.4 dm. long; with barren stems 42 plants with medium amount of anthocyanin in stems and calyces, 14 with no anthocyanin in these organs.

Leaves as in immediate parent.

Calyx of 48 plants broad, of 8 narrow.

Corolla in 22 plants with petals and segments overlapping, in 34 petals overlapping and segments not overlapping; in one plant only anthocyanin blotch in petals; in all good scale; in all petals bilobed.

Androecium with filaments in 23 plants pink, in 31 white; anthers in 42 purple, in 12 yellow-green, in 1 unscorable; 54 with hermaphrodite flowers, 1 with female, 1 unscorable.

Gynaeceum with stigmata of 4 plants pink, of 50 white, of 2 unscorable; immature seeds of 42 pink, of 13 white, of 1 unscorable.

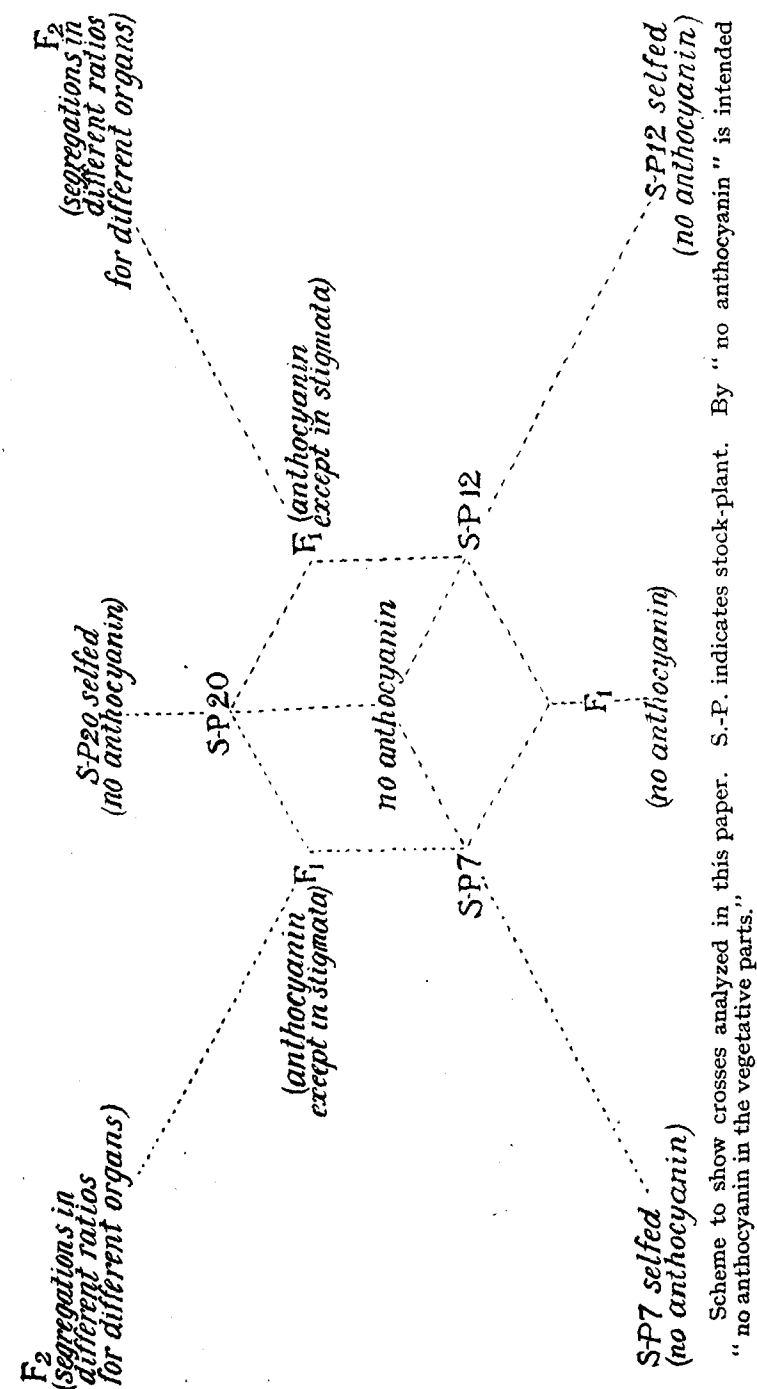
Ripe capsules obloid.

Mature seeds armadillo.

DISCUSSION AND CONCLUSIONS.

Habit. All the plants investigated were clearly *S. maritima* and there were no divergences from characters already known for the species. Thus, the plants in all generations were prostrate and had barren stems like the stock-plant parents, while their flowers were actinomorphic.

Anthocyanin development. Before considering the results of scoring the selfings, F_1 and F_2 generations, it should be stated that, in general, in scoring bred material we simply contrast presence of anthocyanin with its complete absence. It is evident, from the results given below and from other published and unpublished results, that anthocyanin development and distribution in different organs (in *S. maritima* and *S. vulgaris*) depends on a number of genes which can be inherited independently. On the other hand, we know that there are environmental factors which interact with the gene complex to modify the intensity of colour. The hue of colour is, at least most often, the same (Eupatorium purple) in all organs where it occurs. Its pure appearance is, however, often masked, as by the green of the vegetative parts and the yellow-green of the anthers. There is some evidence that the tint (most often Laelia Pink or Pale Laelia Pink) is partly controlled by genes, possibly of cumulative behaviour. The action of environmental factors (such as drought, frost, disease, and mechanical injury), however, so overlaps that of the modifying genes that we have not found it practicable to score for colour intensity. Moreover, colour of detached organs often changes quickly and age of the organ also affects tint. The small size, texture, and pellucid appearance of some of the organs (filaments and stigmata, for example), and changes in moisture and light also set limits to the scoring of small differences in tone when very large numbers of varieties have to be dealt with in the fresh state. The



curious differences in anthocyanin development and distribution in sea-coast, inland, and high-mountain populations of the species we are dealing with in this series will be discussed in later papers. It is, however, advisable to state that these differences have such high statistical significance that they cannot be regarded as accidental. The possible physiological functions of anthocyanin are well summarized by Onslow: *The Anthocyanin Pigments of Plants*, ed. 2, pp. 9, 82-104 (Cambridge, 1925). A comparison of our conclusions should also be made with those of Emerson for maize (Cornell Univ. Agric. Expt. Stat. Memoir, 39: 1921).

The three stock-plants used were devoid of anthocyanin in all parts with the exception of the pink immature seeds of S.-P.20. On selfing they all bred true for general lack of anthocyanin, except that all offspring of S.-P.20 selfed had pink immature seeds.

The results obtained in the F_1 and F_2 generations can be summarized as follows:—

F_1

N.21 (=S.-P.7 × S.-P.12) gave no anthocyanin in any organ.

N.19 (=S.-P.20 × S.-P.12) gave anthocyanin in stems, calyces, filaments, anthers, and immature seeds, but not in petals and stigmata.

N.22 (=S.-P.20 × S.-P.7) gave anthocyanin in stems, calyces, filaments, anthers, and immature seeds, but not in petals and stigmata.

F_2

It will be noted that N.57 and N.58 are selfings of sibs as are also N.59 and N.60.

F_2 s from S.-P.20 × S.-P.12.			F_2 s from S.-P.20 × S.-P.7.		
	With anthocyanin	Without anthocyanin		With anthocyanin	Without anthocyanin
N.57 stems ...	28	38	N.59 stems ...	30	22
N.58 " ...	29	42	N.60 " ...	42	14
	57	80		72	36
N.57 filaments ...	24	37	N.59 filaments ...	28	24
N.58 " ...	10	33	N.60 " ...	23	31
	34	70		51	55
N.57 anthers ...	23	38	N.59 anthers ...	29	23
N.58 " ...	20	23	N.60 " ...	42	12
	43	61		71	35
N.57 stigmata ...	11	55	N.59 stigmata ...	15	34
N.58 " ...	12	59	N.60 " ...	4	50
	23	114		19	84
N.57 immature seeds	36	33	N.59 immature seeds	40	11
N.58 " "	39	32	N.60 " "	42	13
	75	65		82	24

In N.57, N.58, and N.59 all plants were without petal blotch. In N.60 one plant had the petals blotched with anthocyanin.

The following tentative suggestions are offered as possible or partial explanations of the results obtained:—

Stems. It is obvious that the interaction of a number of genes is necessary for anthocyanin production and consequently a number of genotypically different plants may be phenotypically alike in the absence of anthocyanin. S.-P.20 × S.-P.12 (N.57 and N.58) gives ratios (from each of two F_1 sibs) approximating closely to 27:37, a modification of a trihybrid ratio. S.-P.20 × S.-P.7 gives different ratios from each of two F_1 sibs, namely 9:7 (very nearly) and 3:1 (exactly). This strange result prevents the application of any simple scheme involving only complementary genes. There can be little doubt that complementary genes are involved and it seems possible that S.-P.20 contains an inhibiting gene (or inhibiting genes) whose action is absent in N.60. Whether this is due to chromosome aberrations, to an unknown action of the gene complex, or to some other cause we cannot say.

Filaments. The numbers available for filaments and anthers are less than for other organs by the number of female plants, all except one of which occurred (in F_2 s) in N.57 and N.58. For anthocyanin in filaments in N.57 the ratio 24:37 approximates closely to the 27:37 ratio and possibly the totals for the F_2 of S.-P.20 × S.-P.12 should be accepted as representing the same ratio. It is probable that some filaments with traces of anthocyanin were wrongly scored owing to extreme dilution through reaction to external factors (a difficulty we have often encountered in scoring the pellucid filaments). In the F_2 s from S.-P.20 × S.-P.7 the ratio 9:7 is nearly attained in N.59, but not in N.60.

Anthers. The figures obtained approximate in their ratios so closely to the ratios obtained for anthocyanin in the vegetative parts that a similar explanation must probably apply.

Although we suggest the same ratios for F_2 s for anthocyanin in stems, filaments, and anthers, it must be pointed out that all possible combinations for its presence or absence in these organs have been scored in the course of our *Silene* studies. Even if the basic genes for colour production are the same throughout at least much of the plant, and there is some evidence for this, their localized action in any given organ is genetically controlled by other genes, which may be such as set time limits to the action of one or more inhibitors. Localization in developing organisms can be equally well expressed in terms of succession in time as in terms of space, when the sequence of development is known.

Stigmata. Anthocyanin first appeared in F_2 plants. The original stock-plants could therefore be assigned any formulae which postulated that they bred true to absence of anthocyanin on selfing and produced some F_2 s having complementary factors, A and B, and an inhibitor, I, in the heterozygous condition. As, for example,

S.-P.20=A A b b I I.

S.-P.12=a a B B i i.

S.-P.7=a a B B i i.

There would then be expected ratios in the F_2 s of 9:55, those obtained being 23:114 and 19:84, which are slightly low on the coloured side.

Immature seeds. The ratios for N.57 and N.58 approximate to 9:7, those for N.59 and N.60 to 3:1. Immediate parents with complementary gene composition a b A B and A b A B would give these ratios on selfing.

Leaves. In all F_2 generations the leaves were as in the immediate F_1 parents. No striking divergencies from the specific norm occurred in any plants considered in this paper.

Calyx. In all the original parents this was broad. On selfing, S.-P.7 gave all broad, S.-P.12 gave all broad, and S.-P.20 gave 11 broad and 5 narrow.

F_1 . N.21 (S.-P.7 × S.-P.12) gave all broad.

N.19 (S.-P.20 × S.-P.12) gave 19 broad and 4 narrow.

N.22 (S.-P.20 × S.-P.7) gave all broad (2 plants only).

F_2 . N.57 (N.19, Plant 2, with broad calyx, selfed) gave 59 broad and 7 narrow.

N.58 (N.19, Plant 23, with narrow calyx, selfed) gave 13 broad and 58 narrow.

N.59 (N.22, Plant 1, selfed) gave 45 broad and 6 narrow.

N.60 (N.22, Plant 2, selfed) gave 48 broad and 8 narrow.

There is a considerable range in calyx shape within the species but our scoring has been into two classes only owing to the practical impossibility of satisfactory finer classification (see *Kew Bull.* 1929, p. 159). In spite of our wide class ranges there can be no doubt from the above figures that the characters broad and narrow calyx have a genetic basis and that in general terms broad is dominant over narrow. S.-P.20 is heterozygous, 7 and 12 are homozygous. N.19, an F_1 with S.-P.20 for one of its parents, segregated. N.22, also an F_1 with S.-P.20 for one of its parents, would no doubt have shown segregation had the generation been large enough. Segregation occurred in all generations in which S.-P.20 was involved. The immediate parents of N.57, N.59, and N.60 had broad calyces and the F_2 showed preponderance of broad calyces over narrow in ratios approximately between 8:1 to 6:1. On the other hand, the generation of N.58, whose immediate parent had narrow calyces, showed a preponderance of narrow calyces over broad in approximately a 4:1 ratio.

Corolla. In S.-P.s 7 and 12 the petals and segments all overlapped, in S.-P.20 they were scarcely contiguous. The following table summarizes the breeding results:—

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	Petals and segments overlapping.	Petals overlapping, segments not overlapping.	Petals and segments scarcely contiguous.
N.15 (S.-P.7 selfed) ...	38	11	0
N.20 (S.-P.12 selfed) ...	79	0	0
N.18 (S.-P.20 selfed) ...	0	0	16
N.21 (S.-P.7 × S.-P.12) ...	93	0	0
N.19 (S.-P.20 × S.-P.12) ...	19	0	4
N.22 (S.-P.20 × S.-P.7) ...	1 (Plant 1)	1 (Plant 2)	0
N.57 (N.19 Plant 2 selfed) ...	66	0	0
N.58 (N.19 Plant 23 selfed) ...	39	32	0
N.59 (N.22 Plant 1 selfed) ...	52	0	0
N.60 (N.22 Plant 2 selfed) ...	22	34	0

It would appear from the above figures for selfing that S.-P.12 is homozygous for overlapping of petals and segments, S.-P.7 is heterozygous for overlapping of segments, and S.-P.20 is homozygous for a peculiar intermediate condition. In N.21 the overlapping of S.-P.12 completely dominates. In N.19 instead of clear dominance S.-P.20 completely dominates. In N.22 4 plants out of 23 showed the condition of S.-P.20. In N.22 (involving S.-P.7) one plant had segments overlapping, the other had them not overlapping. S.-P.20 is involved in all the F_2 generations and doubtless accounts (with or without S.-P.7) for the segregation. N.57 was derived from an immediate parent with overlapping petals and segments and bred true to this character. Its sib generation, N.58, was derived from an immediate parent with corolla of the nature of S.-P.20 and threw almost as many plants with petals overlapping and segments not overlapping as of those with overlapping petals and segments. Again, N.59 was derived from an immediate parent with petals and segments overlapping and was uniform. Its sib generation, N.60, on the other hand, was derived from a parent with not overlapping segments and showed segregation. In spite of its uniform selfed generation it is obvious that S.-P.20 (perhaps in addition to S.-P.7) causes segregation in some F_2 generations. It appears that definite overlapping of segments is dominant over their not overlapping. Conclusions regarding the genetics of the overlapping of petals (as distinct from the overlapping of the two laminar segments of a single petal) cannot be reached in the plants here considered.

In the stock-plants, selfings, F_1 and F_2 generations, all plants had petals bilobed (bisegmented) for $\frac{3}{4}$ of their laminar length.

Sex. S.-P.7 and S.-P.12 had only hermaphrodite flowers, S.-P.20 had both hermaphrodite and female flowers. The following is a tabulation of the results obtained on breeding:—

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		<i>Hermaphrodite</i> (or hermaphrodite and female)	<i>Female only.</i>
N.15 (S.-P.7 selfed)	...	47	2
N.20 (S.-P.12 selfed)	...	65	14
N.18 (S.-P.20 selfed)	...	16	0
N.21 (S.-P.7 × S.-P.12)	...	93	0
N.19 (S.-P.20 × S.-P.12)	...	23	0
N.22 (S.-P.20 × S.-P.7)	...	2	0
N.57 (N.19 Plant 2 selfed)	...	61	5
N.58 (N.19 Plant 23 selfed)	...	43	28
N.59 (N.22 Plant 1 selfed)	...	52	0
N.60 (N.22 Plant 2 selfed)	...	54	1

Phenotypic characters alone give no insight into the genotypic nature of a plant for sex in *Silene*. Our general experience enables us to say that three groups can be determined but only after critical cultural and genetical investigation of individuals. These groups are (1) constantly hermaphrodite, (2) fixed (at least in *S. vulgaris*) or nearly fixed female, and (3) plants producing at the same or at different times female and hermaphrodite flowers, the former or the latter often much the more numerous. Under these conditions, for the particular crosses considered in this paper, we merely point out that S.-P.20 showed marked segregation on selfing, that no purely female plants appeared in F_1 generations, and that S.-P.20 was a grandmother of all F_2 generations and doubtlessly accounts for what segregation they show.

Mature seeds. All the original stock plants involved in the crosses here described, all selfed offspring, and all the plants of the F_1 and F_2 generations had armadillo seeds. We have previously shown (K.B. 1928, 17) that in interspecific hybrids (involving *S. vulgaris* and *S. maritima*) the armadillo testa is recessive to the tubercled. For *S. vulgaris* we have also stated (K.B. 1931, p. 352) that "it seems from our work up to the present that 'armadillo' is a very clear-cut recessive character." The breeding results given in the present paper are quite in agreement with "armadillo" being also recessive within the species *S. maritima*. It should be recalled that armadillo seeds are much more frequent as a general rule in populations of *S. maritima* than in populations of *S. vulgaris* (excluding high mountain populations).

Summary.

1. An account is given of the selfing and crossing in pairs of three plants of *Silene maritima*. Two of the crosses were carried on to the F_2 generations.

2. Anthocyanin production is shown to be due genetically to the interaction of several genes. It may or may not occur in almost

any of the vegetative or floral parts. Tentative explanations are given.

3. In general terms broad calyx is dominant over narrow.

4. Definite overlapping of petal segments is dominant to their not overlapping.

5. Figures are given for segregation of plants with female flowers only.

6. Armadillo testas alone occurred in the plants considered in this paper.

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XXX.—ON THE IDENTITY OF *ACONITUM ACAULE* DIELS. H. K. AIRY-SHAW.

The purpose of this note is to clear up a certain amount of confusion in which two Chinese species of *Aconitum*, Sect. *Napellus* (sens. lat.), closely allied to *A. venatorium* Diels and *A. coriophyllum* Hand-Mzt., have been involved. It will be convenient to review the question chronologically.

In 1904, Finet and Gagnepain described as *Aconitum Napellus* var. *acaule* a very distinct plant collected by Delavay in 1884, near Tali, Yunnan. Part of this gathering exists in the Kew Herbarium. The specimen is in bud, the young buds being protected by conspicuous, large, deep bluish bracts. The leaves are remarkable for the extremely numerous, long, narrow, linear lobes, into which the principal segments are divided almost to the base. The indumentum of the inflorescence is composed of two kinds of hairs: short, dense, golden-yellow, straight, spreading, mostly glandular hairs, forming a conspicuous velvety tomentum especially on the younger parts; and equally dense, but rather shorter and finer, white, often decurved, eglandular hairs, not easily seen without careful scrutiny.

In 1909, Hector Lévillé described an *Aconitum Duclouxii* from material collected by Jean Py in 1906 near Pin-Tchouan, also in Yunnan. The type specimen in Herb. Edin. has been examined, by courtesy of the Regius Keeper, and it is found to agree perfectly with the plant described by Finet and Gagnepain. This identification has also been noted by Dr. Handel-Mazzetti on the type-sheet of *A. Duclouxii*.

In 1912, Dr. L. Diels described several new species of *Aconitum* from material collected by Forrest in Yunnan, among which were *A. venatorium* Diels and "*A. acaule* (Fin. et Gagnep. sub tit. var.) Diels." The reason for placing the latter name in quotation marks will presently appear. *A. venatorium* was stated by Diels to be near "*A. acaule*." It is certainly distinct from any previously described species. The segments of the leaves are variously divided, sometimes into few, short, broad, oblong lobes, at other times cut into

numerous narrow laciniae almost as in *A. Duclouxii*, and the indumentum of the inflorescence consists of hairs of only one type, namely the second, white, eglandular type described for *A. Duclouxii*, in this case easily visible, though more minute and closely tomentellous.

An examination of the specimens cited by Diels under his "*A. acaule*" shows that they, unfortunately, do not agree with the type specimen of Finet and Gagnepain's *A. Napellus* var. *acaule*. They are, in fact, more or less intermediate between that plant and *A. venatorium*, the glandular constituent of the indumentum agreeing with that of the former, the eglandular with that of the latter. The leaves are generally smaller and less divided than either: in any case they never approach the remarkable laciniation of var. *acaule*.

It seems clear, therefore, that Diels, when making the new combination *Aconitum acaule* (Fin. et Gagnep.) Diels for the plant of Finet and Gagnepain and applying it to Forrest's specimens, had not seen the original type (as indeed might also be inferred from the fact that he does not cite it), and that he was basing his identification solely on Finet and Gagnepain's brief description. This new combination, however, cannot be used for those authors' var. *acaule*, when raised to specific rank, since Lévillé had already independently described the same group as a species under the name *Aconitum Duclouxii*. (He probably did this in ignorance of Finet and Gagnepain's work.) Nor can the combination be employed for the plant which Diels actually described, since it was explicitly based upon *A. Napellus* var. *acaule* Fin. et Gagnep. The new name *A. Dielsianum* is therefore proposed for the species described by Diels under the name *A. acaule*.

A. Inflorescentiae indumentum heterotrichum: pili breves, recti, patentes, aurei, plerumque glandulosi, tomentum velutinum sistentes, cum pilis aliis minoribus tenuioribus decurvis albis eglandulosis intermixtis:

(a) Foliorum segmenta primaria in lacinias lineares longas angustas numerosissimas profunde composito-pinnatifido-dissecta; flores purpurascens.....1. *Duclouxii*

(b) Folia in segmenta primaria 3 fere libera cuneatim divisa; segmenta lateralium quam segmentum medium rhomboideum subduplo maiora, in duas partes subaequales usque $\frac{2}{3}$ divisa; hae partes invicem in duas partes usque $\frac{1}{2}$ divisae; omnia apice modice inciso-lobata; flores caerulescentes; indumentum brevissime tomentellum.....

(c) Folia crassissime coriacea, sicut ea *A. Dielsiani* in segmenta primaria 3 fere libera divisa, sed basi segmentorum lateralium latissime cuneata dein reniformi-flabellata, marginibus lateralibus (ipsa basi excepta) valde imbricatis vel sibi incumbentibus; lobuli ultimi lati, breves; flores viridulo-flavi.....3. *coriophyllum*

B. Inflorescentiae indumentum homotrichum: pili minuti, decurvo-adpressi, albi, eglandulosi, tomentellum brevissimum soli sistentes; folia inter ea *A. Duclouxii* et ea *A. Dielsiani* intermedia; flores caeruleo-purpurei.....4. *venatorium*

The four species here dealt with have the following characters in common: *Leaves* few, mostly basal, very long-petiolate; *inflorescence* leafless; *pedicels* erect, often almost adpressed to the main stem; *carpels* 5. A specimen in Herb. Edin. from Upper Burma (Farrer 1896), the flowers of which are stated by the collector to be "typically pale china-blue, to a deeper shade," and whose indumentum appears to consist exclusively of the golden-velvety glandular type, probably represents an undescribed species closely related to *A. Dielsianum*.

Among less closely allied species, *A. stylosum* Stapf (*A. euryanthum* Hand.-Mazz.) may be easily distinguished by its inflorescence distinctly leafy below, its spreading pedicels, and its very long styles; *A. Souliei* Fin. et Gagnep. by its compound racemose inflorescence, the conspicuously golden-velvety flowers often being congested into false umbels at the ends of the branches. *A. transsectum* Diels (type, Forrest 2868) is separable by means of its eglandular but yellowish indumentum, and by its 3 carpels. Two other gatherings, Forrest 10845 and Forrest 11249, with 3-4 carpels, indumentum very similar to that of *A. venatorium*, and leafy stem, are possibly but doubtfully also referable to *A. transsectum*.

1. *Aconitum Duclouxii* Lévillé in Fedde, Rep. Spec. Nov. vii. 99 (1909).—*A. Napellus* var. *acaule* Finet et Gagnepain in Bull. Soc. Bot. France, li. 512 (1904); Contr. Fl. As. Or. i. 209 (1905). *A. acaule* (Fin. et Gagnep.) Diels in Notes Roy. Bot. Gard. Edinb. v. 270 (1912), excl. descr. et specim. cit. *A. sp. aff. venatorium* Diels, Auctt. Edin. in Notes Roy. Bot. Gard. Edinb. xiv. 290, 328, 353 (1924).

YUNNAN. Chao-Chang, près Pin-Tchouan, Aug. 1906, Jean Py in Herb. Bonatiano no. 576 (typus in Herb. Lévl.). Les bois de chênes sur la montagne de Ki chan, alt. 2800 m., près de Tali, 10 Sept. 1884, Delavay 1209 (typus *A. Napelli* var. *acaulis* Fin. et Gagnep.; syntypus in Herb. Kew.): "Fl. bleues.—La racine appelée Toula est très employée comme contre poison." Margins of thickets on alpine meadows on the Chien-chuan-Mekong divide, lat. 26°30' N., long. 99°40' E., alt. 3600-3900 m., Aug. 1922, Forrest 21,985: "Plant of 14-24 inches. Flowers immature, said to be ruddy-purple." Open rocky slopes and in thickets in side valleys on the Chien-chuan-Mekong divide, lat. 26°30' N., long. 99°40' E., alt. 3600 m., Sept. 1922, Forrest 22,327: "Plant of 2½-3 ft. Flowers deep dull rosy-purple." On ledges of cliffs and open rocky slopes amongst scrub on the Chien-chuan-Mekong divide, lat. 26°40' N., long. 99°40' E., alt. 3900 m., Oct. 1922, Forrest 22,601: "Plant of 2-2½ ft. Flowers dull deep bluish-purple."

2. *Aconitum Dielsianum* *Airy-Shaw*, nom. nov.—*A. acaule* Diels in Notes Roy. Bot. Gard. Edinb. v. 270, tantum quoad descr. et specim. cit.; non *A. Napellus* var. *acaule* Fin. et Gagnep.

YUNNAN. In declivitatibus herbosis montis Ts'ang prope Tali, alt. 2500 m., 4 Oct. 1914, *Schneider* 2721: "Flores intense caerulei." Open mountain pastureland on the Tali range to the west of Tali-fu, lat. 25°40' N., alt. 2700–3000 m., Oct. 1904, *Forrest* 280. Open grassy ledges of cliffs on the eastern flank of the Lichiang range, lat. 27°20' N., alt. 3150–3450 m., Oct. 1906, *Forrest* 3089: "Plant of 1–2½ ft. Flowers deep clear blue." Dry ledges, and at the base of cliffs in side valleys on the eastern flank of the Tali range, lat. 25°40' N., alt. 2400–3000 m., Aug.–Oct. 1906, *Forrest* 4691: "Plant of 1½–3 ft. Flowers deep blue." Ledges of cliffs, Tali range, lat. 25°40' N., alt. 3000–3300 m., Sept. 1910, *Forrest* 7193: "Plant of 20–30 inches. Flowers dull blue-purple." Stony open pasture and on ledges of cliffs, side valleys on the Tali range, lat. 25°40' N., alt. 3000 m., Aug. 1913, *Forrest* 11,695: "Plant of 2–3 ft. Flowers deep clear blue." Margins of forests and on heavy pasture, western flank of the Tali range, lat. 25°40' N., alt. 3300 m., Aug. 1917, *Forrest* 15,507: "Plant of 2–3 ft. Flowers light purplish-blue."—Huic speciei probabiliter spectat quoque specimen sequens:—Vallées de montagnes à Lan-ngi-tsin, alt. 3000 m., Juillet, *Maire* 421/1913 (Herb. Edin.): "Aconitum vivace en touffes dressées; fl. bleu-violacé."

3. *Aconitum coriophyllum* *Hand.-Mazz.* in Akad. Anz. Wiss. Wien, Math.-Naturw. Kl. 1925, lxii. 220 (1926); reimpr.: Pl. Nov. Sin. Fortsetz. 36, 3 (1926).

YUNNAN. In regionis calide temperatae ad austro-orient. pagi Dschungdien ("Chungtien") rupestribus supra vic. Loyü ad fl. Yangdse, lat. 27°13' N., substrato schistaceo, alt. circiter 2600 m., 18 Oct. 1916, *Handel-Mazzetti* 12,994: "Flores viridulo-flavi."

4. *Aconitum venatorium* *Diels* in Notes Roy. Bot. Gard. Edinb. v. 269 (1912).

This appears to be the most abundant species of the four. The following numbers collected by George Forrest in YUNNAN are referable to it, field notes and other data being omitted both in order to save space and also because no confusion as yet attaches to this species:—

Forrest 826, 883, 1101, 9222, 9300, 25,218, 25,316, 27,390, 27,440.

The following specimens from the adjacent territory of NORTH-EAST UPPER BURMA also appear to belong to this species:—

Forrest 27,550; *Farrer* 1310 (Hpimaw Pass, opener places and glades and pathsides in the upper alpine woodland, abundant, alt. 3000–3150 m., 16 Sept. 1919: "Flowers of dark musty purple"); *Farrer* 1376 (Luksang Bum, occasional, in open places, near the top of the mountain, alt. 2550 m., 5 Oct. 1919: "Flowers bright purple, but may= *F[arrer]*. 1310").

A form occurs in which the petals lack the typical gibbous backwardly directed sac or spur: this may be distinguished as—

var. *ecalcaratum* *Airy-Shaw*, var. nov. petalis plus minus rectis haud vel vix uncinato-calcaratis.

YUNNAN. Sine loc. spec., Sept. 1917, *Forrest* 16024 ("duplicate of 1905"). Margins of thickets and by streams, N'Maikha-Salwin divide, lat. 25°50' N., alt. 2100–2400 m., Sept. 1919, *Forrest* 18,478: "Plant of 2–2½ ft. Flowers purplish-blue." Margins of woodland in side valleys, Shweli-Salwin divide, lat. 25°30' N., long. 98°58' E., alt. 3000 m., Nov. 1924, *Forrest* 25,358: "Plant of 2½–4 ft. Flowers deep-blue purple." On open grassy slopes, hills north of Tengyueh, lat. 25°30' N., lat. 98°30' E., 2400–2700 m., Oct. 1924, *Forrest* 25,996: "Plant of 3–4 ft. Flowers deep purplish-blue."

NORTH-EAST UPPER BURMA. On stony alpine meadows, western flank of the N'Maikha-Salwin divide, lat. 26°45' N., long. 98°48' E., alt. 4200 m., Oct. 1925, *Forrest* 27,444: "Plant of 3 ft. Flowers dull purplish-blue."

The writer desires to express once again his gratitude to Professor W. Wright Smith for the loan of copious material from the Edinburgh Herbarium.

XXXI.—NEW OR LITTLE KNOWN PLANTS FROM SOUTH INDIA. I.

Hopea Jacobi *C. E. C. Fischer*, sp. nov. [Dipterocarpaceae]; *H. jucundae* Thw. et maxime var. *modestae* A. DC. affinis, ab utraque foliorum nervis secundariis numerosioribus, tertiariis irregularibus, axillis nervorum eglanduliferis, petalis minute puberulis nec sericeis, strictura inter ovarium et stylopodium manifesta, distinguenda.

A tree, quite glabrous except the petals. Ultimate twigs slender, dark-brown, almost black when dry. Leaves chartaceous, ovate, caudate-acuminate, obtuse or subacute, base rounded, 5.5–8.5 cm. long, 2.6–4 cm. wide, margins entire, subundulate, midrib, 5–6 pairs of lateral nerves, the irregular tertiary nerves and the fine reticulations slightly prominent below; petioles 0.8–1 cm. long. Panicles axillary and terminal, solitary or twin, narrowly racemose, shorter than the leaves; rhachis and its branches filiform; bracts minute. Flowers secund, up to 7 on a branch; pedicels very short, rather stout, enlarged upwards. Sepals coriaceous, the inner with thin margins, subcircular, 1.5 mm. long. Petals oblong, obtuse, 3.25 mm. long, minutely ciliate and minutely puberulous without. Stamens 15; filaments 0.7 mm. long, the lower half dilated and abruptly narrowed into a filiform upper half; anthers circular, flat, 0.3 mm. diam. with a fine, straight arista 2½–3 times as long. Ovary subglobose, with a narrower ovoid stylopodium nearly as long, slightly constricted between the two, together 1.25 mm. long; style very short. Fruit not seen.

Coorg, *K. Cherian Jacob* 16903.

Embelia adnata Bedd. apud C. B. Clarke [Myrsinaceae].

Known from a single sheet in the Kew Herbarium, collected by R. H. Beddome in the Bolampatti Hills near Coimbatore.

High Wavy Mountains, Sept., K. C. Jacob in Madras Herbarium 77056.

Beddome's specimen is in flower and the fruit was unknown. Its leaves are rather larger than those of Jacob's specimen and are nearly always acute; the High Wavy Mountain specimens have leaves rounded or slightly emarginate at the apex and are 2.7–7.5 cm. long, 1.1–3.5 cm. wide. The fruit are globose, 2–2.5 mm. diam., gland-dotted, usually with persistent style.

Eriochrysis Rangacharii C. E. C. Fischer, sp. nov. [Gramineae-Andropogoneae]; *E. purpuratae* Stapf affinis, sed internodii supremo villosi, racemorum pedicellorumque nodis hirsutis, glumis enerviis, gluma superiore carinata, omnibus spiculis staminiferis differt.

Tufted perennial herb. Culms erect, 12–30 cm. long, 3-noded, upper node not or shortly exserted, nodes softly villous with spreading white hairs; lower internodes usually glabrous, sometimes sparsely short-hairy; uppermost node increasingly white-villous upwards, densely so just below the panicle. Leaf-sheaths rather tight, sulcate, glabrous below, increasingly white-villous upwards; ligules short, rounded, rigidly chartaceous, shortly ciliate; blades very narrow, rigid, involute below, plicate or more or less flat with involute margins above, acuminate, those from the innovations up to 21 cm. long and 5 mm. wide, the upper much shorter and narrower, uppermost sometimes only 3.5 cm. long, softly white-villous on both faces, secondary nerves several, varying with the width of the leaf. Panicle narrow, 3.5–6.5 cm. long, rather dense; racemes 3–4, sessile, up to 3 cm. long; joints at the base 2.5 mm. long. Sessile spikelet narrowly lanceolate, 5.5–6.2 mm. long, surrounded by rufous hairs up to 2.2 mm. long; lower glume the shape and length of the spikelet, firmly chartaceous, back flat, margins involute and clothed with rufous hairs at least in the upper part, rest glabrous, nerves obsolete or one faint one in each margin; upper glume nearly as long as the lower, rather thinner in texture, boat-shaped, distinctly keeled, acuminate, margins narrowly involute and hairy at least in upper half, keel bearing a few cilia, rest glabrous; lower lemma hyaline, oblong or lanceolate, obtuse or acute, flat, margins very narrowly involute, softly white-hairy, 4–4.3 mm. long, without palea and empty; upper lemma thinly hyaline, linear or lanceolate, more or less concave, subacute, 2–2.3 mm. long, with an apical tuft of hairs $\frac{1}{4}$ – $\frac{1}{2}$ its length; without palea; lodicules 2, minute, obcuneate, or quadrate-obcuneate, apical margin denticulate, the outer angle produced; stamens 3, filaments short, anthers linear, 2.7 mm. long, apex shortly acutely 2-lobed, base deeply 2-lobed, reddish-brown; styles 2, distinct, stigmas long-plumose. Pedicelled spikelet narrowly

lanceolate, acute, 4–4.5 mm. long, densely surrounded by rufous hairs up to 2.2 mm. long; lower glume the shape and length of the spikelet, thinly chartaceous, flat or slightly concave, margins involute and clothed with rufous hairs, the rest glabrous; nerves obsolete or a faint one at each margin; upper glume nearly as long as the lower, thinly chartaceous, boat-shaped, keeled, acute or acuminate, margins narrowly involute and clothed with rufous hairs, with a few hairs on the keel and on the sides near the apex or all over the upper $\frac{2}{3}$; lower lemma hyaline, lanceolate or oblong, acute or obtuse, 3–4.2 mm. long, softly hairy, margins narrowly involute, without palea and empty; upper lemma thinly hyaline, lanceolate or ensiform, more or less boat-shaped and keeled, 1.5–2 mm. long, with an apical tuft of white hairs about $\frac{1}{3}$ its length, without palea. Lodicules, stamens and pistil as in the sessile spikelet. Grain not seen.

Nilgiri Hills, at Pykara, about 6000 ft., June 1900, Sir A. G. and Lady Bourne without number (Herb. Kew.). Sir Alfred Bourne informs me that the plants were found and passed on to him by Rai Bahadur K. Ranga Achariyar.

Isachne setosa C. E. C. Fischer, sp. nov. [Gramineae-Panicaceae]; *I. Lisboa* Hook. f. affinis, glumis caudato-acuminatis, lemmate superiore quam inferiore multo breviora cum palea sua dorso pubescente differt.

Tufted annual herb. Stem slender, 3–13 cm. high, glabrous, angular, branched. Leaves cauline; sheaths loose, ribbed, more or less densely clothed with spreading hairs from tubercular bases, ciliate; ligule represented by a row of hairs; blade ovate to ovate-lanceolate, acute, base rounded, 1–2.8 cm. long, 0.4–1 cm. wide, many-ribbed, glabrous to rather densely set with hairs from tubercular bases, margins narrowly cartilaginous and minutely scabrid. Panicle up to 5 cm. long, of a few alternate, simple or forked racemes up to 1.5 cm. long; rachis and branches trigonous, glabrous. Spikelets 2–5 to a branch, elliptic, but soon gaping; pedicels short or long, angled, glabrous. Glumes rigid, ovate, concave, caudate-acuminate, obtuse, 2–3 mm. long, the lower usually slightly the longer, 7-nerved, more or less setose from large tubercular bases. Lemmas dissimilar; the lower thinly membranous, elliptic, boat-shaped, subacute, 2–2.2 mm. long, nerves obscure, its palea as long, with incurved margins, containing 3 stamens, anthers linear, 1.7 mm. long; the upper lemma very shortly stipitate, crustaceous, broadly ovate to subcircular, deeply concave, 1–1.4 mm. long, densely pubescent, its palea flat with broad inflexed flaps, pubescent on the back, containing the ovary with two free styles (no trace of stamens seen). Lodicules very minute. Seed plano-convex, filling the hardened lemma and palea.

Cochin, at Kavalai, 3000–4000 ft., A. Meebold 12,125 (type); Travancore, at Devicolam; 6000 ft., A. Meebold 13,586. Both sheets in the Breslau Herbarium.

XXXII.—ON THE FLORA OF THE NEARER EAST: XII.*
 DR. GIUSEPPI'S 1931 COLLECTION FROM EUBOEIA AND OTHER PARTS
 OF GREECE. W. B. TURRILL.

In the summer of 1931 Dr. P. L. Giuseppi made an extensive trip through parts of Crete and Greece. His main object was the collecting of living plants for horticultural purposes, but he made an interesting collection of dried specimens, which he has presented to the Herbarium of the Royal Botanic Gardens, Kew. Since our knowledge of plant distribution in Greece is still far from complete the following list, which includes a few plants from earlier collections of Dr. Giuseppi, appears worth publishing. The majority of the plants in this collection come from the Mt. Dirphys (Delphi) region near the centre of the island of Euboea. Euboea has been visited by several botanical travellers, including Sibthorp, Unger, Fraas, Aucher-Eloy, Heldreich, Pichler, and Tuckett. Unger (Wissenschaftliche Ergebnisse einer Reise in Griechenland, 68-90, Wien, 1862) gives an outline account of the vegetation of the central part of the island. Dr. Giuseppi has, however, added several records to those already known and it is evident that Euboea is worthy of a more detailed botanical survey than has yet been made of it.

Viola delphinantha Boiss. Thessaly: Mt. Olympus, 1840 m., 26.6.29, on cliffs in clefts in rocks, flowers scented, No. 56; Mt. Olympus, below the plain of Bara, on rock cliffs, 1840-1990 m., 12.7.31, No. 45.

V. heterophylla Bert. subsp. *euboea* (Hal.) W. Becker. Euboea: Mt. Dirphys, 2.7.31, No. 22B.

V. saxatilis Schmidt subsp. *aetolica* W. Becker var. *heterosepala* W. Becker. Euboea: Mt. Dirphys, 1230 m., 2.7.31, No. 23.

Cerastium candidissimum Correns. Euboea: Mt. Dirphys, 2.7.31, No. 22A.

Dianthus haematocalyx Boiss. et Heldr. Thessaly: Mt. Olympus, just below the plain of Bara, on scree, 1990-2150 m., 12.7.31, No. 46.

D. viscidus Chaub. et Bory. Euboea: Mt. Dirphys, 610-1550 m., 2.7.31, Nos. 12, 14. The specimens under the second number have glandular-puberulous calyces, but the calycine scales are definitely inflated and it has not, therefore, been named var. *Grisebachii* Boiss.

Drypis spinosa L. Euboea: Mt. Dirphys, 2.7.31, No. 20A.

Gypsophila polygonoides Hal. Euboea: Mt. Dirphys, on mountain cliffs, 610-760 m., 2.7.31, Nos. 7, 11.

Lychnis Coronaria (L.) Desv. Euboea: Mt. Dirphys, 610 m., 2.7.31, No. 36.

Hypericum delphicum Boiss. et Heldr. Euboea: Mt. Dirphys, 1550 m., 2.7.31, No. 35.

H. fragile Heldr. et Sart. Euboea: Mt. Dirphys, mountain cliffs, 760 m., 2.7.31, No. 10.

H. olympicum L. Euboea: Mt. Dirphys, 920 m., 2.7.31, No. 34. Approaching the var. *minus* Chaub. et Bory.

Geranium brutium Gasp. (*G. villosum* Ten.?). Euboea: Mt. Dirphys, 2.7.31, No. 26A.

G. lucidum L. Euboea: Mt. Dirphys, 760 m., 2.7.31, No. 22.

G. macrorrhizum L. Euboea: Mt. Dirphys, 1230 m., 2.7.31, No. 30.

G. subcaulescens L'Hér. Mt. Parnassus, 1840-2150 m., 7.7.31, on scree, flowers bright red with no black centre, No. 41.

Acer monspessulanum L. Crete: Nida Plain, 1230 m., 19.6.31, No. 6.

Anthyllis vulneraria L. var. *Spruneri* Boiss. Euboea: Mt. Dirphys, 2.7.31, No. 28A.

Astragalus rumelicus Bunge. Euboea: Mt. Dirphys, 2.7.31, No. 25.

Orobancha hirsuta L. Euboea: Mt. Dirphys, 2.7.31, No. 23A.

Potentilla speciosa Willd. var. *discolor* Hal. Euboea: Mt. Dirphys, 2.7.31, No. 15.

Saxifraga scardica Griseb. Euboea: Mt. Dirphys, 2.7.31, No. 21; Ziria Mtns., 2000 m., 6.6.31, only found in one locality and very few plants alive, No. 1 (var. *erythrantha* Hal., with purple petals).

Pyrus (*Sorbus*) *Aria* Ehrh. var. *cretica* Lindl. Euboea: Mt. Dirphys, 610 m., 2.7.31, No. 17.

Sedum album L. Euboea: Mt. Dirphys, 610 m., 2.7.31, No. 31 (probably the var. *brevifolium* Boiss. = *S. alatum* DC.).

S. hispanicum W. et K. Euboea: Mt. Dirphys, 2.7.31, No. 20B.

Carum meoides Hal. Euboea: Mt. Dirphys, 920 m., 2.7.31, No. 26.

Asperula arcadiensis Sims. Chelmos Mtns., 1700 m., on rocks, 5.6.31, No. 2.

Galium Mollugo L. (sensu Halácsy). Euboea: Mt. Dirphys, 760 m., 2.7.31, No. 27.

Valeriana tuberosa L. Ziria Mtns., 1380-1700 m., 6.6.31, flowers have a delightful odour, No. 3.

Pterocephalus perennis Coult. Euboea: Mt. Dirphys, 1380 m., on cliffs, 2.7.31, No. 24.

Chamaepeuce nutica DC. Euboea: Mt. Dirphys, 610 m., 2.7.31, mountain sides, No. 9.

Crepis incana S. et S. Euboea: Mt. Dirphys, 1550 m., 2.7.31, Nos. 26B, 29.

Campanula Aizoon Boiss. et Sprun. Mt. Parnassus, 1380 m., cliffs, 7.7.31, No. 40.

C. oreadum Boiss. et Heldr. Thessaly: Mt. Olympus, just below the summits Mitka and Stepham, 2460-2920 m., and also below the plain of Bara, cracks in cliffs, 12.7.31, No. 46A.

C. parnassica Boiss. et Sprun. Mt. Parnassus, on scree, 1900 m., 7.7.31, No. 42.

*Continued from *Kew Bull.* 1932, 198.

- C. rupestris* S. et S. Euboea : Mt. Dirphys, 610 m., mountain sides, 2.7.31, No. 8.
- C. rupicola* Boiss. et Sprun. (forma glabrescens). Mt. Parnassus, cliffs and screes, 1840-2300 m., 7.7.31, No. 43.
- C. saxatilis* L. Crete : Pervolitz, 610 m., 9.6.31, No. 5.
- C. Sibthorpiana* Hal. Euboea : Mt. Dirphys, 610-760 m., on screes, 2.7.31, No. 18.
- Diosphaera dubia* Buser. Thessaly : Mt. Olympus, 1080 m., cracks in cliffs, 12.7.31, No. 47.
- Lycopsis variegata* L. Euboea : Mt. Dirphys, 1230 m., 2.7.31, No. 19.
- Orobancha nana* Noë. Euboea : Mt. Dirphys, 1230 m., 2.7.31, No. 28.
- Vitex Agnus-castus* L. Lake Copais, 610 m., sides of ditches, 8.7.31, No. 39.
- Ajuga genevensis* L. Euboea : Mt. Dirphys, 920-1230 m., 2.7.31, No. 21A.
- Amaracus pulchra* Briq. (*Origanum pulchrum* Boiss. et Heldr.). Euboea : Mt. Dirphys, 610 m., 2.7.31, No. 38.
- Sideritis euboea* Heldr. Euboea : Mt. Dirphys, 2.7.31, No. 37.
- Stachys germanica* L. var. *penicillata* Boiss. Euboea : Mt. Dirphys, 760 m., 2.7.31, No. 13.
- Loranthus europaeus* Jacq. Euboea : Mt. Dirphys, 610 m., 2.7.31, No. 33.
- Castanea sativa* Mill. Euboea : Mt. Dirphys, 610 m., 2.7.31, No. 32.
- Fritillaria Guicciardii* Heldr. et Sart. Ziria Mtns., 1780 m., loose stony soil, 6.6.31, No. 4.
- Lilium chalcedonicum* L. Thessaly : Mt. Olympus, 1550 m., 9.7.31, No. 44.

XXXIII.—MISCELLANEOUS NOTES.

Works on Diatomaceae available on loan.—Mr. Frederick Adams, who has been well known for many years as an enthusiastic collector of Diatomaceae, and whose collection now contains some 21,000 slides comprising over 1,000,000 diatoms, fully indexed, has recently been in communication with Kew as to the best means of ensuring that his collection will be permanently maintained, extended and made available for study. Mr. Adams has also built up a comprehensive set of the principal works on Diatoms, many in duplicate. With regard to the latter Mr. Adams wrote :—" If your regulations permit you to lend books to responsible persons, I would give you at once duplicates I have of the principal works on diatoms. They are of considerable intrinsic value and would be of the greatest service to individual workers who cannot afford to buy them, and it would give me the pleasure of knowing that they are being used." As the Kew Library is maintained primarily for workers at that institution, whose researches would be seriously interrupted by

awaiting the return of a book from loan, the regulations do not permit the borrowing of books, and it is considered undesirable to make any exception to this rule. It was felt, however, that Mr. Adams's generous offer should be accepted if possible, and the Bentham Trustees, on being approached, readily agreed to become the custodians of Mr. Adams's gift on the understanding that, though the works could not be incorporated in the Kew Library, they could be deposited there and issued at the discretion of the Director.

The books in question, of which a list is appended, have now been received at Kew, and the Director has pleasure in informing workers on Diatomaceae, who will no doubt greatly appreciate Mr. Adams's public spirit, that on application to him the works can be consulted at Kew or sent on loan to responsible persons on payment of carriage both ways.

- Bailey, J. W.** Notice of some new localities of fossil and recent *Infusoria*. (Amer. Journ. Sci. xlviii.) New Haven, 1845. 8vo. 25 pp. 1 pl.
- Bailey, J. W.** Microscopical examination of soundings made by the U.S. Coast Survey off the Atlantic Coast of the U.S. (Smithsonian Contrib. ii.) Washington, 1851. 4to. 15 pp. 1 pl.
- Bailey, J. W.** Microscopical observations made in South Carolina, Georgia and Florida. (With Appendix : Microscopical forms found near Salem, Mass., by T. Cole, Esq.) (Smithsonian Contrib. ii.) Washington, 1851. 4to. 48 pp. 3 pl.
- Bailey, J. W.** Notes on new species and localities of microscopical organisms. (Smithsonian Contrib. vii.) Washington, 1854. 4to. 16 pp.
- Bailey, L. W.** Notes on new species of microscopical organisms from the Para River, South America. (Journ. Boston Soc. Nat. Hist. vii.) Cambridge, Mass., 1861. 8vo. 23 pp. 2 pls.
- Boyer, C. S.** New and rare species of *Diatomaceae*. (Contrib. Biol. & Misc. Sect. Acad. Nat. Sci. Phil. no. 1.) Philadelphia, 1922. 8vo. 9 pp. 4 pl.
- Brun, J.** Diatomées des Alpes et du Jura et de la région suisse et française des environs de Genève. Genève & Paris, 1880. 8vo.
- Brun, J.** Diatomées : espèces nouvelles marines, fossiles ou pélagiques. (Mem. Soc. de Phys. et d'Hist. Nat. Genève, xxxi.) Genève, 1891. 4to. 48 pp. 12 pl.
- Brun, J., & J. Tempère.** Diatomées fossiles du Japon. Espèces marines & nouvelles des calcaires argileux de Sendai & de Gêdo. (Mém. Soc. de Phys. et d'Hist. Nat. Genève, xxx.) Genève, 1889. 4to. 75 pp. 8 pl. (3 copies).
- Carpenter, W. B.** The microscope and its revelations. Ed. 8, by the Rev. W. H. Dallinger. London, 1901. 8vo.
- Castracane, F.** Report on the *Diatomaceae* collected by H. M. S. Challenger during the years 1873-1876. London, 1886. 4to. (2 copies).

- Castracane, F.** Quale sia l'estensione della vita vegetale nelle profondità del mare. (Atti Congr. Naz. Bot. Crittog. Parma.) [Varese, 1887.] 4to. 7 pp.
- Cleve, P. T.** Diatomacéer från Spetsbergen. (Öfvers. K. Vet.-Akad. Förhandl. 1864, no. 10.) Stockholm, 1864. 8vo. 10 pp. 1 pl.
- Cleve, P. T.** Svenska och Norska Diatomacéer. (Öfvers. K. Vet.-Akad. Förhandl. 1868, no. 3.) Stockholm, 1868. 8vo. 28 pp. 1 pl.
- Cleve, P. T.** Examination of Diatoms found on the surface of the sea of Java. (Bihang K. Svenska Vet.-Akad. Handl. Bd. 1, no. 11.) Stockholm, 1873. 8vo. 13 pp. 3 pl.
- Cleve, P. T.** On Diatoms from the Arctic Sea. (Bihang K. Svenska Vet.-Akad. Handl. Bd. 1, no. 13.) Stockholm, 1873. 8vo. 28 pp. 4 pl.
- Cleve, P. T.** Diatoms from the West Indian Archipelago. (Bihang K. Svenska Vet.-Akad. Handl. Bd. 5, no. 8.) Stockholm, 1878. 8vo. 22 pp. 4 pl. (2 copies).
- Cleve, P. T.** Färskvattens-Diatomacéer från Grönland och Argentinska Republiken. (Öfvers. K. Vet.-Akad. Förhandl. 1881, no. 10.) Stockholm, 1881. 8vo. 12 pp. 1 pl.
- Cleve, P. T.** On some new and little known Diatoms. (K. Svenska Vet.-Akad. Handl. Bd. 18, no. 5.) Stockholm, 1881. 4to. 28 pp. 6 pl. (2 copies).
- Cleve, P. T.** Diatoms collected during the expedition of the Vega. (Vega-Exped. Vetenskapl. Iakttagelser, Bd. iii.) Stockholm, 1883. 8vo. 61 pp. 4 pl. (2 copies).
- Cleve, P. T.** The Diatoms of Finland. (Acta Soc. Fauna et Flora Fenn. viii, no. 2.) Helsingfors, 1891. 8vo. 68 pp. 3 pl. 1 map.
- Cleve, P. T.** Synopsis of the Naviculoid Diatoms. Pts. 1 & 2. (K. Svenska Vet.-Akad. Handl. Bd. 26, no. 2, & Bd. 27, no. 3.) Stockholm, 1894-95. 4to. Pt. 1, 194 pp. 5 pl. Pt. 2, 219 pp. 4 pl.
- Cleve, P. T.** Diatoms from Baffins Bay and Davis Strait collected by M. E. Nilsson. (Bihang K. Svenska Vet.-Akad. Handl. Bd. 22, Afd. 3, no. 4.) Stockholm, 1896. 8vo. 22 pp. 2 pl. (2 copies).
- Cleve, P. T., & A. Grunow.** Beiträge zur Kenntniss der arctischen Diatomeen. (K. Svenska Vet.-Akad. Handl. Bd. 17, no. 2.) Stockholm, 1880. 4to. 121 pp. 7 pl.
- Comère, J.** Diatomées de la Montagne Noire. (Bull. Soc. Bot. France, li.) Paris, 1904. 8vo. 8 pp.
- Deby, J.** Analysis of the diatomaceous genus *Campylodiscus*. London, 1891. 8vo.
- Diatomeentafeln** zusammengestellt [von Weissflog] für einige Freunde. 81 plates. New York [s.a.] 8vo.
- Le Diatomiste**, par J. Tempère. Vol. 1. Paris, 1890-93. 4to.
- Dippel, L.** Beiträge zur Kenntniss der in den Soolwässern von Kreuznach lebenden Diatomeen, &c. Kreuznach, 1870. 8vo. 50 pp. 3 pl.

- Donkin, A. S.** The natural history of British *Diatomaceae*. Parts 1-3. London, [1870-73.] 8vo.
- Du Rietz, G. Einar.** The fundamental units of biological taxonomy (Svensk Bot. Tidskr. Bd. 24.) Uppsala, 1930. 8vo. 86 pp.
- Elmore, C. J.** The Diatoms (*Bacillarioideae*) of Nebraska. (Nebraska Univ. Studies, xxi.) Lincoln, Nebraska, 1921. 8vo. 148 pp. 23 pl.
- Fontell, C. W.** Süsswasserdiatomeen aus Ober-Jämtland in Schweden. (Arkiv f. Bot. Bd. 14, no. 21.) Stockholm, 1917. 8vo. 68 pp. 2 pl.
- Forti, A.** Contribuzioni diatomologiche. Diagnoses Diatomacearum quarundam fossilium italicarum. (Atti R. Ist. Veneto di Sci., lxxii, pte. 2.) Venezia, 1913. 8vo. 116 pp. 19 pl.
- Griffith, J. W., & A. Henfrey.** The micrographic dictionary: a guide to the examination and investigation of the structure and nature of microscopic objects. Ed. 4. London, 1883. 2 vols. (text and plates) in one. 8vo. (3 copies).
- Grove, E., & G. Sturt.** On a fossil marine diatomaceous deposit from Oamaru, Otago, New Zealand. Pts. 1-3 and appendix. (Journ. Quekett Micr. Club, ser. 2, ii & iii.) London, 1886-89. 8vo. 50 pp. 11 pl.
- Grunow, A.** Some critical remarks . . . on the Oamaru Diatom papers of Messrs. Grove and Sturt . . . with annotations by E. Grove. (Journ. Quekett Micr. Club, ser. 2, iii.) London, 1889. 8vo. 5 pp.
- Heribaud Joseph, Frère.** Les Diatomées fossiles d'Auvergne. 1er (-3me) mémoire. Clermont-Ferrand & Paris, 1902-08. 1a. 8vo.
- Hustedt, F.** Die Bacillariaceen-Vegetation des Sarekgebirges. (Naturwiss. Untersuch. des Sarekgebirges in Schwed.-Lappland, geleitet von A. Hamberg. Bd. iii, Lfg. 6.) Stockholm, 1924. 8vo. 102 pp. 6 pl.
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BULLETIN OF MISCELLANEOUS INFORMATION No. 6 1932 ROYAL BOTANIC GARDENS, KEW

XXXIV.—NEW TREES AND SHRUBS FROM TROPICAL AFRICA. J. BURTT DAVY & A. C. HOYLE.

Increasing interest is being taken in the commercial timbers of the British Empire. Before we are in a position to record the actual or even the potential commercial value of the tropical forests of the British Colonies, and to frame a sound policy for their future management, it is necessary to ascertain of what these forests are composed; in other words we must take a census of the trees, as to the number of kinds represented, the relative abundance of each, what qualities they possess, and to what uses they can be put.

There has been a growing realisation by the British Colonial Governments of the need for taking stock of their timber resources. In this they have the warm support of the Colonial Office, and active Forest Services have been built up, comprising men keenly alive to the needs of the situation. In the last three years there has been a remarkable increase of activity on the part of Forest Officers in the collection of botanical specimens from the areas under their control, resulting in a great increase in the amount of material sent home for identification.

The number of tree-species known from each colony is increasing rapidly, and among them numerous species new to science are coming to light. *Chidlowia*, a new genus from the Gold Coast, new species of *Bersama* and of *Ocotea* from Kenya Colony, and a new species of *Mouriria* from Trinidad, all four discovered by Forest Officers, were described recently in the pages of the *Kew Bulletin*.

The present paper describes a new genus and thirteen new species of tropical African woody plants (trees and shrubs) sent by Forest Officers to the Imperial Forestry Institute for identification. These include: five species from the Gold Coast, four collected by Mr. Chidlow Vigne and one by Mr. W. T. S. Brown; two from Nigeria collected by Mr. J. D. Kennedy; one from the Cameroons collected by Mr. A. T. Johnstone; one from Northern Rhodesia collected by Mr. D. Stevenson and others; one from Tanganyika Territory collected by the late Mr. C. Grey; and three from Kenya collected by Mr. C. W. Elliott, Mr. E. Battiscombe, and Mr. H. G. Deakin.

Carpolobia caudata Burtt Davy, sp. nov. [Polygalaceae]; frutex ramuli tenuibus virgatis, foliis oblanceolatis, *C. albae* affinis sed floribus minoribus, foliis angustioribus conspicue caudato-attenuatis, differt; a *C. lutea* sepalis inaequalibus recedit.

Forest Trees and Timbers of the British Empire.*—This volume, the first of an important series dealing with the forest trees and timbers of the British Empire, has certain features which place it considerably in advance of most of the existing literature on the subject. First amongst these is the fact that the descriptions of the timber structure are based on material of which the botanical identity has been definitely established by a study of herbarium material obtained from the same source. Moreover, not only are there very full accounts of the macroscopic and microscopic features of the timbers, but in addition the common, vernacular, and botanical names of the trees, together with historical notes, a full botanical description (in English), notes on distribution, climatic conditions, vegetation type, regeneration and afforestation, diseases, and economic uses are given. In the present issue the following thirteen species of coniferae and Leguminosae are fully described: *Juniperus procera* Hochst., *Widdringtonia Whytei* Rendle, *W. juniperoides* Endl., *Podocarpus gracilior* Pilger, *P. milanjanus* Rendle, *Afzelia quanzensis* Welw., *Baikiaea plurijuga* Harm., *Copaifera mopane* Kirk, *C. coleosperma* Benth., *Piptadenia Buchananii* Baker, *P. africana* Hook. f., *Pterocarpus angolensis* DC., and *P. Stevensonii* Burtt Davy. Brief notes are also given on other African species of some of these genera. The work is well illustrated with line drawings showing floral and morphological features of diagnostic value, and plates showing the trunk or whole of each tree in its natural surroundings, together with photomicrographs of transverse and tangential longitudinal sections of the mature wood. The comprehensive nature of the information brought together is one of the most useful features of the work, and we look forward with great interest to future numbers in this valuable series. C. R. M.

The Koenig Collection in the Lund Herbarium.—In this article, *K.B.* 1932, 72, item 289, second line, the words “var. *pallida* Thw.” should be omitted.

*“Forest Trees and Timbers of the British Empire.” Edited by L. Chalk and J. Burtt Davy. Imperial Forestry Institute, Oxford. I. Some East African Coniferae and Leguminosae, by L. Chalk, M.A., D.Phil., J. Burtt Davy, M.A., Ph.D., and H. E. Desch, B.Sc., M.A. Oxford, at the Clarendon Press. 1932, pp. 68, 10 pls. and numerous figs. Price 5s.

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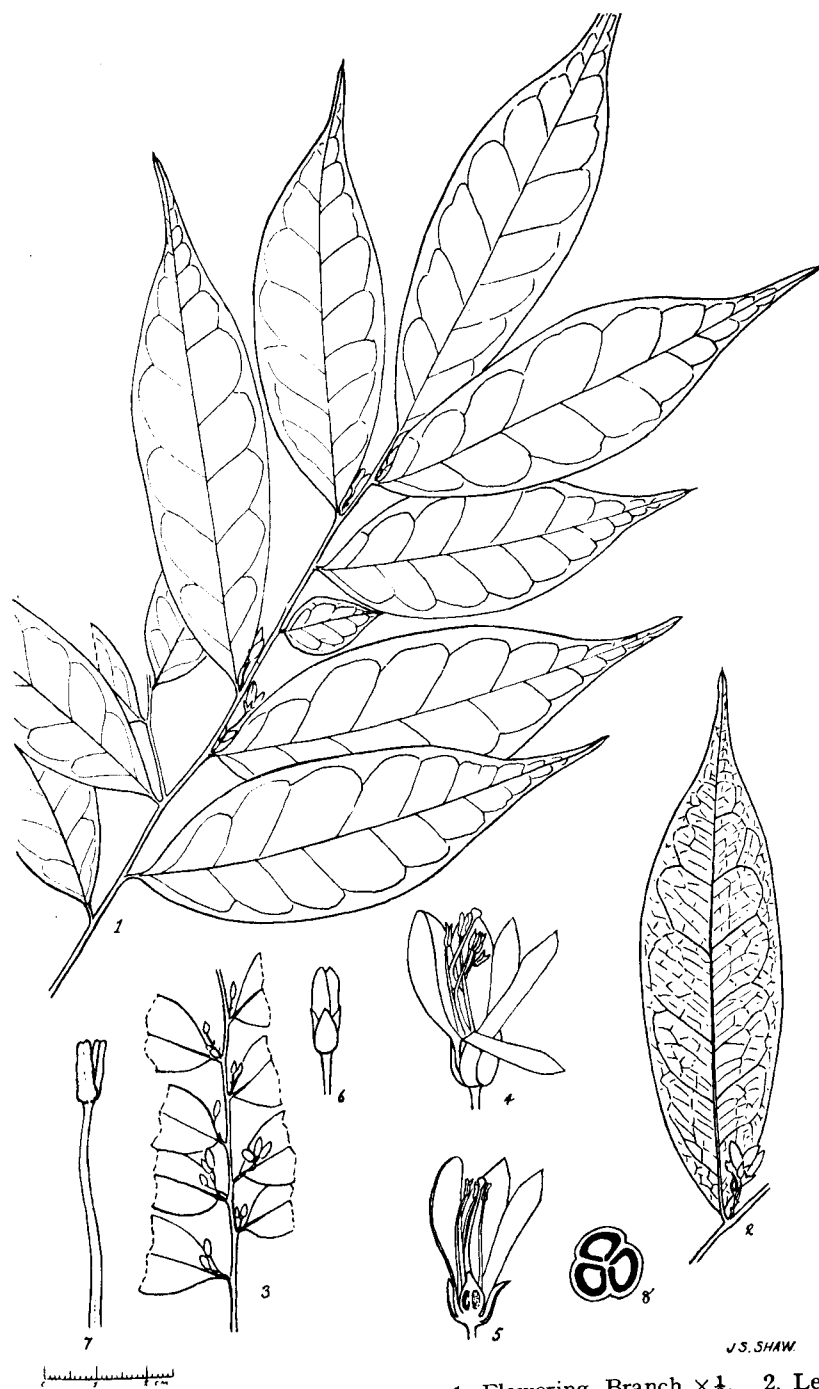
A shrub 6 ft. high; branchlets slender, virgate, slightly flexuose, green to brownish, puberulous. Petiole about 2 mm. long, puberulous; leaf-blade 4.5 to 14.5 cm. long, 1.7 to 3.8 cm. broad, oblong-lanceolate to oblanceolate, caudately attenuate; acumens up to 2 cm. long, sharply pointed, mucronate; base cuneate or sometimes rounded; upper surface dark green, finely and prominently reticulate; both surfaces glabrous except on the midrib; midrib slender, impressed above, prominent and puberulous beneath; main secondary nerves rather distant, not well differentiated, anastomosing about 5 mm. from the margin, connected by loops reaching to within 2 mm. of the margin. Inflorescence axillary, racemose, 1.5 cm. long, 2-5-flowered; axis and pedicels puberulous; bracteoles 1 mm. long, subulate; pedicels 2 mm. long. Sepals 3 mm. long, lanceolate, thinly puberulous, densely ciliate. Petals villosely ciliate in the lower part; median petal galeate, 1×1 cm.; upper petals 10 mm. long, 1.5 mm. broad. Stamens; filaments united for $\frac{1}{3}$ their length, 1.2 cm. long. Ovary glabrous, 3-locular, ovules solitary in each locule. Fruits not seen.

WEST TROPICAL AFRICA. Gold Coast: Kwahu Prasu, Feb. 1929, C. Vigne, Gold Coast Forest Herb. 1619, type in Kew Herb.—Forming undergrowth in high forest.

Allied to *C. alba* Don, from which it differs in the smaller (up to 1 cm. long) flowers, the longer, narrower, caudately attenuate leaves, and the distance from the leaf-margin of the arcuately connected nerves. It approaches *C. lutea* Don in the keel of the corolla, but differs in the very unequal sepals, and in the leaves.

Acioa Johnstonei Hoyle, sp. nov. [Rosaceae], a congeneris inflorescentia et foliis infra longe setoso-pilosis, bracteolis conspicue glanduloso-ciliatis, valde distincta.

A small tree. Branchlets terete, dark reddish brown, at first setose-pilose with spreading hairs. Stipules small, caducous; petiole 2-3 mm. long, stout, transversely rugose, setose-pilose at first. Leaves alternate, coriaceous, 5.5-9 cm. long, 1.7-4 cm. broad, ovate-elliptic to lanceolate; apex gradually and acutely acuminate; base rounded or very broadly cuneate; upper surface glaucous, shining, reticulate, more or less dotted with pitted tubercles; lower surface less glaucous, scarcely shining, with long spreading setose hairs arising from basal tubercles chiefly on nerves and veins, and on the prominent, reddish midrib. Panicles axillary and terminal, subcorymbose, 5-8 cm. long, pedunculate or with a flower arising from the axil of a bract near the base, the branches 1-3-flowered, cymose, the rhachis, branchlets, pedicels and calyces more or less densely covered with long spreading setose hairs in addition to a fine dense pubescence; bracts and bracteoles 3-4 mm. long, ovate, pubescent, the apex and margin furnished with conspicuous long-stipitate capitate glands; pedicels 1.0-1.7 cm. long, with two bracteoles about the middle, which may bear in their axils 1 or 2 additional flowers. Calyx-tube 8-9 mm. long, 0.5-1 mm. wide at the



Carpobolia caudata Burt. Davy. 1. Flowering Branch, $\times \frac{1}{2}$. 2. Leaf, showing lower surface, $\times \frac{1}{2}$. 3. Branchlet with buds. 4. Flower, $\times 1\frac{1}{2}$. 5. Vertical section of flower, $\times 1\frac{1}{2}$. 6. Flower-bud, $\times 1\frac{1}{2}$. 7. Stamen, $\times 3$. 8. Cross-section of ovary, $\times 4$.

slightly swollen base, narrowly infundibuliform, expanding towards the mouth; lobes 5, imbricate, 4–5 mm. long, 2–2.5 mm. broad, oblong, obtuse, slightly unequal in length, sericeous within. *Disc* lining the calyx-tube, villose below the mouth with downwardly-directed setose hairs, the margin shortly free, irregularly crenate, glabrous. *Petals* 5, obovate-orbicular membranous, white (?), prominently palminerved, glabrous, scarcely as long as the calyx-lobes in bud, deciduous at flowering. *Stamens* about 20, glabrous; filaments united for 1.5 cm. of their length in a strap-shaped bundle, which is attached to the disc opposite one of the calyx-lobes, and curved inwards in bud, the free part of the filaments filiform, 8–10 mm. long; anthers medifixed, versatile, orbicular-oblong, 0.5 mm. long and broad. *Ovary* seated at the mouth of the calyx-tube at the base of the staminal bundle, white-tomentose, with a conspicuous tuft of setose hairs directed downwards from its base; ovules 1–2, pendulous from near the apex; style arising from the inner side of the base of the ovary, filiform, tapering, 3 cm. or more long, exerted beyond the staminal bundle; stigma minute, peltate. *Fruit* not seen.

WEST TROPICAL AFRICA. British Cameroons: Bamenda Division, at Bum, A. T. Johnstone 74/31, type in Kew Herb. A small tree in orchard bush. Altitude 5000 ft., fl. Jan. 1931.

Vernacular name (Bamenda): "Tileelee."

Dichapetalum kumasiense Hoyle, sp. nov. [Chailletiaceae]; affinis *D. beniensi* Engl., a qua floribus majoribus, nervis lateralibus foliorum infra minus prominentibus, foliis latioribus acumine brevior et basi rotundatis, differt.

A straggling shrub. *Branchlets* slender, clothed like the buds and youngest leaves, with greyish-fulvous woolly tomentum. *Stipules* subulate, tomentose outside, persistent, 3–4 mm. long. *Leaves* alternate, thinly chartaceous, 5–9 cm. long, 2.5–4.5 cm. broad, ovate or elliptic, acute or gradually and very shortly acuminate, with a hairy mucro, shortly narrowed to the rounded or subauriculate base; upper surface dark green, with midrib impressed and remaining pubescent, lower surface distinctly lighter in colour, densely pubescent on the midrib and nerves, and pubescent on the very finely reticulate veins; lateral nerves 6–9 pairs, arcuately ascending, delicately and repeatedly looped near the margin; petiole 2–3 mm. long, densely woolly-tomentose. *Flowers* few together in axillary fascicles, subsessile. *Sepals* 5, ovate-elliptic, obtuse, 4 mm. long, densely tomentose outside, glabrous within. *Petals* 5, oblanceolate, glabrous, 5 mm. long including the long claw; limb about 2.5 mm. long, divided to the middle, each lobe concave, subacute. *Anthers* ovoid, 5 mm. long, on glabrous filaments 4 mm. long which become broader and flattened towards the base. *Ovary* superior, depressed-globose, 3-locular, 1 mm. in diameter, densely silky; style 4.5 mm. long, glabrous; stigma deeply divided into 3 spreading lobes. *Fruit* not seen.

WEST TROPICAL AFRICA. Gold Coast: Kumasi, C. Vigne 1635, type in Kew Herb. Straggling shrub in secondary forest. Altitude 900 ft. Fl. March, 1929.

Dialium reticulatum Burt Davy et MacGregor, sp. nov. [Caesalpinaceae]; affinis *D. Holtzii* Harms, a qua ramulis novellis puberulis, foliolis paucioribus minoribus obtusis, calycis lobis subaequalibus, recedit.

A spreading tree up to 50 ft. high (*Battiscombe*). Young *branchlets* smooth, puberulous, brown, with numerous small distinct lenticels. *Stipules* caducous. *Leaves* alternate, imparipinnate, 4.5–11.5 cm. long; petiole 1–1.7 cm. long, greyish puberulous, rhachis up to 4 cm. long; petiolules 2 mm. long, stout, puberulous; leaflets opposite or subopposite or rarely alternate, 1.5–5 cm. long, 0.8–3 cm. broad, broadly ovate-elliptic, glabrous on both surfaces except on the midrib below, veins prominently reticulate and pustulate; base rounded to subcordate, or the terminal one cuneate; apex obtuse, acute or rounded; margin entire, minutely ciliolate with crisped hairs; lateral nerves 5–7 pairs, prominently arcuate well within the margin. *Panicles* axillary and terminal, laxly branched, pedunculate, up to about 13 cm. long, branches up to 4 cm. long. *Flowers* rather numerous, cream-coloured, with two caducous bracteoles on the 2–3 mm. long pedicels. *Calyx* shortly gamosepalous, the tube lined by the large flat disc, the lobes 5, imbricate, subequal, 2.5 cm. long, oblong-ovate, deciduous, leaving the disc attached below the fruit. *Corolla* 0. *Stamens* 2, opposite two adjoining sepals, arising on the margin of the disc; filaments short, inflexed in bud; anthers nearly 1.5 mm. long, basifixed, thinly puberulous, oblong, opening by short pore-like apical slits, one locule apiculate. *Ovary* shortly stipitate, ovoid, 1.5 mm. long; ovules 2, pendulous; style 3 mm. long, filiform, stigma small, truncate. *Fruit* 1-seeded, ovoid, about 1.5 cm. long and 1 cm. broad, dark reddish-brown, minutely greyish-puberulous, arising on a stipe about 2.5 mm. long from the persistent combined disc and calyx-tube; epicarp forming a thin brittle shell, mesocarp chestnut-brown, mealy, persisting on the thin leathery endocarp. *Seed* laterally compressed, up to 8 mm. long and 5 mm. broad, greyish-yellow, shining, striate with slightly raised veins from the hilum, pendulous by a slender raphe from the apex.

TROPICAL AFRICA. Kenya Colony: Mida, coastal region, C. W. Elliot, Forest Herb. 167; 1489, type in Kew Herb.; Njomboni, coastal region, E. Battiscombe 802; Arabuko, Malindi Dist., R. M. Graham 377; "Coast District," C. W. Webber 613; Bush lands, Kiyangwe-Wanga Road, Lamu District, Mohammed Abdula 2200.—Fl. September; fr. March.

Vernacular name (Swahili; Lamu): "mPepeta."

"Small tree, 25 ft. Stems white; bark fairly smooth. Flowers greenish-white and scented. Fruits red, 1/2" diam., edible," Mohammed Abdula. The fruit and the largest leaflets are described from Mr. Battiscombe's specimen.

Ostryoderris Brownii Hoyle, sp. nov. [Papilionaceae]; affinis *O. leucobotrya* Dunn, sed ovario in sutura superiore pubescente, ceterum glabro neque ferrugineo-tomentoso, calyce mox glabrescente, paniculis latoribus, foliis anguste oblongis apice gradatim acuminate nec breviter oblique caudatis, nervis lateralibus pluribus tenuissimis indistinctis, ramulis novellis vix lenticellatis differt.

A small tree. *Branchlets* at first purplish-ferruginous-tomentose, soon glabrous, with light grey bark; *buds* scarcely flattened, ferruginous-strigose. *Leaves* imparipinnate, up to 35 cm. long, petiole and rhachis very sparsely ferruginous-pilose, almost glabrous, channelled, petiole pulvinate, 3.5–5.5 cm. long; rhachis 12–21 cm. long, with tufts of hairs at the base of the petiolules; stipels subulate, 1–2 mm. long, subsistent; leaflets 6–7-jugate, 5.5–12 cm. long, 1.8–3.7 cm. broad, coriaceous, dark green when fresh, glabrous, elliptic- to narrowly-oblong or lanceolate, gradually acuminate; acumen obtuse or emarginate; base cuneate to rounded; margin subrevolute; upper surface shining, with midrib impressed and lateral nerves indistinct; lower surface dull, with midrib prominent, the 10–12 pairs of lateral nerves subprominent, doubly looped near the margin, with lax reticulation between; petiolules 2.5–4 mm. long, rugose. *Panicles* axillary and terminal, pyramidal, ferruginous-tomentose, the terminal one branched twice, about 20 cm. long and broad, lower branches spreading, the branchlets bearing numerous flowers on short (1.5 mm. long) ferruginous pedicels. *Calyx* purplish-black when dry, turbinate, 4 mm. long and broad, glabrescent, the 5 very broad and short triangular lobes densely ciliate, especially at the apex. *Petals* glabrous; standard orbicular, 1.2–1.3 cm. across, base cordate, apex emarginate; claw about 3 mm. long; wing-petals free from the keel, 1.3 cm. long including the claw; keel-petals 1.2–1.3 cm. long. *Stamens* diadelphous, tube and filaments glabrous 1.3 cm. long, vexillary stamen free to the base; anthers dorsifixed, narrowly elliptic-oblong, 1 mm. long. *Ovary* bearded on the upper side, 5 mm. long, borne on a stipe of equal length; style curved, glabrous; stigma truncate, minutely hairy. *Pod* not seen.

WEST TROPICAL AFRICA. Gold Coast: Jema, W. T. S. Brown 2163, type, in Kew Herb. Tree 25 ft., in savannah; dark green foliage; pinkish flowers. Fl. Feb. 1931.

Pterocarpus Stevensonii Burt Davy, sp. nov. [Papilionaceae]; affinis *P. Antunesii* Harms, sed inflorescentiae rhachide, calyce et foliolis infra pubescentibus, foliorum rhachidibus adpresso-pubescentibus, petiolis pedicellisque brevioribus, foliolis majoribus, differt.

A small, much-branched deciduous tree; bark of *branchlets* faintly ribbed, pruinose, puberulous when young. *Leaves* 6–10 cm. long, imparipinnate, 1–3-jugate; rhachis appressed-puberulous; leaflets opposite, elliptic to ovate-elliptic, rounded to obtuse, slightly emarginate at apex, with a minute mucro, rounded at base,

minutely pubescent above and beneath, 2.5–4 cm. long, 1.5–2 (rarely 2.5) cm. broad, prominently and closely reticulate; lateral nerves about 12 pairs; petiolule 2 mm. long. *Racemes* axillary, about equalling the subtending leaves, 15- to 20- or more- (rarely fewer-) flowered; rhachis and pedicels appressed-puberulous; pedicels filiform, 1 cm. long. *Calyx* appressed-puberulous, 5 mm. long; lobes shallow, rounded, pubescent within, ciliolate. *Corolla* yellow; standard about 1.5 cm. long. *Ovary* pilose. *Fruits* obliquely obovate, winged all round, strongly reticulate, about 3.5 cm. long, 2.5 cm. broad, light grey-brown in colour, minutely pubescent.

SOUTH TROPICAL AFRICA. N. Rhodesia: Siburu Teak Forest, about 70 miles west of Livingstone, on sand-veld, fruiting 26 February, 1929, *Duncan Stevenson* 2; *Burt Davy* 20,574. S. Rhodesia: Victoria Falls? "a yellow-flowering tree," "all over the veld," fl. Nov. and Dec. *C. E. F. Allen* 85, type in Kew Herb.; Victoria Falls, near Cascade Falls, Nov. 1906, a "spreading thorny tree," *C. E. F. Allen* 421 (appears to be this, but the specimen is leafless and otherwise very incomplete). Portuguese East Africa: Tette District, opposite Sena, June, 1859, *Dr. J. Kirk*, in fruit. Gazaland, Boka, Lower Buzi, 400 ft. elev., on limestone, Dec. 20, 1906, *Swynnerton* 1432 (a very incomplete specimen); Madanda Forest, a medium-sized tree, flowering Sept.-Oct. 1911, *Dawe* 462 (inflorescence very floriferous and somewhat fasciated).

Vernacular names (Chitonga): "mWangura" teste *Stevenson*; (Port E. Africa) "chiViri" teste *Dawe*.

Uses. Wood valued for handles for picks, hoes and axes, and for wheel-spokes.

Pterocarpus Stevensonii is an abundant species in the Siburu Forest, in the Upper Zambesi drainage basin, where it is associated with *Baikiaea plurijuga* Harms.

Hippocratea Kennedyi Hoyle, sp. nov. [Hippocrateaceae]; affinis *H. Chevalieri* Hutch. et M. B. Moss, sed bracteolis brevioribus integerrimis, petalis majoribus spathulatis, foliis ellipticis tenuiter membranaceis margine haud conspicue serratis, differt.

A glabrous climber with greyish bark; bud-scales persistent at the base of the current year's growth; the slender *branchlets* angular, striate, grooved between the decurrent bases of the *petioles*, which are 5–7 mm. long, slender and deeply channelled above. *Stipules* minute, subulate. *Leaves* opposite, thinly membranous, 9–13 cm. long, 3.5–5 cm. broad, broadly oblanceolate to elliptic or obovate, more or less tapered to the cuneate base, gradually or subabruptly caudate-acuminate, acumen up to 2.5 cm. long, minutely mucronulate; the midrib and the 7–8 pairs of lateral nerves very slender, sub-prominent on both surfaces, with conspicuous delicate reticulation between, the main nerves arcuate-ascending; margin shallowly and unevenly crenate-serrulate except at base and apex, with marginal nerve. *Cymes* axillary and subterminal, pedunculate,

corymbose, dichotomous, 2-3 cm. long and 2 cm. wide, reddish all over, the branchlets short, stout, deeply grooved and verrucose; peduncles 1-2 cm. long, slender; bracteoles paired and more or less connate at the base, spreading, deltoid-acuminate, 0.5-1 mm. long; pedicels rather crowded, slender, about 2 mm. long. *Sepals* 5, almost free, 1 mm. long, orbicular, imbricate, shortly fimbriate on the margin. *Petals* 5, imbricate, coriaceous, cuneate-spatulate, rounded at the apex, 4 mm. long, 2 mm. broad. *Stamens* 5; filaments about 0.75 mm. long, flattened, incurved, arising from the margin of an annular disc which is adnate to the base of the ovary; anthers reniform, 0.5 mm. across, opening by a transverse terminal slit. *Ovary* 3-locular, globose, 1 mm. in diameter, surmounted by 3 sessile oblong stigmas 0.5 mm. long; ovules several in each locule, on axile placentas. *Fruit* not seen.

WEST TROPICAL AFRICA. S. Nigeria: Sapoba, J. D. Kennedy 858, type in Kew Herb.

Hippocratea Vignei Hoyle, sp. nov. [Hippocrateaceae]; affinis *H. guineensi* Hutch. et M. B. Moss, sed petalis intus pilosis, inflorescentia vix ferruginosa, foliis membranaceis latioribus crebre et tenuiter reticulatis, acumine longiore, differt.

A climber glabrous except the inflorescence; branchlets slender, terete, flattened at the distant nodes. *Stipules* paired, deltoid acuminate, 1.5 mm. long, coriaceous, subpersistent, leaving a conspicuous interpetiolar scar on falling; petioles 1.2-1.5 cm. long, rather slender, channelled above, drying almost black. *Leaves* opposite, membranous, translucent olive-green, finely reticulate on both surfaces, broadly oblong-elliptic to suborbicular, 8-12 cm. long, 4.5-7 cm. broad; apex abruptly and obtusely acuminate, acumen 1-1.5 cm. long; base cuneate to rounded, but always very shortly tapering at its junction with the petiole; margin cartilaginous, finely and regularly crenate-serrate except at the entire base; upper surface with midrib scarcely impressed and lateral nerves finely channelled; lower surface with the midrib and slender lateral nerves prominent, and tertiary nerves parallel; lateral nerves 7-8 on each side of the midrib, strongly arcuate. *Cymes* axillary and subterminal, laxly branched, 6-12 cm. across, the branches spreading, compound-dichasial, fulvous-tomentellous; peduncles 2-4 cm. long, glabrous, striate; bracts and bracteoles lanceolate, 1-2 mm. long, glabrescent. *Flowers* on tomentellous 3-4 mm. long pedicels, the flower-buds subglobose, 2.5 mm. in diameter just before opening, tomentellous outside. *Calyx* pateriform, 5-dentate, open in bud, 2 mm. in diameter. *Petals* 5, spreading, 3 mm. long, 1-1.5 mm. wide, oblong-elliptic, subacute, coriaceous, tomentose outside, the upper half pilose inside. *Disc* large, fleshy, depressed globose, tomentellous, the margin annular, thick, pubescent. *Stamens* 3, arising inside the margin of the disc on very short flattened filaments 0.5 mm. long; anthers very broadly obovate, 0.5 mm. broad, opening by a transverse terminal slit. *Ovary*

embedded in the centre of the disc, 3-locular with numerous ovules on axile placentas; style extremely short; stigma entire or 2-3-fid.

WEST TROPICAL AFRICA. Gold Coast: Kwahu Prahsu, C. Vigne 1752, type in Kew Herb. "Liane, common, to top of trees; profuse small cream flowers." Fl. June, 1929.

Homalium neurophyllum Hoyle, sp. nov. [Samydaceae]; affinis *H. aolichophyllo* Gilg ex Hutch. et Dalz., sed calycis tubo brevior, foliis minoribus basim vix cordatis, nervis lateralibus pluribus, ramulis novellis fulvo-tomentellis, differt.

A tree 20 m. high. Young branchlets, inflorescence, petioles and nerves beneath more or less fulvous-tomentellous. *Stipules* large, falcate-reniform, subpersistent, up to 1.2 cm. long and 1 cm. broad, glandular-serrate, strongly arcuate-nerved, puberulous. *Leaves* shortly petiolate, 11-18 cm. long, 5.5-9 cm. broad, oblong-elliptic to broadly elliptic or slightly obovate; apex obtusely cuspidate-acuminate; base rounded to truncate or subcordate; margin cartilaginous, bluntly serrate with a circular gland on the lower surface of each tooth; upper surface glabrous, reticulate, with midrib impressed; lower surface with midrib and lateral nerves very prominent, and tertiary nerves subparallel, with reticulation between, the midrib and lateral nerves remaining more or less pubescent; lateral nerves 11-14, conspicuously closer together towards the base of the leaf, spreading obliquely, and strongly arcuate near the apex. *Panicles* axillary and terminal, up to about 25 cm. long and 20 cm. broad, laxly branched, the branches slender and whip-like, subspicate, bearing numerous flowers in fascicles of 2-4 together in the axils of deciduous bracteoles. *Flowers* (fruiting stages) 5-6-merous; pedicels 0.5-1 mm. long, tomentellous, articulated at the top and often persisting as pegs after the flowers have fallen. *Calyx* short for the genus, subrotate even in fruit, tomentellous, the tube about 0.5 mm. long, the 5-6 narrowly oblong subacute lobes 1.5-2 mm. long and 0.75 mm. broad. *Petals* arising from between the bases of the calyx-lobes, spatulate, pubescent, strongly accrescent in fruit, at length 11-13 mm. long, 3-3.5 mm. broad. *Disc* of separate fleshy, swollen, puberulous, more or less semilunar glands opposite the sepals. *Stamens* equal in number to the petals and opposite to them; filaments linear, 2 mm. long, slightly pubescent; anthers subglobose, the rounded cells diverging slightly below, dorsifixed. *Fruiting ovary* adnate at the base to the slightly below, dorsifixed. *Fruiting ovary* adnate at the base to the calyx-tube, the free part conical, 1 mm. long, white-tomentose outside and inside, 1-locular with a (spurious) linear central axis, and 3-6 strap-shaped arching parietal placentas each bearing several pendulous seeds at its apex; style 1 mm. long, dividing into 3-6 short linear stigmas, the whole fruit splitting readily on dissection into as many portions, each bearing a placenta within.

WEST TROPICAL AFRICA. Gold Coast: Offinso, C. Vigne (Gold Coast Forest Herb. No. 1182), type in Kew Herb.: Aiyem, Upper W.

Reserve, C. Vigne 179. "A tree in closed forest 60 ft. high, 4 ft. girth, very hard wood yellow-white. Alt. 800'." Fl. June, 1928.

Vernacular name: "Asun-Kruma."

Tecleopsis Hoyle et Leakey, gen. nov. [Rutaceae]; affinis *Toddaliopsi* Engl., a qua floribus hermaphroditis, ovario 2-, rarissime 3-(4?)-loculari, fructu glanduloso-punctato neque verrucoso, recedit.

Arbores inermes. *Folia* 3-foliolata, pellucido-punctata. *Flores* paniculati, bisexuales. *Calyx* 4-dentatus. *Petala* 4. *Stamina* 8. *Ovarium* 2-, rarissime 3-(4?)-loculare, alte longitudinaliter sulcatum, carpellis conjunctis; ovula pendula in loculo solitaria. *Fructus* 2-, interdum 1-, rarissime 3-carpellatus, glanduloso-punctatus. *Semina* exalbuminosa, pro loculo 1. *Embryo* rectus, radiculo superiore, cotyledonibus carnosus.

Tecleopsis glandulosa Hoyle et Leakey, sp. nov.

Arbor mediocris, ramulis novellis fortiter striatis fulvo-tomentosis, glabrescentibus, cortice cinereo vel rubescente. *Folia* opposita, interdum subopposita, petiolo 1.5-4 cm. longo supra canaliculato pubescente vel tomentoso, petiolulis 2-8 mm. longis fortiter canaliculatis primum tomentosis, foliolis 3 laxe sed distincte glanduloso-punctatis utrinque reticulatis usque ad 12 cm. longis et 4 cm. latis oblongo-lanceolatis vel oblanceolatis apice obtuse acuminatis basi acute cuneatis saepe inaequilateralibus margine obscurissime crenulatis supra glabris nitidulis sparse glanduloso-punctatis infra primum (praecipue in costa) pubescentibus tandem glabris sparse et conspicue glanduloso-punctatis. *Paniculae* axillares et terminales, densissime fulvo-tomentosae, usque ad 12 cm. longae et 10 cm. latae, cymulis in ramis distanter dispositis. *Flores* pro cymulo 3-10, pedicellis usque ad 2 mm. longis pubescentibus vel glabris. *Calyx* glaber, alabastro apertus, 1 cm. longus, alte et irregulariter 4-dentatus, dentibus obtusis ciliatis. *Petala* 4, vix imbricata, circiter 2.5 mm. longa, latissime elliptica, conspicue pellucido-punctata, subaequalia, interdum 2 connata vel 1 latius. *Stamina* 8, filamentis linearibus 2.5 mm. longis glabris, antheris versatilibus 0.75 mm. longis, thecis infra divergentibus. *Discus* magnus, carnosus, 1.5 mm. longus et latus, cum ovario densissime pilosus. *Ovarium* parvum, disci in parte superiore dispositum, bicarpellatum, loculis rarissime 3 (vel 4?). *Stylus* vix visus. *Ovula* pro loculo 1, ab apice pendula, succinea. *Fructus* maturus laete ruber, sicco brunneus, glaber, plerumque 2-, interdum abortu 1-, rarissime tamen 3-locularis, circiter 1.5 cm. longus et latus, latissime compresso-ellipticus, fibro-carnosulus, inter carpellas sulcatus, extus conspicue glanduloso-punctatus, pedicello crasso 5 mm. longo. *Semina* pro loculo 1, pendula, usque ad 1.2 cm. longa et 1 cm. lata, ellipsoidea. *Embryo* rectus, radiculo superiore, cotyledonibus plano-convexis carnosus, plumula parva.

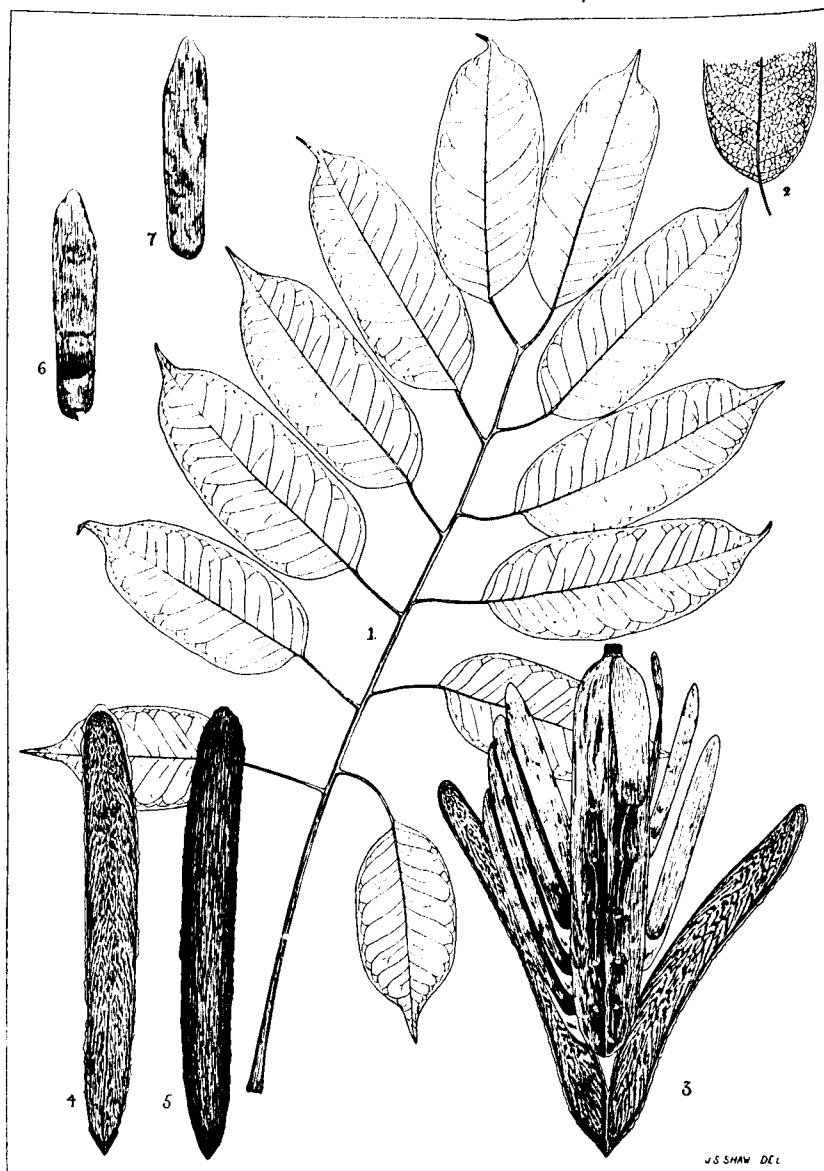
EAST TROPICAL AFRICA. Kenya Colony: Kikuyu, Kikueru, H. G. Deakin 323, type in Kew Herb. & Imp. For. Inst. Herb., Oxford.

Vernacular name (Kikuyu, Itu): "Munderendu," used also for *Teclea viridis* Verdoorn, and other allied trees.

The above-mentioned specimen (H. G. Deakin 323), comprises leaves and flowers. J. H. Echelez subsequently sent another specimen, no. 503, stating that it was a fruiting specimen of no. 323. The two specimens compare in all points, and the fruit of the type description is that of Echelez 503. The notes given by Echelez are as follows:—"A medium sized forest tree growing in mixed forest of *Juniperus procera*, *Olea Hochstetteri*, *Warburgia ugandensis*, *Calodendrum capense*, etc., at Kikuyu, 7000 ft., rainfall 40 ins. The fruits when ripe are covered with a bright red epicarp. The mesocarp is fleshy, but as the fruit gets older the epicarp turns brown and the mesocarp becomes dry and somewhat spongy. Collected Nov. 1931."

Entandrophragma lucens Hoyle, sp. nov. [Meliaceae]; affinis *E. caudato* Sprague, a qua foliis glabris, foliolis longioribus subcoriaceis, capsula angustiore valvis tenuibus extus purpureo-vel atrobrunneis, columna centrali purpureo-brunnea alata vel acutissime angulata, recedit.

A large tree. *Leaves* up to 40 cm. or more long, paripinnate (?), 6-jugate, glabrous; petiole 9-11 cm. long, like the rhachis and petiolules striate and glaucous; rhachis 15-17 cm. long; petiolules slender, 1.2-3.2 cm. long; leaflets usually alternate, thinly coriaceous, very densely and minutely pellucid-punctate, 6.5-11 cm. long, 3.0-4.2 cm. broad, ovate- to elliptic-oblong, apex abruptly long-acuminate, acumen very acute, gland-tipped, 1.3-2.0 cm. long, base rounded or very broadly cuneate, somewhat unequal-sided, upper surface dark shining green, laxly reticulate, dotted with minute black glandular papillae, the striate midrib slightly impressed; lower surface a lighter dull green, closely reticulate, with midrib prominent; lateral nerves 10-14 pairs, subprominent above, prominent beneath; obliquely ascending and arcuately looped twice or thrice close to the margin. *Flowers* not seen. *Capsule* 5-locular, narrowly oblong, cylindrical, 12-15 cm. long, 2.5-3 cm. broad, apex acute or shortly cuspidate, base rounded or obtuse; valves linear-oblong, 12-15 cm. long, 1.7-2.0 cm. broad, dehiscing elastically from the base and shortly cohering at the apex for some time, the margin irregularly broken; apex acute; base obtusely cuneate or truncate; outer surface purplish-brown or almost black, rugosely striate, sparsely and inconspicuously lenticellate; inner surface smooth and shining, yellowish-brown, delicately variegated with brown or dark brown markings, the impression of the seeds more or less visible; central column strictly pentagonal in the lower third, the septa conspicuously wing-like in the upper two-thirds, the faces between the septa dark purplish-brown, showing the very distinct oval impressions of the seeds, the topmost seed arising about 5 mm. from the winged apex of the column. *Seeds* 5-6 per loculus, 1.2-1.8 cm. long, 1-1.5 cm. broad, with a distal oblong obtuse wing 3.5-7.5 cm. long, 1.5-1.8 cm.



Entandrophragma lucens Hoyle. Fig. 1, leaf. 2, portion of leaflet showing venation. 3, fruit showing dehiscence. 4, valve of fruit (inner face). 5, same (outer face). 6, seed (inner face). 7, same (outer face)—all $\times \frac{3}{4}$.

broad directed towards the base of the capsule; seeds convex on the inner face, concave or plane on the outer, truncate or emarginate at the attached end, which bears a small elliptic hilum only 4 mm. long, attached slightly to right and left of the centre of each face of the central column to a prominent horn at the upper end of each oval depression, the horn continued upwards through the next depression in the form of a wing-like ridge; the seeds often remain attached to the horns by small elastic masses of microscopic spirally thickened threads resembling cotton-wool; fruit-stalk short and stout, 5–6 mm. long and broad.

EAST TROPICAL AFRICA. Tanganyika Territory: near Muzi, $1\frac{1}{4}$ hrs. from Kasanga on Kasoti path, collected by the late Mr. C. Grey, No. 5, type in Kew Herb. Communicated to the Imperial Forestry Institute by the Forest Products Research Laboratories, Princes Risborough.

"Straight clean trunk. Alt. above lake about 800 ft. Only tree in this locality."

Vernacular name: (Msofwe) "mTembo."

Chrysophyllum edule Hoyle, sp. nov. [Sapotaceae]; affinis *C. albido* G. Don, sed foliis vix acutis, ramulis novellis, floribus, et foliis infra ferrugineo-tomentellis, costa et nervis lateralibus infra prominentioribus, corollae lobis densissime ciliatis, recedit.

A tree. Young branchlets angular, strongly ribbed, densely appressed ferruginous-tomentellous, becoming glabrous and terete with grey bark; leaf-scars prominent, decurrent. Leaves when mature 13–25 cm. long, 6–9 cm. broad, coriaceous, oblong- to narrowly obovate-elliptic; apex obtuse or subacute; base cuneate; margin entire, slightly revolute; upper surface glabrous, dull green, very closely areolate, with midrib and lateral nerves impressed; lower surface densely ferruginous-tomentellous, with midrib and lateral nerves prominent; lateral nerves 13–18 pairs, obliquely ascending, arcuately looped close to the margin; tertiary nerves forming distinct warts on the current year's wood; pedicels 1–2.5 mm. long, ferruginous-tomentellous. Calyx 2.5–3 mm. long and broad, divided almost to the base into 5 ovate obtuse sepals, densely ferruginous without, pilose within. Corolla-tube puberulous within the staminodes above or glabrous, 1–1.5 mm. long, the 5 lobes about the same length, glabrous except for the densely ciliate margins. Staminalodes 0.5 mm. long, lanceolate, acute, sessile, their filaments entirely adnate to the base of the corolla-tube, opposite the lobes. Ovary sessile, ovoid, 1.5 mm. long, densely pilose-tomentose, 5-locular; ovules solitary; style columnar 1.5 mm. long, glabrous; stigma subtruncate, obscurely 5-lobed. Fruit (immature) ovoid, fleshy, drying hard, 3.5 cm. long, 3 cm. broad, longitudinally ridged, densely ferruginous, glabrescent. Seeds 3–5, about 2.2 cm. long, and 1.2 cm. broad, shining nut-brown.

WEST TROPICAL AFRICA. S. Nigeria : Sapoba, J. D. Kennedy 1613, type in Kew Herb.

Vernacular name (Benin) : "Omumu."

This species approaches in general appearance most nearly to *C. albidum* G. Don, although it is also closely allied to *C. africanum* A. DC. It differs from both in the comparatively obtuse leaves, and from *C. africanum* in having a much smaller fruit and narrower, more coriaceous leaves with fewer nerves. From *C. albidum* it differs in having the lobes of the corolla densely, instead of only slightly, ciliate, and the young branchlets, leaves and flowers much more definitely and coarsely ferruginous, in which last respect it is nearer *C. africanum*.

The native name of the species indicates the sensation experienced by a Beni native on masticating the fruit, of which he is said to be extremely fond. The tree is grown in villages for food, and is distinguished there from *C. albidum*.

It is understood that the name OMUMU or a similar word is used by natives for other genera.

Strychnos reticulata Burtt Davy et Honoré, sp. nov. [Loganiaceae] ; affinis *S. usambarensi* Gilg, a qua foliis supra distincte et prominente reticulatis apice vix apiculatis, pedunculis ramulisque cymorum longioribus et crassioribus, cymis densioribus, floribus majoribus, recedit.

A small tree, glabrous except the inflorescence. Branchlets greenish, angular, deeply channelled, becoming terete, with yellowish or grey bark. Stipules absent or very early caducous. Leaves opposite, subsessile, broadly ovate to elliptic, or even lanceolate, 2-5 cm. long, up to 3 cm. broad, strongly reticulate on both surfaces, shining above, apex rounded to subacute or minutely apiculate, base rounded to subcordate, more rarely cuneate, margin entire, basal nerves 5, prominent above. Cymes axillary, dense, up to about 2 cm. long, usually 20-30 flowered, more or less pubescent ; peduncles 0.5-1 cm. long, bracts lanceolate from a broad base, 2 mm. long, bracteoles small, ovate, ciliolate, pedicels very short. Sepals 5, imbricate, orbicular, puberulous and ciliolate, 1 mm. in diameter, green. Petals 5, almost free, ovate, subacute, 2.5-3 mm. long, coriaceous, green, glabrous. Anthers half as large as the petals, sessile. Ovary superior. Disc fleshy, glabrous. Fruit not seen.

EAST TROPICAL AFRICA. Kenya Colony : growing at an altitude of 5000-6000 ft., Conservator of Forests, No. 40, type in Kew Herb. and Imp. For. Inst. Herb., Oxford.

Vernacular name : "muTete."

XXXV.—RESEARCHES ON *SILENE MARITIMA* AND *S. VULGARIS* : IX.*—E. M. MARSDEN-JONES AND W. B. TURRILL.

A STATISTICAL STUDY OF CHARACTERS IN A WILD POPULATION OF *S. VULGARIS*.

The population of *Silene vulgaris*, of which two samples, each of one hundred specimens, are analysed below, occurred around The Ridgeway, 1½ miles almost due north of Compton, Berkshire, 120-146 m. altitude (Ord. Survey, Reading District sheet). The area consists of chalk downland. The samples were taken from the grassy sides, six yards wide, of an old farm road running across the Down. On the west of the road there was an enclosed grazed pasture and on the east open arable land. The *Silene* population was a considerable one and the conspicuous associated species were : *Carduus nutans* L., *Reseda lutea* L., *Potentilla Anserina* L., *Daucus Carota* L., *Sinapis arvensis* L., *Lychnis alba* Mill., *Trifolium medium* (L.) Huds., *Ononis spinosa* L., *Peucedanum sativum* (L.) Benth. et Hook. fil., *Achillea Millefolium* L., *Cirsium arvense* (L.) Scop., *Matricaria inodora* L., *Galium verum* L., *Spiraea Filipendula* L., *Plantago major* L., *P. lanceolata* L., *P. media* L., *Lotus corniculatus* L., *Poterium Sanguisorba* L., *Leontodon autumnalis* L., *Linaria vulgaris* L., *Lithospermum arvense* L., *Dactylis glomerata* L., *Lolium multiflorum* Lam., and *Poa trivialis* L. var. *glabra* Doell.

The first sample of 100 specimens in flower was collected, on 1st July, 1931, at random and analysed for the characters with which we are dealing in this series of papers, except for fruits and seeds. The scorings for fruit and seed characters were made from a second random sample taken from another 100 plants of the same population on 19th August 1931. The results of analysis, including quantitative and qualitative variates, are given below under the headings of organs and characters.

Height of flowering stems. The highest stem per plant, including inflorescence, measured to nearest cm.

Maximum 10 dm. Minimum 4.1 dm. Mean 6.46 dm.
Standard deviation 1.044.

Number of internodes. Counts were made of the number of internodes above ground level up to but not including the inflorescence.

Maximum 15. Minimum 6. Mean 9.68.

Standard deviation 1.865.

Length of middle internode. The middle internode was determined arithmetically, with an even number the one immediately above the middle node being measured.

Maximum 8 cm. Minimum 1.5 cm. Mean 5.05 cm.

Standard deviation 0.8.

Length of longest internode. This was invariably that immediately below the inflorescence.

*Continued from K.B. 1932, 241.

Maximum 24 cm. Minimum 5 cm. Mean 15.83 cm.
Standard deviation 4.2.

Habit. Strict plants 27 : not strict plants 73.

Anthocyanin in vegetative parts. Much 0 : some 96 : none 4.

Indumentum. Dense 3 : medium 14 : few hairs 12 : glabrous 71.

Leaves. For measurements well developed leaves were chosen, not unduly enlarged ones. In the following summary the figures are given for the whole population and for the strict and not strict plants separated.

	Maximum.	Minimum.	Mean.	Standard deviation.
Length, whole sample ...	7.1 cm.	2.8 cm.	5.05 cm.	0.8536
Breadth, whole sample ...	3.0 cm.	0.7 cm.	1.445 cm.	0.3433
Length, strict plants ...	6.3 cm.	3.9 cm.	5.06 cm.	0.6821
Breadth, strict plants ...	2.1 cm.	0.7 cm.	1.27 cm.	0.2951
Length, not strict plants ...	7.1 cm.	2.8 cm.	5.04 cm.	0.9190
Breadth, not strict plants ...	3.0 cm.	0.8 cm.	1.5 cm.	0.3427

Correlation between length and breadth

for whole population 0.4620.

for strict plants 0.32 (not of statistical significance).

for not strict plants 0.53.

The not strict plants are more variable in length and breadth than the strict, but length and breadth are more highly correlated in them. The mean length in the two classes is about the same but on the average the not strict have broader leaves.

Measurements of leaves on flowering stems. Four plants with a total of fifteen stems were chosen at random except that they bore fully developed inflorescences whose flowers were at mid-anthesis. The length and breadth of all the green foliage leaves were measured. In the table below the measurements are given in centimeters, one leaf having been measured from each node. Usually the leaves at a node are equal in size, or at least show no great differences in length and breadth. The nodes are numbered from above downwards, node 1 being that immediately below the inflorescence node whose branches are subtended by a pair of bracts.

The tables show that in general there is an increase in length and breadth from above downwards to a maximum for each stem, after which a slight decrease is usual. Occasionally a relatively smaller pair of leaves may occur about the middle node and break the regularity of the sequence. New shoots of *S. vulgaris* normally commence growth in early spring. It may be suggested that the first formed (lowest) leaves largely utilize stored food material and that it is not till about half the nodes have developed leaves that the foliage is fully functioning in food manufacture and the soil has attained a favourable temperature for root absorption. It should be noted that in flowering stems there are usually several of the lowest nodes with only brown and shrivelled leaves or their remains.

These are not included in the table but it appears that in general they are smaller than the leaves of the nodes above them. The maximum of foliage size is reached when the stem concentrates its use of food in developing the inflorescence, especially the flowers, with consequent reduction in leaf size and the final production of bracts.

Plant No. 2, of not strict habit.

Stem I.		Stem II.	
Node 1.	4.0 × 1.2	Node 1.	4.0 × 1.2
" 2.	4.5 × 1.3	" 2.	4.0 × 1.1
" 3.	4.5 × 1.3	" 3.	3.7 × 1.1
" 4.	4.1 × 1.2	" 4.	3.7 × 1.0
" 5.	3.2 × 0.8	" 5.	3.3 × 1.0
		" 6.	3.2 × 0.9
Mean	4.06 × 1.16	Mean	3.65 × 1.05
Stem III.		Stem IV.	
Node 1.	2.9 × 0.8	Node 1.	3.7 × 1.0
" 2.	4.0 × 0.9	" 2.	4.7 × 1.4
" 3.	4.0 × 1.0	" 3.	4.7 × 1.2
" 4.	4.0 × 1.2	" 4.	4.7 × 1.3
" 5.	3.5 × 1.0	" 5.	3.7 × 1.1
" 6.	3.1 × 0.6	" 6.	4.0 × 1.1
		" 7.	3.5 × 1.0
Mean	3.58 × 0.92	Mean	4.14 × 1.16

Plant No. 24, of strict habit.

ant No. 24, of strict habit.

Stem I.		Stem II.		Stem III.	
Node 1.	3.0 × 0.9	Node 1.	3.4 × 1.2	Node 1.	3.2 × 1.2
" 2.	3.3 × 1.2	" 2.	3.0 × 1.0	" 2.	3.3 × 1.2
" 3.	3.6 × 1.2	" 3.	3.0 × 1.4	" 3.	3.6 × 1.6
" 4.	3.7 × 1.6	" 4.	2.0 × 1.0	" 4.	3.5 × 1.3
" 5.	3.7 × 1.3	" 5.	3.2 × 0.9	" 5.	3.7 × 1.3
" 6.	4.0 × 1.1	" 6.	3.6 × 1.2	" 6.	3.5 × 1.1
" 7.	4.6 × 1.2	" 7.	3.6 × 0.8	" 7.	3.2 × 0.7
" 8.	3.1 × 0.9	" 8.	3.2 × 0.9	" 8.	3.1 × 0.9
Mean	3.63 × 1.18	Mean	3.13 × 1.05	Mean	3.39 × 1.16
Stem IV.		Stem V.			
Node 1.	2.7 × 1.0	Node 1.	2.0 × 0.8		
" 2.	3.0 × 1.0	" 2.	2.4 × 0.8		
" 3.	3.0 × 0.8	" 3.	2.6 × 1.1		
" 4.	2.9 × 1.2	" 4.	2.6 × 1.2		
" 5.	2.1 × 0.6	" 5.	2.9 × 1.0		
" 6.	2.3 × 1.0	" 6.	2.9 × 1.0		
" 7.	2.7 × 0.9	" 7.	2.5 × 0.9		
" 8.	3.0 × 0.9	" 8.	2.8 × 1.0		
" 9.	2.3 × 0.8	Mean	2.59 × 0.98		
Mean	2.67 × 0.91				

Plant No. 26, of strict habit.

Stem I.		Stem II.	
Node 1.	3.8 × 1.6	Node 1.	3.0 × 0.9
" 2.	4.5 × 1.7	" 2.	4.4 × 1.5
" 3.	5.0 × 1.8	" 3.	4.5 × 1.5
" 4.	5.3 × 1.8	" 4.	4.7 × 1.4
" 5.	5.0 × 1.3	" 5.	4.9 × 1.6
" 6.	5.7 × 1.2	" 6.	5.0 × 1.7
" 7.	6.2 × 1.8	" 7.	5.8 × 1.7
" 8.	5.3 × 1.6	" 8.	5.6 × 1.3
Mean	4.98 × 1.60	Mean	4.74 × 1.45

Plant No. 40, of strict habit.

Stem I.	Stem II.	Stem III.
Node 1. 2.4×0.6	Node 1. 3.5×1.2	Node 1. 3.0×0.8
„ 2. 3.0×1.0	„ 2. 4.5×1.8	„ 2. 3.8×1.3
„ 3. 3.8×1.1	„ 3. 4.7×1.7	„ 3. 4.0×1.7
„ 4. 3.9×1.4	„ 4. 5.3×2.1	„ 4. 4.4×1.7
„ 5. 3.8×1.4	„ 5. 4.8×1.6	„ 5. 4.0×1.5
„ 6. 3.5×1.1	„ 6. 5.9×2.2	„ 6. 4.0×1.2
„ 7. 3.8×0.7	„ 7. 6.0×2.2	Mean 3.87×1.35
Mean 3.46×1.04	„ 8. 5.7×1.6	
	Mean 5.05×1.80	

For all the green foliage leaves at anthesis (4 plants, 15 flowering stems, 108 leaf-pairs) the following values have been obtained :

Average number of pairs of green leaves per flowering stem : 7.2.

Maximum length : 6.2 cm.

Minimum length : 2.0 cm.

Grand mean length : 3.8 cm.

Maximum breadth : 2.2 cm.

Minimum breadth : 0.6 cm.

Grand mean breadth : 1.2 cm.

Number of flowers. In each plant the flowers were counted in the inflorescence with the largest number.

Maximum 61. Minimum 10. Mean 29.63.

Standard deviation 10.

Calyx. Inflated 42. Subinflated 44. Narrow 14. Much anthocyanin 0. Some anthocyanin 100. No anthocyanin 0.

Corolla.

Length of petals. Claw and lamina included.

Maximum 1.9 cm. Minimum 1.1 cm. Mean 1.497 cm.

Standard deviation 0.0164.

Breadth of petals. Lamina.

Maximum 9 mm. Minimum 4 mm. Mean 5.95 mm.

Standard deviation 0.12.

Correlation between length and breadth of petals 0.42.

Lobing of petals. $\frac{3}{4}$ lobing 99. $\frac{2}{3}$ lobing 1.

Overlapping. Petals overlapping 0. Petals not overlapping 100. Segments overlapping 0. Segments not overlapping 100.

Anthocyanin. Blotch present 4. Blotch not present 96.

Corona. Boss 86. Small scale 14.

Sex. Hermaphrodite 32. Female 68.

Androecium. In the 32 hermaphrodite plants.

Filaments pink 28, i.e. 87.5% of the hermaphrodite plants.

„ white 4, i.e. 12.5% „ „ „

Anthers purple 32, i.e. 100% „ „ „

Anthers yellow-green, 0, i.e. 0% „ „ „

Gynaeceum. For all plants.

Stigmata pink 73. Stigmata white 27.

Immature seeds pink 10. Immature seeds white 86.

Immature seeds not scorable 4.

Fruits. Type I. 38. Type II. 25. Intermediate (I.-II.) 37.

Mature Seeds. Armadillo 2. Weak armadillo 8. Tubercled 78. Strongly tubercled 12.

Summary and Conclusions.

1. A statistical analysis is given of samples of a population of *Silene vulgaris* growing near Compton, Berkshire. The full significance of this analysis will not be apparent till after the publication of comparable analyses of coastal (*S. maritima*) and high mountain populations.

2. The characters studied may be classified as follows :

A. *Involving measurements.*

Heights of flowering stems.

Lengths of middle and longest (highest) internodes.

Lengths and breadths of leaves.

Lengths and breadths of petals.

B. *Involving counts.*

Numbers of internodes.

Numbers of flowers.

C. *Qualitative scoring.*

Habit.

Anthocyanin in vegetative parts.

Indumentum.

Calyx shape and anthocyanin.

Lobing, overlapping, and anthocyanin of petals.

Corona.

Sex.

Anthocyanin in filaments, anthers, stigmata, and immature seeds.

Fruit shape.

Testa markings.

3. Attention is called to the following :

i. The longest internode is invariably that immediately below the inflorescence.

ii. The rather high number of strict plants (27%).

iii. The absence of plants with much anthocyanin in their vegetative parts.

iv. The few plants (3%) with dense indumentum.

v. The leaf measurements, showing means, for well developed leaves, of 5.05 cm. length and 1.445 cm. breadth, and usually an increase in length and breadth from above downwards, with a final slight decrease.

vi. The mean flower number per inflorescence 29.6.

vii. The mean petal length of 1.49 cm. and breadth 5.95 mm.

viii. $\frac{3}{4}$ petal lobing in only 1%, anthocyanin blotch in only 4%, small scale in 14%.

ix. The complete absence of overlapping of both petals and segments.

- x. The unusually high number of female plants (68%).
- xi. The absence of yellow-green anthers.
- xii. The number of immature pink seeds (10%).
- xiii. The low number of full armadillo seeds (2%).

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XXXVI.—CONTRIBUTIONS TO THE FLORA OF SIAM.* ADDITAMENTUM XXXIV.

Urophyllum oblongum Craib, Fl. Siam. Enum. ii. 84 (1932), descr. ampl. [Rubiaceae-Mussaendeae]; ab affini *U. Griffithiano* (Wight) foliis subtus in nervorum axillis pilosis, stipulis angustioribus, et pedunculo brevi recedens.

Arbuscula circa 5 m. alta (ex Kerr); ramuli iuventute praecipue nodos versus pilis adpressis sparse instructi, cito glabri, sicco primo compressi et sulcati, mox teretes, stramineo-virides, pallide virides. vel olivacei, lenticellis parvis nec numerosis nec conspicuis. *Folia* opposita, saepissime lanceolato-oblonga, apice obtuse acuminata vel subcaudato-acuminata, basi saepe parum inaequilateralia, cuneata vel late cuneata, 13–24 cm. longa, 4–7.8 cm. lata, rigide chartacea, sicco subviridia, subtus parum pallidiora, supra glabra, subtus ad costam nervosque laterales pilis paucis instructa, cito glabrescentia, praeterea in nervorum axillis plus minusve pilosa, costa supra impressa subtus prominente, nervis lateralibus utrinque 9–10 supra plus minusve conspicuis subtus prominentibus, nervulis subtus subprominulis, petiolo 1–1.5 cm. longo supra canaliculato suffulta; stipulae deciduae, ad 1.5 cm. longae et basi 3 mm. latae, dorso pilis adpressis tectae. *Cymae* axillares, condensae, et pedunculo communi brevi et floribus inclusis petiolo dimidio breviores; pedunculus communis adpresse hirsutus; pedicelli ad 4 mm. longi, pilis brevibus albis adpressis instructi. *Receptaculum* pilis brevibus albis sparse instructum. *Calyx* fl. masc. circa 1.5 mm. longus, apice vix denticulatus, dorso subglaber. *Corollae* dorso glabrae tubus 2 mm. longus, intra apice annulo denso pilorum erectorum instructus, lobi 5, crassi, subelliptici, apice subacuti, 3 mm. longi, 2 mm. lati, glabri. *Filamenta* 0.5 mm. longa, ad corollae tubi apicem inserta; antherae apiculatae, 1.5 mm. longae.

Takuapa, Kapong, 100 m., evergreen forest, Kerr 17,131.

Tarenna cinerea Craib, Fl. Siam. Enum. ii. 88 (1932), descr. ampl. [Rubiaceae-Gardenieae]; inter species calycis segmentis latis et corolla extra haud glabra ob indumentum densum persistentem foliorum paginae inferioris *T. pubescenti* Craib tantum affinis a qua indumento tenuiore adpresso et calycis segmentis conspicue brevioribus distincta.

Arbor circa 5 m. alta (ex Kerr); ramuli iuventute compressi, parce adpresse breviter pubescentes, mox glabri, teretes, cortice brunneo vel cinereo-brunneo obtecti, lenticellis haud conspicuis. *Folia* oblongo-oblancoolata, elliptico-oblancoolata, vel rarissime elliptico-obovata, apice acuminata vel subacuminata, basi cuneata, 6–10 cm. longa, 2.5–4 cm. lata, coriaceo-chartacea, supra glabra, subtus dense adpresse molliter cinereo-pubescentia, costa supra impressa subtus prominente, nervis lateralibus utrinque 10–12 supra subconspicuis subtus prominentibus, nervulis obscuris, margine recurva, petiolo 5–10 mm. longo suffulta; stipulae subulato-acuminatae, ad 6 mm. longae, dorso breviter adpresse pubescentes, diu persistentes. *Inflorescentia* terminalis, pedunculo communi circa 1 cm. longo incluso 3 cm. longa, 2 cm. lata, et rhachi et ramulis dense breviter adpresse cinereo-pubescentibus; bractae angustatae, ad 4 mm. longae; pedicelli breves vel deficientes. *Receptaculum* 1.25 mm. longum, indumento ei inflorescentiae ramulorum simili tectum. *Calycis* tubus brevis, lobi oblatis, 0.5 mm. longi, paululo ultra 1 mm. lati, ciliati, recurvi. *Corollae* tubus 3 mm. longus, extra glaber, intra superne dense villosus, lobi 5 mm. longi, 2 mm. lati, extra apice parce adpresse pubescentes, intra basi villosi. *Antherae* 4 mm. longae, filamentis brevibus. *Stylus* glaber, cum stigmatibus 1 cm. longus; ovula loculo quoque solitaria.

Surat, Nawng Wai, 200 m., evergreen on rocky limestone hill, Kerr 12,283.

Tarenna cinnamomea Craib, Fl. Siam. Enum. ii. 88 (1932), descr. ampl. [Rubiaceae-Gardenieae]; *T. odoratae* (Hook. f.) habitu subsimilis sed foliis tenuioribus, inflorescentia laxiore indumento sparsiore instructa recedens.

Frutex circa 2.5 m. altus (ex Kerr); ramuli subgraciles, glabri, cortice cinnamomeo obtecti, lenticellis parvis inconspicuis. *Folia* oblongo-elliptica, oblongo-lanceolata, vel oblongo-oblancoolata, apice acuminata, basi cuneata vel attenuato-cuneata, 9–20 cm. longa, 3–7.5 cm. lata, chartacea, sicco viridia vel hic et illic fusca, pagina utraque glabra, costa supra impressa subtus prominente, nervis lateralibus utrinque 10–15 supra conspicuis subtus prominentibus intra marginem anastomosantibus, nervulis paucis subtus conspicuis, petiolo ad 1.8 cm. longo glabro supra canaliculato suffulta; stipulae vix 5 mm. longae, glabrae, deciduae. *Inflorescentia* terminalis, recta vel subrecta, pedunculo communi ad 3 cm. longo incluso ad 14 cm. longa, usque ad 12 cm. lata, ramis utrinque saepissime 3, supremis brevibus, partibus omnibus, corolla inclusa, breviter pallide plus minusve adpresse pubescens; bractae lanceolatae, ad 3 mm. longae; pedicelli ad 1 cm. longi, infra medium bibracteolati. *Receptaculum* 1.25 mm. longum. *Calycis* tubus 1 mm. longus, lobi deltoidei, tubo paululo breviores, basi 1 mm. lati, ciliati. *Corollae* albae (ex Kerr) tubus ante anthesin 6 mm. longus, intra superne dense pilosus, lobi 5, circa 8.5 mm. longi et 3 mm. lati, supra basi pilosi. *Antherae* apiculatae, 7 mm. longae, filamentis brevibus.

* Continued from K.B. 1932, 149.

Stylus superne brevius pilosus, cum stigmatibus 13 mm. longus, ovulis loculo quoque solitariis placentis immersis.

Chumpawn, Ta Ngaw, 50 m., evergreen forest, *Kerr* 11,468.

Tarenna elliptica Craib, Fl. Siam. Enum. ii. 90 (1932), descr. ampl. [Rubiaceae-Gardenieae]; a *T. depauperata* Hutchinson calyce glabro distinguenda.

Arbuscula circa 4.5 m. alta (ex *Garrett*); ramuli glabri, primo fusci, dein brunnei, mox cinerei, lenticellis inconspicuis. *Folia* elliptica, elliptico-obovata, vel obovata, apice brevius acuminata vel cuspidato-acuminata, basi cuneata vel rotundata, 5.5–12 cm. longa, 3.5–7 cm. lata, rigide chartacea, sicco viridia, pagina superiore glabra, inferiore in nervorum axillis subsparse pilosa, aliter glabra, costa supra impressa subtus prominente, nervis lateralibus utrinque 7–10 supra conspicuis vel subprominulis subtus prominulis, nervulis obscuris, petiolo 5–12 mm. longo glabro supra canaliculato suffulta; stipulae circa 6 mm. longae. *Inflorescentia* terminalis, e basi furcata, ad 3 cm. longa et 4.5 cm. lata, glabra; bracteae ad 2 mm. longae; flores sessiles vel pedicello ad 2 mm. longo suffulti, pallide aurantiaci, fere albi (ex *Garrett*). *Receptaculum* glabrum, circa 1 mm. longum. *Calycis* tubus brevis, segmenta sicco viridia, apice brevius acuminata vel rotundata, 1 mm. longa, 1 mm. lata, pauperius brevissime ciliolata. *Corolla* extra glabra, tubo vix 4 mm. longo intra apice dense piloso, lobis 5 oblongis apice rotundatis 6 mm. longis 2.5 mm. latis supra inferne pilosis. *Antherae* 5 mm. longae, apiculatae, filamentis glabris ad corollae tubi apicem positae circa 1.5 mm. longis suffultae. *Stylus* apicem versus sparse puberulus vel subglaber, cum stigmatibus 9 mm. longus; ovula loculo quoque solitaria.

Chiengrai, Doi Tam Tu Pu, 530 m., *Garrett* 276.

Tarenna hirsuta Craib, Fl. Siam. Enum. ii. 91 (1932), descr. ampl. [Rubiaceae-Gardenieae]; a *T. pulchra* Ridl. corolla extra haud glabra, a *T. sumatrana* (Boerl.) cui habitu similis foliorum nervis lateralibus paucioribus recedit.

Frutex circa 3 m. altus (ex *Kerr*); ramuli primo densius adpresse albo-hirsuti, glabrescentes, cortice brunneo vel pallide brunneo obtekti, lenticellis inconspicuis. *Folia* saepissime elliptica, apice obtuse acuminata vel subacuminata, basi cuneata vel rotundata, 8–16 cm. longa, 3–6.3 cm. lata, rigide chartacea, supra glabra, subtus praesertim ad nervos breviter albo-hirsuta, costa supra conspicua subtus prominente, nervis lateralibus utrinque 7–9 supra conspicuis subtus prominentibus, nervulis paucis subtus conspicuis, petiolo ad 1 cm. longo adpresse hirsuto supra canaliculato suffulta; stipulae 5 mm. longae, dorso adpresse hirsutae, deciduae. *Inflorescentia* terminalis, reflexa vel saepe refracta, pedunculo communi ad 1.5 cm. longo incluso ad 8 cm. longa, circa 10 cm. lata, ramis utrinque 3–4, partibus omnibus, alabastris inclusis, breviter adpresse vel subadpresse albo-hirsuta; bracteae angustae, circa

4 mm. longae; pedicelli ad 6 mm. longi, bracteolis duabus alternis saepissime fere ad medium sed nunquam apice vel sub apicem instructi; flores albi (ex *Kerr*). *Receptaculum* 1.5 mm. longum, apice constrictum. *Calycis* tubus vix 0.5 mm. longus, lobis 5, deltoidei, ad 0.75 mm. longi, basi ad 1 mm. lati, ciliati. *Corollae* tubus 8 mm. longus, intra superne piloso-pubescent, lobis 5, circa 6 mm. longi et 2.75 mm. lati, ciliati, intra inferne pilis paucis subrigidis albis instructi. *Antherae* apiculatae, 6 mm. longae. *Stylus* superne pubescens, cum stigmatibus 1.7 cm. longus, ovulis loculo quoque solitariis in placentis immersis.

Pattani, Kao Kalakiri, 900 m., evergreen forest, *Kerr* 14,976.

Tarenna hispidula Craib, Fl. Siam. Enum. ii. 91 (1932), descr. ampl. [Rubiaceae-Gardenieae]; a *T. longifolia* (G. Don) foliis subtus ad costam nervosque et aliter iuventute pilis adpressis sat rigidis instructis haud hirsutis recedens.

Ramuli iuventute hirsuti, fusci, compressi, mox glabrescentes, teretes, pallescentes. *Folia* oblongo-oblancheolata, apice acute acuminata, basem versus attenuata, 15–26 cm. longa, 5–7.5 cm. lata, sicca fusciscentia, supra glabra, subtus ad costam nervosque laterales pilis adpressis sat rigidis subsparse instructa et aliter iuventute similiter induta, costa supra conspicua subtus prominente, nervis lateralibus utrinque 13–15 supra conspicuis subtus prominulis intra marginem arcuatim iunctis, nervulis subtus conspicuis vel fere subprominulis, petiolo usque ad 1.8 cm. longo suffulta; stipulae ad 8 mm. longae, apice subulato-acuminatae, dorso medio adpresse hirsutae. *Inflorescentia* terminalis, pedunculo communi saltem primo nutante ad 11 cm. longo brunneo-hirsuto suffulta, apice trifurca, pedunculis partialibus 2–3 cm. longis, apice trifurcis, pedunculis ultimis brevibus, bracteis primariis 1 cm. longis, pedicellis brevibus vel ad 3 mm. longis basi parvi-bracteatis. *Receptaculum* ad 1 mm. longum, hirsutum. *Calycis* tubus brevis, segmenta 1 mm. longa, hirsuta. *Corolla* extra brunneo-hirsuta, tubo ante anthesin 8 mm. longo, lobis 6 mm. longis. *Antherae* 5 mm. longae, filamentis brevibus. *Stylus* sparse hirsutus.

Langkawi, Burau, *Ridley* 15,818 (Herb. Kew! et Singapore!).

Tarenna puberula Craib, Fl. Siam. Enum. ii. 94 (1932), descr. ampl. [Rubiaceae-Gardenieae]; a *T. insulare* Ridl. foliis subtus ad nervos puberulis, corollae alabastro extra densius puberulo recedens.

Frutex circa 1.5 m. altus (ex *Kerr*); ramuli primo puberuli, glabrescentes, cortice brunneo-cinereo obtekti. *Folia* oblongo-elliptica, oblongo-oblancheolata, vel subelliptica, apice acute acuminata, basi cuneata vel acuminata, haud rarius inaequilateralis, 7.5–14 cm. longa, 2.5–4.7 cm. lata, sicco fusciscentia vel viridia, chartacea, supra glabra, subtus ad nervos puberula et in nervorum axillis pilosa, costa supra parum impressa subtus prominente, nervis lateralibus utrinque 7–8 supra plus minusve conspicuis subtus pallidis prominentibus, nervulis vix conspicuis, petiolo 3–10 mm.

longo supra parum canaliculato suffulta; stipulae 6 mm. longae, diutius persistentes. *Inflorescentia* terminalis, corymbiformis, pedunculo communi ad 7 mm. longo incluso ad 3.5 cm. longa, 4 cm. lata, partibus omnibus puberula; bracteae ad 4 mm. longae; pedicelli ad 2.5 mm. longi, lateralibus apice bibracteolatis; alabastra puberula, apice angustata, summo apice stellulata; flores virides (ex *Kerr*). *Receptaculum* puberulum, 1 mm. longum. *Calycis* tubus brevis, segmenta 5, lineari-lanceolata, acuta, 3 mm. longa, basi 0.75 mm. lata. *Corollae* tubus 5 mm. longus, lobi 7 mm. longi, 2 mm. lati, acute attenuati, basi cum tubi apice pilosi. *Antherae* 4.5 mm. longae, filamentis brevibus. *Stylus* basi excepta pubescens, cum stigmatibus 11 cm. longus, ovulis loculo quoque 3.

Surat, Yanyao, 50 m., light evergreen forest, *Kerr* 18,242.

Tarenna pubescens *Craib*, Fl. Siam. Enum. ii. 94 (1932), descr. ampl. [Rubiaceae-Gardenieae]; a *T. cinerea* *Craib* foliorum et inflorescentiae indumento longiore facile distinguenda.

Arbor parva, circa 5 m. alta (ex *Kerr*); ramuli primo fusci, compressi, longius puberuli, mox brunnei vel cinereo-brunnei, glabri, lenticellis haud conspicuis. *Folia* saepissime lanceolato-elliptica vel elliptica, apice acuminata vel subacuminata, basi cuneata, 7-13 cm. longa, 2-5.3 cm. lata, subcoriacea, sicca supra subviridia, subtus cinerea, supra glabra, subtus molliter pubescentia, pilis ad costam nervosque laterales divergentibus, costa supra saepissime immersa subtus prominente, nervis lateralibus utrinque 10 supra conspicuis subtus prominentibus, nervulis vix conspicuis, petiolo 5-15 mm. longo indumento ei cauli simili tecto supra canaliculato suffulta; stipulae cuspidato-acuminatae, 8 mm. longae, dorso longius puberulae, sicco fuscae, deciduae. *Inflorescentia* terminalis, corymbiformis, pedunculo communi circa 5 mm. longo incluso ad 5 cm. longa, usque ad 6 cm. lata, rhachi et ramulis breviter pubescentibus, ramulis utrinque 3 supremis brevibus; bracteae plus minusve deltoideae; pedicelli breves vel subnulli; flores pallide virides (ex *Kerr*). *Receptaculum* paulo ultra 1 mm. longum, longius puberulum. *Calycis* tubus brevis, segmenta oblonga, apice rotundato-obtusa, 1.25 mm. longa, 1 mm. lata, dorso longius puberula, ciliata. *Corolla* extra glabra, tubo 2 mm. longo intra apice dense villosa, lobis 6.5 mm. longis 1.25 mm. latis. *Antherae* 5 mm. longae, apiculatae, filamentis brevibus. *Stylus* apicem versus parce pubescens, cum stigmatibus 9 mm. longus; ovula loculo quoque solitaria.

Prachuap, Pak Tawan, 100 m., light evergreen forest, *Kerr* 20,516.

Tarenna sakae *Craib*, Fl. Siam. Enum. ii. 95 (1932), descr. ampl. [Rubiaceae-Gardenieae]; inter species calycis segmentis brevibus et corolla extra glabra apiceque rotundata ob folia subtus ad nervorum axillas pilosa et aliter primo pilis distinctis (iis ad nervos persistentibus) instructa distincta.

Frutex circa 2 m. altus (ex *Kerr*); ramuli graciles, glabri, cortice cinnamomeo vel cinereo-cinnamomeo obtecti, lenticellis obscuris. *Folia* late oblanceolata vel oblanceolata, apice obtuse subacuminata, basi longius cuneata, 6.5-13 cm. longa, 2.5-4 cm. lata, subrigide chartacea, sicco supra fuscescentia, subtus viridia, supra glabra, subtus ad nervos sparse crispatis puberula, in nervorum axillis pilosa, et aliter setulis brevibus hic et illic instructa, costa supra impressa subtus prominente, nervis lateralibus utrinque circa 10 supra plus minusve conspicuis subtus prominentibus, nervulis obscuris, petiolo 7-12 mm. longo supra canaliculato suffulta; stipulae ad 1 cm. longae. *Inflorescentia* terminalis, ad 4 cm. longa et lata, fere ex ima basi ramosa, corolla excepta crispatis puberula; bracteae parvae, saepissime deciduae; pedicelli subnulli vel ad 2 mm. longi. *Receptaculum* 1 mm. longum. *Calycis* tubus 0.5 mm. longus, lobi 0.75 mm. longi, 1 mm. lati, apice rotundati, ciliati. *Corollae* albae (ex *Kerr*) tubus 4 mm. longus, extra glaber, intra apice dense villosus, lobi 5, circa 7 mm. longi et 3 mm. lati, dorso glabri vel ante anthesin apicem versus pauperrime puberuli, intra inferne albo-pilosi. *Antherae* longius apiculatae, 6 mm. longae, filamentis glabris 1 mm. longis. *Stylus* parte dimidia superiore puberulus, cum stigmatibus 13 mm. longus, ovulis loculo quoque solitariis.

Nakawn Sritamarat, Lan Saka, 100 m., evergreen on limestone hill, *Kerr* 15,392.

Tarenna valida *Craib*, Fl. Siam. Enum. ii. 96 (1932), descr. ampl. [Rubiaceae-Gardenieae]; a *T. insulare* *Ridl.* receptaculo calyceque pilis albis adpressis instructis haud minute puberulis, corolla apice haud stellulata recedit.

Frutex circa 2.5 m. altus (ex *Kerr*); ramuli primo fusci, compressi, albo-hirsuti, mox pallescentes, teretes, glabri. *Folia* oblongo-elliptica vel elliptica, apice acute acuminata vel subacuminata, basi cuneata, rarius late cuneata, 9.5-17 cm. longa, 3.5-6 cm. lata, rigide chartacea, sicco fusca, supra glabra, subtus ad costam nervosque laterales pilis paucis brevibus plus minusve deciduis instructa, costa supra conspicua interdum impressa subtus prominente, nervis lateralibus utrinque 8-10 supra conspicuis subtus prominentibus intra marginem anastomosantibus, nervulis paucis tantum conspicuis, petiolo 3-7 mm. longo glabro fusco supra parum canaliculato suffulta; stipulae ad 1 cm. longae, fuscae, glabrae, mox deciduae. *Inflorescentia* terminalis, pedunculo communi ad 3 cm. longo fusco albo-hirsuto suffulta vel saepe ob bracteas primarias foliaceas inflorescentiam sessilem simulans, ad 3.5 cm. longa et 4 cm. lata; ramuli utrinque saepissime 2, inferioribus circa 1.5 cm. longis, superioribus circa 0.5 cm. longis, cum rhachi albo-hirsuti; bracteae primariae angustae, circa 5 mm. longae vel saepe foliaceae et ad 7.5 cm. longae; pedicelli breves. *Receptaculum* breviter albo-hirsutum, vix 2 mm. longum. *Calycis* tubus brevis, segmenta lanceolata, acuta, 2 mm. longa, basi 0.75 mm. lata, breviter

albo-hirsuta. *Corollae* tubus extra breviter pubescens, intra superne pilosus, 4.5 mm. longus, lobi ante anthesin 5 mm. longi. *Antherae* 5 mm. longae, filamentis brevibus. *Stylus* basi excepta pubescens, cum stigmatibus 9 mm. longus, ovulis loculo quoque solitariis.

Ranawng, Kao Pawta Luang Keo, 1300 m., open evergreen on ridge, *Kerr* 16,959.

Tarenna viridis Craib, Fl. Siam. Enum. ii. 97 (1932), descr. ampl. [Rubiaceae-Gardenieae]; a *T. insulare* Ridl. foliis sicco viridibus subtus hispidulis, calyce et receptaculo densius breviter pubescentibus distinguenda.

Frutex circa 1.5 m. altus (ex *Kerr*); ramuli primo compressi, mox teretes, cito pallescentes, glabri, lenticellis haud conspicuis. *Folia* elliptica, rarius oblonga, apice subacute acuminata vel caudato-acuminata, basi cuneata, 10–19 cm. longa, 4.5–7.8 cm. lata, chartacea, sicco subviridia, subtus parum pallidiora, pagina superiore glabra, inferiore breviter hispidula, costa supra conspicua vel leviter impressa subtus prominente, nervis lateralibus utrinque 8 supra conspicuis subtus subprominentibus saltem supremis intra marginem arcuatim iunctis, nervulis paucis subtus prominulis, petiolo ad 1 cm. longo supra canaliculato suffulta; stipulae ad 8 mm. longae, mox deciduae. *Inflorescentia* terminalis, etiam interdum ex axillis supremis, breviter pedunculata, ad 2.5 cm. longa et 3.5 cm. lata, pedunculo rhachi et ramulis longius puberulis vel breviter pubescentibus; bractee lanceolatae, acutae, circa 2 mm. longae, puberulae, ciliatae; flores pallide virides (ex *Kerr*), terminalibus sessilibus vel breviter pedicellatis, lateralibus pedicellis ad 3 mm. longis apice bibracteolatis suffultis; alabastra breviter pubescentia, apice breviter stellulata. *Receptaculum* longius puberulum, vix 1.5 mm. longum. *Calycis* tubus brevis, segmenta 5, lanceolata, acuta, 3.75 mm. longa, 1 mm. lata, dorso puberula, intra sericea, ciliata. *Corollae* tubus 3 mm. longus, lobi acuminati, circa 6 mm. longi et 2 mm. lati, inferne cinnamomeo-pilosi. *Antherae* 4.25 mm. longae, acuminatae, filamentis brevibus. *Stylus* basi excepta pubescens, cum stigmatibus 7 mm. longus; ovula loculo quoque 3.

Ranawng, Kapôr, 10 m., evergreen forest, *Kerr* 16,839.

Randia celastroidea Craib, Fl. Siam. Enum. ii. 99 (1932), descr. ampl. [Rubiaceae-Gardenieae]; a *R. Griffithii* Hook. f. petiolo glabro, receptaculo haud glabro inter alia recedens.

Arbor 4–5 m. alta—an scandens?—(ex *Kerr*); ramuli glabri, primo sicco atri, mox substraminei vel grisei, spinis paucis rectis 4–6 mm. longis armati. *Folia* oblongo-obovata, rarius oblongo-oblanceolata vel obovata, apice breviter acute acuminata, basi cuneata, 4.5–10 cm. longa, 2.2–4.5 cm. lata, chartacea, sicco fusciscentia, subtus parum pallidiora, pagina utraque, nisi inferiore in nervorum axillis breviter pilosa, glabra, costa supra impressa subtus prominente, nervis lateralibus utrinque 8 supra impressis subtus prominulis, nervulis paucis subtus prominulis, petiolo 6–12 mm. longo

glabro supra canaliculato suffulta; stipulae subulato-acuminatae, 5 mm. longae, dorso superne adpresse hirsutae, deciduae. *Cymae* paniculam terminalem foliis multo breviorum 2–3 cm. diametro partibus omnibus adpresse hirsutis formantes; pedicelli breves. *Receptaculum* 1.5 mm. longum, adpresse hirsutum. *Calycis* tubus 1.5 mm. longus, extra adpresse hirsutus, intra glaber, lobi 5, circa 1 mm. longi, extra medio inferne adpresse hirsuti, ciliati. *Corolla* alba (ex *Kerr*); tubus 7.5 mm. longus, extra glaber, intra superne fere e medio pilosus; lobi 5, oblongi, saepe emarginati, 5 mm. longi, 1.5 mm. lati, glabri. *Stamina* ad corollae tubi apicem posita, filamentis vix 1 mm. longis, antheris mucronatis 3 mm. longis. *Stylus* cum stigmatibus circa 1.5 cm. longus, glaber; ovarium biloculare, ovulis loculo quoque circa 6 in placentam immersis.

Nakawn Sawan, Klawng Kung, 300 m., evergreen forest, *Kerr* 6051.

Randia crassispina Geddes apud Craib, Fl. Siam. Enum. ii. 100 (1932), descr. ampl. [Rubiaceae-Gardenieae]; a *R. fasciculata* DC. foliis floribusque maioribus, calycis lobis haud subulato-acuminatis recedens.

Frutex ad 3 m. altus (ex *Kerr*); ramuli spinis crassis rectis ad 1.3 cm. longis armati, pubescentes, primo quadrangulares. *Folia* ovato-lanceolata, apice acuminata, subacuta, basi rotundata, 2.8–9 cm. longa, 1.5–4 cm. lata, chartacea, sicco viridia, subtus pallidiora, supra glabra, subtus ad costam nervosque laterales parce hirsuta et in nervorum axillis pilosa, nervis lateralibus utrinque 6–7 supra conspicuis subtus prominentibus, petiolo 3–6 mm. longo pubescente suffulta; stipulae cuspidatae, 4 mm. longae. *Inflorescentia* terminalis, compacta, brevis, breviter pedunculata, partibus omnibus hirsuta; bractee bracteolaeque lanceolatae; flores sessiles. *Receptaculum* vix 3 mm. longum, hirsutum. *Calycis* tubus receptaculo subaequilongus, extra hirsutus, lobi 5, circa 1 mm. longi, extra hirsuti, intra glabri. *Corolla* alba (ex *Kerr*); tubus 1.3 cm. longus, glaber; lobi 5, oblongi, obtusi, 7 mm. longi, 3.75 mm. lati, glabri. *Stamina* 5, ad corollae tubi os affixa, antheris mucronatis 4.75 mm. longis. *Stylus* glaber, 8 mm. longus; stigmata duo, vix 4 mm. longa; ovarium biloculare, ovulis loculo quoque paucis.

Nawngkai, Chaiyaburi, 200 m., evergreen forest, *Kerr* 8537.

Randia elliptica Geddes apud Craib, Fl. Siam. Enum. ii. 100 (1932), descr. ampl. [Rubiaceae-Gardenieae]; a *R. malabarica* Lamk. floribus multo maioribus differt.

Frutex circa 3 m. altus (ex *Kerr*); ramuli spinis axillaribus rectis ad 7 mm. longis armati, pubescentes, griseo-brunnei vel grisei. *Folia* saepissime elliptica, apice et basi rotundata vel saepe apice emarginata, 2–4 cm. longa, 1–2 cm. lata, chartacea, sicco supra fusca, supra subsetuloso-puberula, subtus glabra, nervis lateralibus utrinque 3–5 subconspicuis, margine parum revoluta, petiolo 1–3 mm. longo pubescente suffulta; stipulae 2 mm. longae, deciduae. *Cymae*

pauciflorae, foliis conspicue minores, pedicellis brevibus bracteolatis. *Receptaculum* 2 mm. longum, hirsutum. *Calycis* tubus 3 mm. longus, extra hirsutus, intra glaber, lobi 5, oblongi, acuminati, 1·5 mm. longi et lati, dorso medio carinati. *Corolla* alba (ex *Kerr*); tubus 5 mm. longus, extra glaber, intra superne densius hirsutus; lobi 5, suboblongi, 8 mm. longi, 3·5 mm. lati. *Stamina* 5, ad corollae tubi os posita; filamenta circa 1 mm. longa; antherae exsertae, mucronatae, 5 mm. longae. *Ovarium* biloculare, ovulis loculo quoque permultis; stigmata exserta.

Nakawn Panom, Tat Panom, 200 m., evergreen scrub by creek, *Kerr* 8422.

Randia fusca *Craib*, Fl. Siam. Enum. ii. 102 (1932), descr. ampl. [Rubiaceae-Gardenieae]; a *R. murina* Craib foliis sicco fuscis tenuioribus haud hirsutis vel tomentosis recedit.

Arbor circa 8 m. alta (ex *Kerr*); ramuli iuvenes sicci fusci, breviter adpresse subsparse pubescentes, annotini glabri, cortice cinereo vel brunneo-cinereo obtecti, lenticellis longitudinaliter extensis conspicuis. *Folia* opposita, paribus inter se inaequalibus vel subinaequalibus, elliptica vel elliptico-ovata, apice acute acuminata, basi saepe parum inaequilaterialia, cuneata vel cuneato-rotundata, sub anthesin ad 7 cm. longa et 3·8 cm. lata, sicca fusca, subtus parum pallidiora, sat rigida, supra pilis brevibus ad costam densius, ad nervos laterales sparse, aliter hic et illic iuventute instructa, subtus pilis paululo longioribus similiter instructa et in nervorum axillis pilosa, costa supra conspicua subtus prominente, nervis lateralibus utrinque circa 12 supra conspicuis subtus subprominentibus, nervis transversis pagina utraque plus minusve conspicuis, nervulis rete gracile efficientibus, petiolo ad 1 cm. longo sicco fusco pilis paucis adpressis instructo supra late canaliculato suffulta; stipulae connatae, e basi lata subulato-acuminatae, ad 4 mm. longae, dorso subglabrae, ciliolatae, deciduae. *Corymbi* pedunculo communi brevi incluso circa 3 cm. longi, ad 3 cm. lati, pedunculo cum ramulis breviter adpresse albo-pubescente; bracteae parvae; flores albi (ex *Kerr*), pedicellis brevibus vel subnullis suffulti. *Receptaculum* 2·5 mm. longum, fuscum, subglabrum. *Calycis* tubus 1·5 mm. longus, lobi 5, deltoideo-lanceolati, 1–1·5 mm. longi, ciliati. *Corollae* alabastra acuta, apice mox parum stellulata, tubus 6·5 mm. longus, extra albo-subtomentosus, intra superne pilosus, lobi 5, circa 5 mm. longi et 3 mm. lati, glabri. *Antherae* e corollae tubo parum exsertae, apiculatae, 5 mm. longae, medifixae, filamentis brevibus. *Stylus* cum stigmatibus 8 mm. longus, subglaber, sulcatus; ovarium 2-loculare, ovulis numerosis inter maiuscula.

Krabi, Kaw Pipi-le, 50 m., open rocky (limestone) ground, *Kerr* 18,917.

Randia ligustrifolia *Geddes* apud *Craib*, Fl. Siam. Enum. ii. 102 (1932), descr. ampl. [Rubiaceae-Gardenieae]; a *R. malabarica* Lamk. spinis curvatis, floribus maioribus differt.

Ramuli primo pubescentes, mox glabri, cortice cinnamomeo vel griseo obtecti, spinis curvatis 6–8 mm. longis armati. *Folia* anguste elliptica, apice rotundata, mucronulata, basi rotundata vel subcordata, 3·2–5·5 cm. longa, 1·8–3 cm. lata, chartacea, supra fusca, glabra, subtus pallidiora, ad costam parce hirsuta, demum fere glabra, nervis lateralibus utrinque circa 7 subconspicuis, nervulis subobscuris, margine revoluta, petiolo 2–4 mm. longo pubescente suffulta; stipulae 2 mm. longae, deciduae. *Cymae* breves, 3–4-florae, pubescentes. *Receptaculum* circa 2 mm. longum, hirsutum. *Calycis* tubus 3 mm. longus, extra hirsutus, intra glaber; lobi 5, ovati, acuti, carinati, 1·75 mm. longi, circa 2 mm. lati, ciliati, extra hirsuti, intra superne parce adpresse pubescentes. *Corolla* alba (ex *Kerr*); tubus 4·5 mm. longus, basi extra glaber, intra parte superiore barbatus; lobi 5, oblongi, apice obliqui, 8 mm. longi, 3 mm. lati, margine minute ciliati, aliter glabri. *Stamina* 5, ad os tubi corollae affixa, filamentis circa 1 mm. longis, antheris exsertis mucronatis 3·5–4 mm. longis. *Ovarium* 2-loculare, ovulis in loculis multis; stylus 6 mm. longus; stigmata duo, contigua, fusiformia, 3·5 mm. longa, glabra.

Nakawn Sawan, under 50 m., evergreen forest, *Kerr* 5986.

Randia murina *Craib*, Fl. Siam. Enum. ii. 104 (1932), descr. ampl. [Rubiaceae-Gardenieae]; *R. anisophyllae* Jack probabiliter maxime affinis sed foliis minoribus, calycis tubo multo brevioris haud ferrugineo facile distinguenda.

Arbor circa 15 m. alta (ex *Kerr*); ramuli primo breviter subhirsuti, fusci, mox glabrescentes, cortice cinereo obtecti, circa 5 mm. diametro, lenticellis haud conspicuis. *Folia* opposita, paribus inter se inaequalibus, ovata vel elliptica, apice acute subacuminata, basi saepissime parum inaequilaterialia, rotundata vel late cuneata, sub anthesin ad 11·5 cm. longa et 6 cm. lata, subcrassa, sicca supra fusco-viridia, subtus murina, supra subhirsuta, subtus tomentosa, costa supra conspicua subtus prominente, nervis lateralibus utrinque circa 12 supra conspicuis subtus subprominentibus, petiolo ad 2 cm. longo hirsuto supra canaliculato suffulta; stipulae late deltoideae, circa 5 mm. longae, fuscae, dorso subglabrae, deciduae. *Inflorescentia* ut videtur saepissime terminalis, corymbiformis, pedunculo communi ad 3 cm. longo incluso ad 6 cm. longa, circa 5 cm. lata, pedunculo cum ramulis et pedicellis breviter hirsuto, pedicellis ante anthesin ad 3 mm. longis, bracteis ad 4 mm. longis, floribus albis (ex *Kerr*). *Receptaculum* circa 2 mm. longum, densius hirsutum. *Calycis* tubus 2·5 mm. longus, subsparse adpresse vel subadpresse hirsutus, lobi 5, deltoidei vel sublanceolati, acuti vel acute subacuminati, 2·25 mm. longi, basi 2 mm. lati, dorso sparse adpresse hirsuti vel fere glabri, ciliati. *Corollae* tubus 8 mm. longus, extra subsericeus, intra superne pilosus, lobi late elliptici, 7 mm. longi, 5 mm. lati, dorso dense hirsuti, supra pilis sparsis instructi. *Antherae* parum exsertae, 5 mm. longae, apiculatae, medifixae,

filamentis brevibus. *Stylus* cum stigmatibus fusiformibus 1 cm. longus, glaber.

Satul, Tung Nui, 100 m., evergreen on rocky limestone hill, *Kerr* 14,651.

Randia mussaendoides Craib, Fl. Siam. Enum. ii. 104 (1932), descr. ampl. [Rubiaceae-Gardenieae]; *R. sikkimensi* Hook. f. habitu similis sed floribus conspicue minoribus facile distinguenda.

Arbor circa 15 m. alta (ex *Kerr*); ramuli iuventute sericei; mox plus minusve glabrescentes, cortice cinereo vel brunneo-cinereo obtekti, lenticellis inconspicuis. *Folia* opposita, paribus inter se saepissime inaequalibus, lanceolata, oblanceolata, vel late oblanceolata, apice acute vel obtuse acuminata, basi cuneata, usque ad 16 cm. longa et 4 cm. lata, rigide chartacea, sicca supra fusciscentia, subtus pallide viridia, pagina utraque pilis brevibus albis adpressis sed inferiore ad costam nervosque magis densis instructa, mox plus minusve glabrescentia nisi nervorum axillis subtus pilosis, costa supra conspicua vel impressa subtus prominente, nervis lateralibus utrinque circa 10 supra conspicuis subtus prominulis, nervis transversis pagina utraque conspicuis vel inferiore subprominulis, petiolo ad 1.5 cm. longo suffulta; stipulae 2 mm. longae, dorso sericeae, deciduae. *Paniculae* ad apices ramulorum positae, ut videtur axillares, pedunculo communi ad 1 cm. longo incluso ad 6 cm. longae, pedunculo rhachi ramulis et pedicellis sericeis; pedicelli usque ad 1 cm. longi; bracteae parvae; flores lactei (ex *Kerr*). *Receptaculum* sericeum, 3 mm. longum. *Calycis* tubus receptaculo aequilongus, lobi 5, breves. *Corolla* extra sericea; tubus 2 cm. longus, apice 3.5 mm. diametro, intra paulo supra basem villosus; lobi elliptico-oblongi, circa 1 cm. longi et 4.5 mm. lati. *Antherae* sessiles, ad corollae tubi apicem positae, dorsifixae, lineares, acuminatae, 7 mm. longae. *Stylus* 2.5 cm. longus, medio puberulus; stigmata fusiformia, 6 mm. longa.

Krabi, 50 m., evergreen on rocky limestone hill, *Kerr* 18,849.

Randia pilosa Craib, Fl. Siam. Enum. ii. 110 (1932), descr. ampl. [Rubiaceae-Gardenieae]; a *R. armigera* K. Schum. foliorum paginae inferioris pilis divergentibus, corollae tubo extra piloso recedit.

Ramuli pilis divergentibus hirsuti, spinis axillaribus rectis circa 8 mm. longis primo subhirsutis armati. *Folia* saepissime oblongo-lanceolata vel lanceolata, apice acute subacuminata, basi cuneata vel rotundato-cuneata, 4-10 cm. longa, 2-3.2 cm. lata, chartacea, sicca supra subfusca, subtus pallidiora, supra ad costam et sparse ad nervos laterales setulosa, setulis mox plus minusve deciduis, subtus ad costam nervosque laterales hirsuta, aliter breviter hirsuta, nervis lateralibus utrinque 8 supra conspicuis subtus prominentibus, nervulis vix conspicuis, petiolo 2-7 mm. longo subhirsuto suffulta; stipulae 3 mm. longae, adpresse hirsutae, deciduae. *Cymae* et axillares et terminales, saepissime triflorae, pedunculo communi

petiolo brevior suffulta; pedicelli circa 4 mm. longi, subsparse hirsuti, basem versus bracteolis duabus oppositis 2 mm. longis instructi. *Receptaculum* 2 mm. longum, pilis divergentibus dense hirsutum. *Calycis* tubus receptaculo subaequilongus, hirsutus, lobi ad 6 mm. longi, hirsuti. *Corollae* tubus 3 cm. longus, apice circa 3 mm. diametro, extra sparse sed conspicue pilosus, intra superne pilosus, lobi 5, suboblongi, 1.6 cm. longi, 5 mm. lati, dorso plus minusve pilosi, supra ima basi pilis paucis brevibus instructi. *Antherae* apiculatae, 8 mm. longae, medifixae, subsessiles. *Stylus* cum stigmatibus crassis 3.3 cm. longus.

Rayawng, Ban Pe, *Put* 2684.

Randia plumbea Craib, Fl. Siam. Enum. ii. 111 (1932), descr. ampl. [Rubiaceae-Gardenieae]; a *R. Griffithii* Hook. f. pedicellis brevioribus, receptaculo haud glabro, floribus minoribus inter alia distinguenda.

Arbor circa 9 m. alta (ex *Kerr*); ramuli glabri, sicco iuventute, virides, mox cortice cinnamomeo obtekti, spinis rectis ad 6 mm. longis interdum armati. *Folia* oblongo-lanceolata, oblonga, vel oblongo-elliptica, apice acute acuminata, basi cuneata, 7-12 cm. longa, 3-4.8 cm. lata, rigide chartacea, sicca supra viridia, subtus plumbea, subtus in nervorum axillis pilosa, aliter glabra, costa supra conspicua subtus prominente, nervis lateralibus utrinque 5-7 supra conspicuis subtus prominulis, nervulis paucis tantum subconspicuis, petiolo circa 5 mm. longo supra canaliculato et margine hirsuto-ciliato suffulta; stipulae lineari-lanceolatae, acutae, 4 mm. longae, deciduae. *Inflorescentia* terminalis, pedunculo communi incluso ad 2 cm. longa; bracteae mox deciduae, deltoideae, circa 2 mm. longae, ciliatae; pedicelli ad 4 mm. longi, pilis paucis sed conspicuis adpressis instructi. *Receptaculum* 1.5 mm. longum, pilis paucis adpressis instructum. *Calyx* extra pilis adpressis sparsis instructus; tubus receptaculo subaequilongus; lobi receptaculo subaequilongi, oblongi, cuspidato-acuminati. *Fructus* juvenilis ater, 5 mm. diametro.

Doi Sutep, 1400 m., evergreen forest, *Kerr* 3141.

Gardenia lineata Craib, Fl. Siam. Enum. ii. 119 (1932), descr. ampl. [Rubiaceae-Gardenieae]; a *G. hygrophila* Kurz eiusque affinioribus, receptaculo costato, corolla indumento in lineas disposito extra instructa recedens.

Frutex circa 1.5 m. altus (ex *Kerr*); ramuli hornotini sicco fusci, sparse pubescentes, annotini glabrescentes, mox cortice griseo vel fusco-griseo obtekti, lenticellis parvis rotundatis inconspicuis. *Folia* oblongo-lanceolata vel oblongo-elliptica, apice subobtusata, saepe breviter acuminata, basi cuneata, 3-3.5 cm. longa, 1.2-1.5 cm. lata, sicco fusca, chartacea, pagina inferiore ad nervorum axillas saepe breviter pilosa, aliter glabra, costa supra conspicua subtus prominente, nervis lateralibus utrinque 10 supra conspicuis subtus prominulis intra marginem anastomosantibus, nervulis rete subtus

plus minusve conspicuum formantibus, petiolo ad 2 mm. longo suffulta; stipulae inter se connatae, circa 8 mm. longae, stramineae, glabrae. Flores solitarii, albi (ex Kerr), breviter pedicellati. *Receptaculum* costatum, circa 4 mm. longum, glabrum, sicco fuscum. *Calycis* tubus 2 mm. longus, lobi 5, lanceolato-deltoides, acuti, tubo paululo longiores. *Corollae* tubus 2 cm. longus, parte basali aequali circa 3 mm. longa, superne expansus, extra lineis puberulis cum lobis alternantibus instructus, intra basi supra partem aequalem villosus; lobi 5, oblongi, apice rotundati, circa 1.3 cm. longi et 1 cm. lati. *Antherae* lineares, 1.2 cm. longae. *Stylus* 2.5 cm. longus.

Nakawn Panom, Ta Uten, 200 m., open ground, Kerr 8455.

Gardenia mamillata Craib, Fl. Siam. Enum. ii. 121 (1932), descr. ampl. [Rubiaceae-Gardenieae]; a *G. campanulata* Roxb. fructu apice mamillata recedit.

Frutex ad 5 m. altus (ex Kerr); ramuli annotini subcinerei, glabri, paulo compressi, ramulis lateralibus spinescentibus usque ad 6 cm. longis ramulos abbreviatis gerentibus. *Folia* oblongo-elliptica, anguste elliptica, vel elliptico-obovata, 6–11.5 cm. longa, 2–3.7 cm. lata, subacute vel obtuse acuminata, basi cuneata, chartacea, sicco brunnescentia, subtus pallidiora, supra parce hirsuta, mox glabrescentia, subtus ad nervos nervulosque hirsuta, mox nisi in nervorum axillis glabrescentia, costa supra conspicua vel prominula subtus prominente, nervis lateralibus utrinque 6–8 supra conspicuis subtus prominulis intra marginem anastomosantibus, nervis transversis paucis subtus subprominulis, petiolo 3–12 mm. longo supra canaliculato primo parce adpresse hirsuto suffulta; stipulae deciduae. *Fructus* ellipsoideus vel late ellipsoideus, apice obtuse mamillatus, ad 6.5 cm. longus et 4.5 cm. diametro, sicco maturus stramineus.

Ranawng, Kao Pawta Chongdong, 500–800 m., bamboo forest, Kerr 16,750.

Gardenia truncata Craib, Fl. Siam. Enum. ii. 123 (1932), descr. ampl. [Rubiaceae-Gardenieae]; ab affini *G. sootepense* Hutchinson petiolo breviori, foliis basi truncatis, fructu subrotundato recedit.

Arbor parva, circa 6 m. alta (ex Kerr); ramuli primo puberuli, resinosi, mox glabri, cortice cinereo obtekti, lenticellis haud conspicuis. *Folia* rotundato-elliptica vel late oblongo-elliptica, apice breviter obtuse acuminata, basi truncata, usque ad 22 cm. longa et 16 cm. lata, rigide chartacea, sicca viridia, subtus pallidiora, supra crasse puberula, subtus ad costam nervos nervulosque breviter submolliter pubescentia, costa supra conspicua subtus prominente, nervis lateralibus utrinque circa 20, inferioribus patulis approximatis, superioribus intra marginem ipsam anastomosantibus, nervulis supra conspicuis subtus subprominulis, petiolo circa 5 mm. longo crasso longius puberulo suffulta; stipulae intrapetiolaris, 13 mm. longae, dorso puberulae, parte basali saepe diu annulatim

persistente. Flores axillares, solitarii, breviter pedicellati. *Receptaculum* circa 7 mm. longum, puberulum, 5-costatum. *Calyx* circa 1.5 cm. longus, apice bilobatus, costatus, dorso puberulus. *Corollae* tubus paulo ultra 4 cm. longus, medio 4 mm. diametro, superne parum ampliatus, lobi 5, late elliptici, 2.7 cm. longi, 2 cm. lati, glabri. *Antherae* paulo exsertae, 1.7 cm. longae, medifixae, filamentis brevibus. *Stylus* cum stigmatibus paulo ultra 5 cm. longus, glaber; ovarium uniloculare, placentis duabus. *Fructus* subrotundatus, costatus, ad 2.7 cm. diametro, brunneus, lenticellatus, pedicello 8 mm. longo suffultus.

Kanburi, common in deciduous forest, Kerr 20,493.

XXXVII.—TWO NEW SPECIES OF DENTELLA.

H. K. AIRY-SHAW.

Siamese material of what appeared to be a new species of *Dentella* (Rubiaceae-Hedyotideae) was presented to the Kew Herbarium in October, 1931, by Prof. W. G. Craib, who suggested that a revision of the genus might be undertaken. It was found impracticable, with the inadequate material available, satisfactorily to revise the whole genus, but a description of the new species was prepared, and the name, *Dentella serpyllifolia* Wall. ex Airy-Shaw, was forwarded to Prof. Craib. Owing to a misunderstanding this name was published (Fl. Siam. Enum. ii. 27: March 1932) before the appearance of the Latin description validating it under the International Rules of Nomenclature.

A full description of the species is now supplied together with its geographical distribution so far as known. The description of a second apparently distinct Asiatic species is appended.

Dentella serpyllifolia Wallich ms. (in sched. in Herb. Wall., sub no. 6206 G) ex Airy-Shaw, sp. nov. *D. repenti* (L.) Forst. valde affinis sed ovario fructuque glaberrimo statim recognoscenda.—*D. repens* Hook. f. in Hook. f. Fl. Brit. Ind. iii. 42 (1880), pro parte; Ridley, Fl. Mal. Penins. ii. 44 (1923), pro parte; non Forst., nec *Oldenlandia repens* L. ? *D. repens* var. *grandis* Pierre ex Pitard in Lecomte, Flore Gén. Indo-Chine, iii. 76 (1922). *D. serpyllifolia* Wall. ex Craib, Florae Siam. Enum. ii. 27 (1932), nomen subnudum.

Herba annua vel perennis, prostrata, diffuse ramosa, habitu omnino *D. repentis*. *Caules* glaberrimi, nodis radicanibus. *Folia* quam ea *D. repentis* plerumque pro rata longiora et angustiora, oblanceolata usque oblongo-obovata, 5–9 mm. longa, 1–2 (rarissime fere 3) mm. lata, basi in petiolum brevem valde attenuata, apice acuta usque obtusa et subrotundata, glaberrima vel rarissime folia iuniora setulis paucis apicem versus ciliata, marginibus levissime revoluti. *Stipulae* ut in *D. repente*. Flores solitarii, primum sessiles, demum brevissime pedicellati, e caulis bifurcationibus alternis fere semper orti. *Ovarium* oblongo-ovoideum, glaberrimum, sub anthesin vix 1 mm. longum. *Calyx* tubulosus, membranaceus, glaber, subtruncatus, nervis 5 asperulis in dentes 5 subulatos

hispidulos excurrentibus. *Corolla* alba, ei *D. repentis* similis sed maior, usque 8 mm. longa, lobis subdentatis. *Stamina* et *stylus* generis. *Capsula* sicca, indehiscens, oblique latissime ellipsoidea usque fere sphaeroidea, quasi zygomorpha, levissime dorsiventraliter compressa, uno latere (dorsali) ventricosa altero (ventrali) subplana, axi caulis praecipui transverse spectans, subtilissime 5-costata, secus septum distincte sulcato-constricta, 2.5 mm. longa, fere 2.5 mm. lata, glaberrima, calyce persistente erecto coronata. *Semina* numerosa, sphaerico-tetrahedrica, testa echinulato-reticulato, castanea.

ORISSA. Mahanadi, 8 May 1850, *Hooker & Thomson*.

NORTHERN BENGAL. Gongachora, 2 May 1809, *Hamilton* in *Herb. Wallich*, Cat. no. 6206 D.

LOWER BENGAL. Chittagong Hill Tracts: Kagi-ke-hath, 6 Jan. 1851, *Hooker & Thomson* 433: "Fl. white."

ASSAM. Brahmaputra, Booth in *Herb. Nuttall*.

LOWER BURMA. Bank of the Irrawaddi at Henzada, 9 Sept. 1826, *Wallich* 204 (Cat. no. 6206 G) (typus in *Herb. Wall.* et *Herb. Kew.*).

SIAM. Krungtep: Bangkok, growing on brick path, 5 Sept. 1920, *Kerr* 4454: "Flowers white."

EAST INDIES: LOMBOK. Ampanam, cult. ground, 1856, *A. R. Wallace*.

MAURITIUS (introd.?). Curepipe, growing as a weed on railway tracts, *Royal Botanic Garden, Mauritius*, no. 46.

Very close to *D. repens* (L.) Forst., but apparently a distinct species, since no true intermediates have been observed. The absolutely glabrous capsules give the fruiting plant a characteristic appearance. The orientation of the "zygomorphic" ovary in relation to the main and secondary axes seems peculiar in this genus. It is more easily observed in *D. serpyllifolia* than in *D. repens*, owing to the dense covering of hyaline setae in the latter obscuring the shape of the ovary. In the former species the plano-convex or plano-spheric form of the capsule is easily seen. The attachment of the septum is marked by a vertical furrow down the outside of the capsule, on opposite sides. The flowers are borne terminally and almost invariably at alternate nodes, and from these nodes 1 or 2 opposite, lateral branches are given off, one of them usually developing more strongly than the other. In the fruiting stage it is clearly seen that the pedicel, though terminal, is not borne symmetrically: it leans outward, as it were, from the angle formed by the two subtending branches, though the flower itself is erect. The orientation of the ovary (best seen in fruit) is such that the plane of the septum is at right angles to the vertical plane passing through the two opposite lateral branches, and it is the convex side of the fruit which always "leans out" from the fork. This position does not seem to be due to any torsion of the pedicel. A further peculiarity is that the plane of symmetry of the zygomorphic fruit does not coincide with any of the five possible ones of the pentamerous calyx and corolla. The

ribs of the calyx-lobes are faintly but distinctly decurrent down the receptacle, and careful examination of these shows that the calyx is symmetrical in relation to the plane of the two lateral branches, and therefore asymmetrical in relation to that of the receptacle.

I have not seen these features mentioned in any description of the genus hitherto, nor do I know of any parallel example in other Rubiaceous genera. It would be interesting to hear of such cases, if they exist, since they might throw light on the origin and significance of these peculiarities.

The existence of this glabrous-fruited *Dentella* has evidently been known for over a century, since Wallich gave a distinctive name to his 1826 collecting in his Herbarium, though he did not publish it in his Catalogue; and Hooker (*l.c.*) stated that the fruit of *D. repens* might be "hispid or glabrous."

Dentella concinna *Airy-Shaw*, sp. nov.; capsulis glabris *D. serpyllifoliae* Wall. affinis, sed foliis parvis rigidulis confertis subimbricatis costa valida differt.

Herba prostrata, radice perennante. *Caules* graciles, glabri, pro genere parum ramosi, ramis subsimplicibus 2-4 cm. longis; internodia breviora, 1-10 (circiter 5) mm. longa. *Folia* parva, rigida, adscendenti-patentia, nonnunquam imbricata, anguste elliptica usque oblango-oblancheolata, 2-5 mm. longa, 0.5-1 mm. lata, acuta, basi attenuata, vix vel brevissime petiolata, coriacea, margine revoluta, pagina superiore setis longis albis prorsum spectantibus praesertim marginem versus obsita, pagina inferiore glabra costa valida conspicua. *Stipulae* conspicuae, membranaceae, albae, deltoideae, apice in setas longas laciniatae. *Flores* ut videtur valde sparsi (an semper?), more generis orti, subsessiles. *Ovarium* oblongum, 1 mm. longum, diametro minore. *Calyx* membranaceus, tubo 1 mm. longo, costis 5 asperulis in dentes subulato-filiformes 0.75 mm. longos apice leviter patulos excurrentibus. *Corolla* infundibuliformis, circiter 6 mm. longa, intus prope stamina pubescens. *Stamina* generis. *Stylus* cum stigmatibus ut videtur longe papillosis 1.75 mm. longus. *Capsula* oblique compresso-sphaeroidea, circiter 2 mm. diametro, glabra, 5-costata, costa quinta sulcae ventrali proxima et eam fere percurrente, calyce 2 mm. longo dentibus hispidis coronata, brevissime (vix 1 mm.) pedicellata. [*Semina* non scrutata, capsula matura unica tantum in speciminibus praesente.]

LOWER BURMA. Henzada Distr.: Myanaung, Apr. 1872, *Gamble* 3723 A.

The possibility is not to be excluded that Gamble's collection may be an extreme habitat-form of *D. serpyllifolia* grown under exceptionally dry conditions. A specimen, however, with the setose fruits of *D. repens*, collected presumably under such conditions in the dried-up bed of a lake at Meiktila, Central Burma, does not possess the narrow leaves and remarkably strong midrib, characteristic of *D. concinna*, and appears to be referable with little doubt to

D. repens. For this reason it seems best at present to treat the plant from Lower Burma as a distinct species. Further material is, however, needed (as is the case throughout the genus) before the true status of this plant can be definitely settled.

In conclusion, it may be noted that the genus *Dentella* shows a marked centre of development in the northern, central and eastern parts of Australia. The Kew Herbarium possesses specimens of four or five undescribed species from this region. One or two are clearly allied to *D. minutissima* White et Francis, recently (1922) described from Central Queensland; others are close to *D. repens*, whilst yet others appear to be without obvious allies. The writer would therefore value the opportunity of examining further gatherings from Australia, in order that the new species may be described from adequate material. The collections at present at Kew are mostly somewhat fragmentary.

XXXVIII.—CONTRIBUTIONS TOWARDS A FLORA OF BRITISH NORTH BORNEO: II.* C. E. C. FISCHER.

Ixora lunutica C. E. C. Fischer, sp. nov. [Rubiaceae]; *I. accedenti* Val. proxima, foliorum nervis primariis paucioribus subtus haud elevatis, floribus pedicellatis, calycis lobis acutis, corollae tubo brevioris recedit.

A tree; twigs terete, brown, glabrous. Leaves directed forward at a sharp angle with the twigs, narrowly oblanceolate, acuminate, base tapering to the short petiole, glabrous, olive-brown when dry, 10–27 cm. long, 1.6–3.7 cm. wide, midrib and the 14–16 primary nerves prominent below, the latter regular, forming an acute angle (less than 45°) with the midrib, curving slightly and uniting close to the slightly revolute margin; petioles terete, channelled above, 5–7 mm. long; stipules 7 mm. long, shortly and broadly ovate and more or less keeled, the apex produced into a trigonous subulate mucro. Inflorescence of terminal, repeatedly trichotomous cymes 16 cm. long, with a pair of much reduced leaves (7 mm. long) and stipules at the first fork; rhachis and its branches compressed below the nodes, glabrous or minutely puberulous; bracts at the forks 2, acuminate, minute; flowers numerous, glabrous, pedicels slender, 4–8 mm. long, each bearing 2 minute bracteoles. Calyx turbinate, slightly constricted above the ovary, 1.5 mm. long including the minute, triangular-ovate, acute or subacute lobes. Corolla-tube 2.7 cm. long, .5 mm. diam., striate with 8 thick nerves; lobes 4, elliptic-oblong, acute, 7 mm. long, 2.5 mm. wide, twisted clockwise in bud, forming a narrowly fusiform acuminate apex to the tube. Stamens 4, seated on the mouth of the corolla-tube, exserted; filaments fleshy, subulate, 1.5 mm. long; anthers linear, abruptly finely acuminate, 3.5 mm. long. Ovary 1 mm. long; style very slender, 4 mm. exserted; stigmas oblong-ovate. Fruit not seen.

*Continued from K.B. 1932, 182.

Lunut, fls. Aug., *Arsat* in Herb. For. Dept. 1259. "Height 40 ft., diam. 1 ft. Flowers white."

Vaccinium adenurum C. E. C. Fischer, sp. nov. [Vacciniaceae]; *V. laurifolium* Miq. affinis, foliis minoribus, racemis longioribus, bracteis majoribus, tubis antherarum truncatis minute glandulosis differt.

A shrub; branchlets terete, glabrous, pale-brown, youngest twigs striate, reddish-brown, minutely puberulous. Leaves thinly coriaceous, elliptic-obovate, attenuate at both ends, apex obtuse or acute, 3–5.5 cm. long, 1.5–2.6 cm. wide (a few here and there spatulate, 1.5 cm. long), midrib slightly raised below, primary nerves 4–6 pairs, arising at an acute angle from the midrib, arching and anastomosing, reticulations indistinct, quite glabrous, when dry dark-brown and smooth above, paler, wrinkled and obscurely glandular below, margins recurved and sometimes with an immersed gland on one or both sides just above the petiole; petioles flat, 3–4 mm. long, pruinose. Inflorescence of terminal and axillary racemes; rhachis angular, up to 10 cm. long, minutely puberulous, with several deciduous minute, ovate, pungently acuminate mucronate, puberulous scales at the base; bracts deciduous or some persisting till the corollas fall, membranous, subsessile, narrowly oblanceolate, attenuate at both ends, apex acute, minutely puberulous, 1.5–2 cm. long; flowers numerous; pedicels 5–7 mm. long, minutely puberulous. Calyx broadly campanulate, 2.2 mm. long; lobes 5, broadly ovate, abruptly acute, 1 mm. long, minutely ciliate. Corolla tubular, slightly inflated at the middle, contracted at the mouth, glabrous without, furnished with scattered short white hairs within, tube 5–6 mm. long; lobes 5, triangular, obtuse, reflexed, 1 mm. long, minutely grey-papillose within. Stamens 10, epigynous, free; filaments linear-ensiform, base inflexed, 3.5 mm. long, pilose; anthers oblong, muriculate, spurs 0 or minute, the terminal tubes truncate, erose, sparsely minutely glandular. Disc dome-shaped, 5-lobulate, glabrous. Ovary 5-celled, ovules several in each cell; style compressed, 5 mm. long, pilose below, minutely grey-papillose above, truncate. Fruit not seen.

Sandakan, on hill near catchment area, fls. Nov., *G. Pascual* in Herb. For. Dept. 1219. "Height 10 feet, diam. 4 in. Flowers white."

Embelia philippinensis A.DC. [Myrsinaceae].

Pin River, fls. Sept., *Arsat* in Herb. For. Dept. 1241. "Fl. white." Orang Sungei name: *Sabiliken*. Without precise locality, *D. D. Wood* 2123.

Diospyros borneensis Hiern [Ebenaceae].

Gaya, Gov. Creagh.

Diospyros cauliflora Bl. [Ebenaceae].

Banguey Island, *P. Castro et F. Melegrito* 1379.

Diospyros elliptifolia Merr. [Ebenaceae].
Banguey Island, P. Castro et F. Melegrito 1666.
forma **kinalabuensis** Bakh.
Kinabalu, 3000 ft., G. D. Haviland 1322.

Diospyros Enderti Bakh. [Ebenaceae].
Without precise locality, D. D. Wood 1305.

Diospyros Everettii Merr. [Ebenaceae].
Kudat, fls. Feb., Dr. M. Fraser 203.

Diospyros Helferi C. B. Clarke [Ebenaceae].
Without precise locality, D. D. Wood 1964.

Diospyros Korthalsiana Hiern [Ebenaceae].
Banguey Island, P. Castro et F. Melegrito 1706.

Diospyros lanceifolia Roxb. forma **consanguinea** (Merr.) Bakh.
[Ebenaceae].
Kinabalu, Jesselton, M. S. Clemens 9600.

Diospyros maritima Bl. [Ebenaceae].
Port Myburgh, Gov. Creagh; Kudat, Dr. M. Fraser 80.

Diospyros pendula Hasselt. [Ebenaceae].
Kudat, Dr. M. Fraser 201.

Diospyros tuberculata Bakh. [Ebenaceae].
Banguey Island, P. Castro et F. Melegrito 1409.

Jasminum triandrum C. E. C. Fischer, sp. nov. [Oleaceae]; ab omnibus ceteris speciebus staminibus 3 recedit; *J. celebico* Merr. proximum, a quo nervis foliorum primariis paucioribus, bracteis majoribus, floribus numerosioribus et majoribus differt.

A woody climber; twigs terete, glabrous except for the brownish-puberulous upper nodes. Leaves opposite, simple, distichous, ovate-lanceolate, tapering to a fine point, base rounded, 3.5-7.5 cm. long, 1.2-3.2 cm. wide, midrib slightly impressed above, prominent below, primary nerves pennate, 4-5 pairs, the upper 1 or 2 pairs obscure, looping and anastomosing near the margin, reticulations obscure, quite glabrous, fuscous-brown when dry; petioles slender, curved upwards, 7-10 mm. long, channelled above, articulated below the middle and minutely puberulous below the articulation, base widened, the two opposite petioles joined by a raised line. Inflorescence terminal and from the upper axils; peduncles compressed, glabrous, the lower ones up to 3 cm. long, gradually shorter upwards; cymes trichotomous, rather dense-flowered, the ultimate divisions 1-flowered, or more usually 2-5 in umbels, often with much reduced lanceolate or linear-lanceolate, acuminate and petiolate leaves, acute at the base, at the forks; partial rhachises sometimes puberulous, bracteoles linear or linear-spathulate, up to 1 cm. long, glabrous; pedicels rather stout, 3-3.5 cm. long. Calyx-tube cupular, 2-2.5 mm.

long; lobes 6, linear-acicular, 5-7 mm. long, glabrous, minutely ciliate. Corolla-tube 1.4-1.6 cm. long; lobes 8-9, linear-oblong, finely acuminate, 9-10 mm. long. Stamens 3; filaments short, flat; anthers linear, apiculate, 3-3.5 mm. long. Ovary ellipsoid, 1 mm. long, glabrous; style slender, as long as the corolla-tube, glabrous. Fruit not seen.

Lundan, 100 ft., fls. June, Md. Tahir in Herb. For. Dept. 1313. "In forest. Flowers white." Malay name: *Bunga Malur-hutan*.

Three stamens in a *Jasminum* is very unusual. Several flowers were dissected and every one was tri-staminate.

Alstonia angustiloba Miq. [Apocynaceae].

Sandakan, 80 ft., fr. Feb., H. G. Keith in Herb. For. Dept. 1271; fls. Sept., H. G. Keith in Herb. For. Dept. 1321 (both specimens from same tree). "Tree 50 ft. high, 40 in. diam; fls. white, fr. pale-green." Vernacular name: *Pulai*.

Avicennia alba Bl. [Verbenaceae].

Nabakan, Weston, fls. Oct., Md. Tahir in Herb. For. Dept. 1232. "In swamp." Malay name: *Api-Api*.

XXXIX.—BOTANICAL NAMES OF LAVENDER AND SPIKE. M. L. GREEN.

As the result of an enquiry from the Pharmaceutical Society, an historical investigation was undertaken by the writer into the nomenclature of Lavender and Spike with the following results:—

(1) The name *Lavandula Spica* as originally published by Linné included both Lavender (as var. α), and Spike (as var. β).

(2) The name *L. Spica* was presumably given by Linné with reference to "*Spica recentiorum*" Lobel. Hist. 235 (vide Linn. Hort. Cliff. 303) i.e. Spike, and it was adopted by the following botanists for that species when it was separated from Lavender: Chaix (1786); De Candolle (1815); Gingins (1826); Bentham (1833, 1848); in most recent pharmaceutical works also, the name *L. Spica* has been applied to Spike.

(3) When a species originally composed of varieties is broken up into two or more species it is generally assumed, in the absence of evidence to the contrary, that var. α is the type of the specific name, that is, the element for which the name should be retained in the event of segregation. Hence numerous botanists have retained the name *L. Spica* L. for the Lavender; e.g. Loiseleur (1807); Nyman (1881); Briquet (1891, 1896); Schinz & Thellung (1923); Rehder (1927).

(4) It has been shown by Sprague, however, that in various cases the type of a Linnean specific name was not his var. α (*Rhodora*, xxx. pp. 55-56: 1928).

(5) In view of the name *L. Spica* L. having been used in numerous standard floras for Spike and in others for Lavender, it is now

wholly ambiguous unless the words "emend. Chaix" or "emend. Loisel." are added whenever it is mentioned.

It was decided at the International Botanical Congress held at Cambridge in 1930 that "a name of a taxonomic group must be rejected if, owing to its use with different meanings, it becomes a permanent source of confusion or error," and that a list of "nomina ambigua" should be prepared by the Executive Committee of Nomenclature. The name *Lavandula Spica* L. is here suggested for inclusion in the list. If it is treated as a "nomen ambiguum," the correct name for Lavender is *Lavandula officinalis* Chaix and that of Spike is *Lavandula latifolia* Vill.

The more important synonymy of the two species is as follows:—

LAVENDER.

Lavandula officinalis Chaix in Vill. Hist. Pl. Dauph. i. 355 (1786); Vill. l.c. ii. 363 (1787); Ard. Fl. Alp.-Marit. ed. 2, 296 (1879); Parl. Fe. Ital. vi. 56 (1884); Rouy & Fouc. Fl. France, xi. 254 (1909); Tschirch, Handb. Pharmacogn. ii. 823 (1912); Finne-
more, Essential Oils, 707 (1926); Hegi, Ill. Fl. Mittel-Eur. v. 2277 (1927).

L. Spica Linn., var. α , Linn. Sp. Pl. 572 (1753).

L. Spica Linn. emend. Loisel. Fl. Gall. ii. 346 (1807); Bertoloni, Fl. Ital. vi. 74 (1844); Nyman, Consp. Fl. Eur. 572 (1881); Briq. Lab. Alp. Marit. 464 (1891); Briq. in Engl. & Prantl, Nat. Pflanzenfam. iv. 3A, 228 (1896); Fiori & Paoletti, Fl. Ital. iii. 18 (1903); Schinz & Thellung, Fl. Schweiz, ed. 4, i. 556 (1923); L. H. Bailey, Man. Cult. Pl. 641 (1924); Rehder, Man. Cult. Trees & Shrubs, 780 (1927).

L. angustifolia Moench, Meth. 389 (1794).

L. vera DC. Fl. France, vi. 398 (1815); Gingins, Hist. Nat. Lavand. 145 (1826); Benth. Lab. Gen. & Spec. 148 (1833); De Notaris, Rep. 347 (1844); Benth. in DC. Prodr. xii. 145 (1848); Masters in Treas. Bot. 664 (1866); Willk. & Lange, Prodr. Fl. Hisp. ii. 391 (1870); Benth. & Trimen, Med. Pl. iii. t. 199 (1880); Flückiger, Pharmacogn. Pflanzenr. ed. 3, 811 (1891); Coste, Fl. France, iii. 78 (1904); Greenish, Mat. Med. ed. 2, 95 (1909), et Greenish, l.c. ed. 5, 89 (1929).

SPIKE.

Lavandula latifolia Vill. Hist. Pl. Dauph. ii. 363 (1787); Loisel. Fl. Gall. ii. 346 (1807); Willk. & Lange, Prodr. Fl. Hisp. ii. 392 (1870); Ard. Fl. Alp.-Marit. ed. 2, 296 (1879); Nyman, Consp. Fl. Eur. 572 (1881); Parl. Fl. Ital. vi. 59 (1884); Briq. Lab. Alp.-Marit. 469 (1891); Briq. in Engl. & Prantl, Nat. Pflanzenfam. iv. 3A, 228 (1896); Fiori & Paoletti, Fl. Ital. iii. 19 (1903); Coste, Fl. France, iii. 78 (1904); Rouy & Fouc. Fl. France, xi. 255 (1909); Tschirch, Handb. Pharmacogn. ii. 831 (1912); L. H. Bailey, Man. Cult. Pl. 641 (1924); Finne-
more, Essential Oils, 718 (1926); Rehder, Man. Cult. Trees & Shrubs, 780 (1927); Hegi, Ill. Fl. Mittel-Eur. v. 2276 (1927).

L. Spica Linn., var. β , Linn. Sp. Pl. 572 (1753).

L. Spica Linn. emend. Chaix in Vill. Hist. Pl. Dauph. i. 355 (1786); DC. Fl. France, vi. 397 (1815); Gingins, Hist. Nat. Lavand. 151 (1826); Benth. Lab. Gen. & Spec. 149 (1833); De Notaris, Rep. 347 (1844); Benth. in DC. Prodr. xii. 145 (1848); Masters in Treas. Bot. 664 (1866); Flückiger, Pharmacogn. Pflanzenr. ed. 3, 814 (1891); Greenish, Mat. Med. ed. 2, 96 (1909), et Greenish, l.c., ed. 5, 89 (1929); Sprague & Nemes in Journ. Linn. Soc., Bot. xlviii. 326 (1931).

XL.—INEZIA, A NEW GENUS OF COMPOSITAE FROM SOUTH AFRICA. E. P. PHILLIPS.

Inezia E. P. Phillips, gen. nov., affinis *Lidbeckiae* Berg., sed floribus radii fertilibus, bracteis apice scariosis, et pappo minuto differt.

Planta 30–60 cm. alta, villosa. *Caules* erecti. *Folia* sessilia, integra. *Capitula* solitaria, heterogama, floribus radii 1-seriatis fertilibus, disci $\varnothing$ fertilibus. *Involucrum* campanulatum, bracteis pauciseriatis imbricatis, interioribus apice scariosis. *Receptaculum* conicum, nudum. *Corollae* radii ligulatae, involucri aequilongae; $\varnothing$ regulares, 4-angulares, 4-fidae. *Antherae* basi obtusae, integrae. *Styli* rami fl. $\varnothing$ apice truncati. *Achaemia* anguste oblonga, anguste alata.

Inezia integrifolia (Klatt) E. P. Phillips, comb. nov.—*Lidbeckia integrifolia* Klatt in Bull. Herb. Boiss, sér. 1, iv. 840 (1896).

TRANSVAAL: Barberton distr.; Dry range at Moodies, 5000 ft., Feb., Thornecroft 452*, 453, and in Herb. Wood 4948*; Saddleback Mt., 4000 ft., Nov. & Dec., Galpin 1174; Near top of mountain behind Barberton, 5000 ft., Feb., Liebenberg 2420; Lydenburg distr.; open veld near Graskop, 4760 ft., Jan., Irvine in Nat. Herb. 11,421.

SWAZILAND: Near Mbabane, 5000 ft., Dec., Bolus 12,012; 4600 ft., Jan., Burt Davy 2868.

As formerly constituted, the genus *Lidbeckia* consisted of three species, two from the south-western districts of the Cape Province, and the third from the Transvaal and Swaziland. The last species, which Klatt placed in the genus *Lidbeckia*, not only differs in some important characters from the Cape plants, but also occurs in quite a different floral region, and there is, therefore, justification for regarding it as a distinct genus. The two species from the Cape are more or less branched, semidecumbent, undershrubs, with divided leaves. The plant under consideration has a perennial underground stem, from which stiff, erect, leafy branches arise, and the leaves are entire. It further differs from the type species of *Lidbeckia* in that the ray-flowers are scarcely longer than the involucrial-bracts, which, more especially the inner ones, are

*Klatt quotes Thornecroft 552 and 4958, whereas the numbers should be as above.

truncate and membranous at the tips; the ovary of the disc-flowers does not break away from the corolla with an attached shoulder, as in *Lidbeckia*, but comes away clear, and then shows a very minute crown-like pappus. The genus has been named in honour of Miss Inez C. Verdoorn, on the staff of the National Herbarium, Pretoria.

XLI.—MISCELLANEOUS NOTES.

THE DIRECTOR has been honoured by being elected a Corresponding Member of the Deutsche Botanische Gesellschaft at the meeting held on May 18th, 1932. At the same meeting DR. O. STAFF, F.R.S., already a Corresponding Member, was elected an Honorary Member of the Society.

Hackelia macrophylla (Brand) Johnston. This species was treated originally as a variety of *Cynoglossum uncinatum* Benth. In Fl. Brit. Ind. iv. 161, it was united with *Paracaryum glochidiatum* Benth. and has been much confused with that species in herbaria. In Fedde, Rep. xiv. 146-147 (1915), Brand showed that neither of these two species is a true *Paracaryum* and placed them in the genus *Lappula* Gilib., making the new combination *Lappula glochidiata* and describing the variety as a new species *Lappula macrophylla*.

In 1923, Johnston (Contr. Grey Herb. new series, lxviii. 43) pointed out that the usual conception of *Lappula* comprises two sharply differentiated groups of plants and proposed to revive the genus *Hackelia* Opiz for the biennial or perennial species, the nutlets of which have a large ovate or deltoid areola, leaving in *Lappula* the annuals whose nutlets are attached by a narrow areola extending all along the medial ventral keel. In this view both the species under review fall in *Hackelia*. Johnston, however, correctly rejected the specific name *glochidiata* of Wall, as a *nomen nudum* on a Wallichian sheet not validated by any description (vide art. 37 of the International Rules), and substituted the trivial *Roylei*, after *Cynoglossum Roylei* G. Don, Syst. iv. 356 (1838). In his revision of the family in Pflanzenr. Borraginac.-Cynogloss. 119-120 (1931), Brand accepts the transfer to the genus *Hackelia* but retains the incorrect trivial *glochidiata*. As pointed out in K.B. 1925, 319, *Cynoglossum uncinatum* Benth. in Royle Ill. 305 is the earliest valid name for the plant, as the part containing the description appeared in 1836. The correct name for the species, therefore, is **Hackelia uncinata** (Benth.).

Brand in the two publications cited has shown the characters distinguishing the two species, but Mr. B. O. Coventry, who has had the opportunity of studying both in Kashmir, has brought the following additional points to my notice:—

H. uncinata: One or two pairs of nerves in the leaves above the basal continued in an even, practically uninterrupted curve to near the apex, upper surface of the leaves asperous; nutlets with the glochidia in usually two marginal rows (one row in occasional, reduced nutlets) and the faces devoid of glochidia; corolla blue.

H. macrophylla: All the nerves soon forking and anastomosing, upper surface of leaves smooth; nutlets with glochidia spread over the whole face; corolla white with a purple blotch at the sinus between the lobes.

H. macrophylla does not appear to extend as far East as *H. uncinata*, the following localities being represented in the Kew Herbarium, besides several sheets collected by T. Thomson attributed to "Him. Bor. Occ." without more precise localisation; Hatta, T. Thomson; Murree, Top of Mt. Mokshpuri A.F.; Yarkand Expedition, Dr. Henderson; Kumaon, Ralam River, 11,500 ft., Strachey and Winterbottom 6; W. Him., Pangee, Dr. Watt; Kulu Lahoul, near Pulga, J. R. Drummond 22,963; Kashmir, Aru, 9000 ft., J. R. Drummond 14,116; Mirga, 9200 ft., Chitral Relief Expedition 17,353; Jaunsar, Chachpur, 7000 ft., J. S. Gamble 23,692; Tehri Garhwal, Bamsu and Murali, 6500-8500 ft., fl. and fr. May-June, J. S. Gamble 24,217, 24,792, 24,947; Punjab, Changla Forest, fl. and fr. July, Miss E. M. Saunders, "Grows near water in woods. Flowers white or pale-pink with pink centre"; Chitral, Ziarat, 8000 ft., S. M. Toppin 431; Kashmir, Badwan, 7500 ft., fl. July, B. O. Coventry 1488.

C. E. C. FISCHER.

Ruyschia phylladenia Sandwith.—The description of this species (see K.B. 1930, 153) was incomplete since the petals and stamens had fallen and none were to be found with the herbarium material. Mr. C. H. Lankester, who discovered this interesting plant at Las Cónovas, Cartago, Costa Rica, at an attitude of 4800 ft., has kindly presented to Kew a fine flowering raceme preserved in spirit. The description of the species may therefore be amplified as follows:—

Petala obovata usque anguste obovata, 7 mm. longa, 3-4 mm. lata, libera, sub anthesi reflexa. *Stamina* 3, 5-6 mm. longa; filamenta complanata, supra basin ad 1.2 mm. lata, sursum angustata, basi petalis manifeste adhaerentia, inter se libera; antherae suborbiculari-ovatae, 1 mm. longae, 0.8 mm. latae. *Ovarium* biloculare, globosum, 2 mm. longum atque diametro, stylo manifesto cum stigmatibus subintegro 1.5 mm. longo.

The most interesting features of the flower of this species, as will at once be seen by students of the *Marcgraviaceae*, are the choripetaly and the presence of three stamens. These characters immediately suggest the transference of *R. phylladenia* to the genus *Caracasias* Szysz., which was originally described by Ernst as *Vargasias*, a name which had to be abandoned under the International Rules of Nomenclature. *Vargasias* was distinguished from *Ruyschia* (*sensu latiore*, including *Souroubea*) by the possession of 3 instead of 5 stamens, which were free instead of adnate to the petals at the base; by the bilocular, instead of quinquelocular, ovary; and by the biconvex lamina of the nectaries. The two last characters were subsequently found to be worthless, since *Ruyschia* Jacq. *sensu*

stricta has, in fact, a bilocular ovary, and the lamina of its nectaries is more or less biconvex. Subsequent authors, therefore (Szyszylovicz and, more recently, Gilg and Werdermann, in Engler and Prantl, *Pflanzenfamilien*) have distinguished *Caracasía* from *Ruyschia* on the number of the stamens, and the freedom of the petals and stamens, the petals of *Ruyschia* being said to be connate at the base, and the 5 stamens connate and adherent to the petals.

But dissection of the flower of the type species of *Ruyschia*, *R. clusifolia* Jacq., shows that neither the 5 stamens nor the petals are connate. The 5 broad filaments are adnate to the petals at the base and meet each other at this point, but they are not connate; and several of them are so placed towards the side of the petal that they appear to be alternate with, rather than opposite to, the petals. Thus the filaments partly adhere to and partly overlap the petals, and the result is that the petals tend to appear fused at the base, although in reality they are free.

In *R. phylladenia*, which has the 3 stamens of *Caracasía*, although its general facies is exactly that of *R. clusifolia*, the filaments are adnate to the petals at the base and inserted at the side rather than in the centre, precisely as in *R. clusifolia*. The petals always appear perfectly free, since the filaments, being fewer in number, do not meet each other nor tend to create an appearance of fusion.

R. phylladenia, therefore, disagrees with Ernst's description of *Vargasia* (*Caracasía*), since the 3 stamens are not free from the petals. There is no material of *Caracasía* at Kew. The genus was based on two species discovered near Caracas, *C. tremadena* (Ernst) Szysz. and *C. viridiflora* (Ernst) Szysz. Of these the former has the leaves rounded, the latter subcordate at the base, and in both species the free part of the nectary is situated at the apex of the pedicel. Thus it is clear that *R. phylladenia* is distinct from both species of *Caracasía*, not merely in its stamens which are adnate to the petals at the base, but also in its shorter leaves which are attenuate at the base, and in the lamina of its nectary which arises from above the middle of the pedicel but at some distance from the apex.

Although no material of *Caracasía* has been available for examination, the above remarks would seem to suggest that the genus is not really separable from *Ruyschia*. If the stamens of *Caracasía* are truly free, then *Ruyschia phylladenia* is a connecting link between the two genera. Meanwhile, it does not seem desirable to place *R. phylladenia* in *Caracasía* merely on account of its three stamens.

N. Y. S.

Conifers in Cultivation.*—This book of 634 pages is the official report of the Conifer Conference, organised by the Royal Horticultural Society, held in the Society's Hall in Greycoat Street, Westminster, in November 1931.

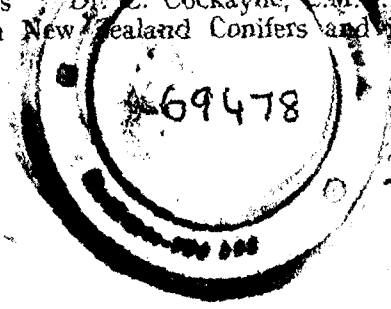
*Conifers in Cultivation: The Report of the Conifer Conference held by the Royal Horticultural Society, November, 1931. Price £1 1s. 0d. net from The Secretary, Royal Horticultural Society, Vincent Square, London, S.W.1.

Forty years had passed since the Society held their previous Conference, and in the intervening years so much additional knowledge had been gained about Conifers and their cultivation, and so many new species had been introduced, that an opportunity for collating and distributing information had become necessary.

Quoting from the report, p. 2, "The principal objects of the Conference were to collect experiences regarding the many coniferous plants introduced as a result of expeditions to China, N. Burma, Tibet, etc.; to revise the conclusions on the cultural possibilities of various Conifers as stated at the last Conference; to gather together the changes that have become necessary in nomenclature; and to collect statistics of the growth in the British Islands of coniferous trees and, so far as possible, compare the statistics with those obtained 40 years ago." To gain these ends a number of papers on varied subjects were prepared for reading at the Conference and these papers, with the discussions that ensued, appear in the report. Statistics concerning the various species grown in some 250 gardens situated in different parts of the British Isles were obtained, and they form an important section of the work—pp 329–596. Unfortunately the statistical comparisons with trees measured 40 years ago could not be made, for in very few instances was it possible to find trees that were measured in 1891; some had died standing, others had been blown down, while in many instances estates had changed hands and no record had been kept of the measured trees.

The book begins with a list of the Executive Committee and a definition of the objects of the Conference, followed by the Opening Address given by the Hon. Henry McLaren, C.B.E., President of the Royal Horticultural Society. The next 300 pages are devoted to papers and discussions, the first paper being a Reference List of Conifers grown out of doors in the British Isles. The list is made up from the names sent in with the statistical returns; many of those names are obsolete and the Conference was considered to be a favourable opportunity for directing attention to the names now recognised as correct according to the International Rules of Botanical Nomenclature. By means of different kinds of type correct names and synonyms are clearly defined. The list is prefaced by explanatory matter regarding the necessity for name changes, and at the beginning of each important genus its distinctive characters are given.

The papers read on the first day and their readers were:—"The Influence of Exotic Conifers on Silviculture in the British Isles," by Sir John Stirling Maxwell, Bart., K.T.; "Random Notes on Diseases of Conifers," by Professor Dr. Borthwick, O.B.E.; "Dwarf Conifers," by Mr. Murray Hornum. On the second day Mr. L. B. Stewart, A.H.R.H.S., dealt with "Propagation of Conifers"; Mr. A. D. Slavin, M.S., read a paper on "Some Conifers cultivated in the United States"; Dr. E. Cockayne, C.M.G., F.R.S., wrote on "Polymorphy in New Zealand Conifers and its Relation to



Horticulture"; Mr. A. C. Forbes dealt with "Some Problems connected with the Natural Reproduction and Survival of New Zealand Conifers"; Mr. F. R. S. Balfour, M.A., F.L.S., V.M.H., gave "The History of Conifers in Scotland and their Discovery by Scotsmen"; the Marquess of Headfort contributed "Conifers in the Parks and Gardens of Ireland"; and Mr. E. L. Hillier described "Conifers of the Temperate Regions of the Far East."

On the third day Mr. A. B. Jackson, A.L.S., contributed "Notes on Chinese Conifers"; Mr. W. Dallimore dealt with "The Economic Value of the Coniferae"; Professor H. E. Armstrong, F.R.S., gave "Conifer Chemistry"; Mr. H. M. Gardner "Conifers of Kenya"; and Mr. C. E. Legat, B.Sc., "Exotic Conifers in South Africa." All these papers are given in full and several are illustrated by numerous excellent photographs. Following the papers there is a list of the exhibitors, and between that and the statistical returns a selection of the most notable trees in cultivation, of a large number of species, is given. As the statistical returns were received they were examined, and where a name did not correspond with the name now recognised as correct, the correction was made, the sender's name being given first in italics, followed by the correction in small Roman capitals. A Bibliography of Conifers, compiled by Mr. H. R. Hutchinson, and an excellent index completes what will be found a most useful book by all who are interested in coniferous trees and shrubs. The important work of editing was carried out by Mr. F. J. Chittenden, F.L.S., V.M.H., and he is to be congratulated upon the results, for he had a by no means easy task. W. D.

Botanical Magazine.—The third part of Vol. clv. was published on May 26th and contains the following plant portraits and some descriptions of new species:—

Rhododendron Kyawii Lace & W. W. Smith (t. 9271), from the rain-forest belt of Upper Burma; *Acarpha laciniata* Stapf, comb. nov. (t. 9272), found on the eastern slopes of the Andes near Lake Nahuel Huapi and formerly known as *Boopis laciniata* Ball; *Petrocosmea Parryorum* C. E. C. Fischer (t. 9273), collected by Mr. and Mrs. Parry in the Lushai Hills, Assam; *Aerides Jarckianum* Schlechter (t. 9274), a native of the Philippine Islands; *Pourthiaca villosa laevis* Stapf, comb. nov. (t. 9275), a rosaceous shrub, with many synonyms, introduced some seventy years ago from Japan; *Primula alpicola* Stapf (t. 9276), a new species, allied to *P. sikkimensis* Hook. f. and *P. florindae* Ward, with cream-coloured or purple flowers from Kongbo Province, Tibet—a useful key to the allied species follows the description; *Camellia cuspidata* Hort. (t. 9277), a handsome free-flowering shrub common in the Yangtse-Kiang Valley from western Anhwei to eastern Szechuan, Chekiang, originally discovered in 1886 by Augustine Henry; *Calceolaria acutifolia* Witasek (t. 9278), introduced in 1900 by Mr. A. K. Bulley from the Patagonian Andes; *Iris Polakii* Stapf forma *protonyma*

(t. 9279), a native of North-Western Persia; *Nothopanax arboreus* Seemann (t. 9280), a tree found throughout the New Zealand Islands, and *Berberis Francisci-Ferdinandi* C. K. Schneider (t. 9281), discovered by E. H. Wilson in the mountains of Western Szechuan.

A Second Biology.*—This volume is the second of a series of three textbooks designed to cover a course in biology up to the standard of Higher School Certificate and similar examinations. The authors emphasize in the preface the need of first-hand observation of living organisms in biological teaching and this principle is well carried out in the text, in which a greater number of types is described than is usual in such books. There is an excellent chapter on plant and animal ecology and throughout special attention is paid to organisms as living entities.

That the authors possess the gift of clear exposition is well illustrated by the sections on Meiosis and the dehiscence of the Fern sporangium, processes always difficult to describe satisfactorily in an elementary textbook.

In placing Pooh Bah's "Primordial Protoplasmic Atomic Globule" at the base of their hypothetical scheme of life the authors betray a sense of humour rarely met with in a biological textbook.

The index might well have been more carefully compiled; there is no mention of pollination or seed dispersal, though these subjects are treated in the text. This, however, is a small blemish in a book which should prove acceptable to all teachers of Biology.

Flora of the Prairies and Plains of Central North America.†—Botanists studying the flowering-plants and ferns of the north-eastern United States have long had two excellent manuals at their disposal, namely, Gray's New Manual of Botany, and Britton and Brown's Illustrated Flora of the Northern States and Canada. Small's Flora of the South-eastern United States covers the south-eastern area while Jepson's Manual of the Flowering Plants of California and Abrams' Illustrated Flora of the Pacific States are available for the western States. The Rocky Mountain region was covered by the late Dr. Rydberg's Flora of the Rocky Mountains and adjacent plains, and the lacuna remaining between east and west is now filled by the volume under review. It aims to be "a complete manual of the Spermatophyta and Pteridophyta of the States of Kansas, Nebraska, Iowa, Minnesota, South Dakota, and North Dakota, and of Southern Manitoba and south-eastern Saskatchewan" and includes descriptions of 1066 genera and 3988 species. There is no Introduction, but an account of the phytogeography of the area

*By S. Mangham, M.A. and W. Rae Sherriffs, M.A., D.Sc., F.L.S. London, Sidgwick & Jackson, Ltd., 1931, pp. vii+367, 197 figures. Price 6s.

†By Per Axel Rydberg, New York. Published by the New York Botanical Garden, 1932, pp. vii+969, figs. 600. 8vo. Price \$5.50 post paid.

was published in *Brittonia*, i. 57-66, a few months before the author's death, and Latin diagnoses of the new species and the single new genus, *Denslowia* (based on *Habenaria clavellata* Spreng.) appeared in a posthumous paper (l.c. 79-111). Various changes in nomenclature have been made in order to conform with the International Rules.

The only satisfactory test of a work of this nature is to use it for identifying a number of unknown plants. Here it must suffice to say that the keys seem to be clear, with adequately contrasting characters, and that the descriptions are short but helpful. The format and style are attractive. Misprints are commendably few, but *Hypochoeris radicata* appears as "*H. radiata*." The large number of plants naturalized from Europe and Asia is a feature which the region of the prairies and plains shares with the north-eastern area. In Brassicaceae (Cruciferae) alone, over forty species are included as adventive or naturalized from the Old World, or occur as escapes from cultivation. As might be expected, these are not so well described as the native species: *Barbarea stricta*, for example, being inadequately distinguished from *B. vulgaris*. But on the whole, considerable care seems to have been taken in drawing up the descriptions, and the work will be welcomed by all those interested in the flora of the region. The author's taxonomic tendencies are reflected in his segregation, from the Liliaceae, of the families Melanthiaceae, Calochortaceae, Alliaceae, Convallariaceae, Dracaenaceae, Trilliaceae and Smilacaceae.

T. A. S.

Ledger Bark and Red Bark.—In the article on this subject, published in *Kew Bulletin*, 1932, No. 1, the quotation from King's Manual of Cinchona Cultivation in the fourth paragraph on page 10, commencing "In 1886 the Nilgiri plantations . . .", should read "In 1866 . . .".

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BULLETIN OF MISCELLANEOUS INFORMATION ²⁴ No. 7 1932 ROYAL BOTANIC GARDENS, KEW

XLII.—CONTRIBUTIONS TO THE FLORA OF TROPICAL AMERICA: XIII.* A. H. G. ALSTON (British Museum).

Pteridophyta collected by the Oxford Expedition to British Guiana, 1929.

The collection enumerated here was made by Mr. P. W. Richards, a member of the Oxford Expedition to British Guiana, 1929.

The expedition, under the leadership of Major R. W. G. Hingston, spent nearly four months camping in the forest on the Moraballi Creek, Essequibo River, from August to November. All the ferns listed are from Moraballi Creek unless otherwise stated.

Mr. Richards collected 81 species, all but 4 of which were from Moraballi Creek. 298 species (of Filices) are known from British Guiana, but of this number 103 species are recorded only from Roraima and the Canuku Mts., leaving 195 "low-country" species. In addition, 1 species of *Equisetum*, 9 species of *Lycopodium* and 19 species of *Selaginella* are recorded. This total of 327 pteridophytes compares favourably with that of Porto Rico, 285 (Maxon), but falls short of the enormous total, 760, recorded by Knuth from Venezuela. As the areas of these countries are so different it is evident that the comparison of mere numbers is unsatisfactory. Mr. Sandwith estimates the number of phanerogams found at Moraballi Creek at 550-600; if this be taken as 575, it would give a Pteridophyte quotient of nearly $3\frac{1}{2}$, using Raunkiaer's method (Bot. Tidsskr. xxxvii, 148). Though Raunkiaer gives no figures for any continental area in the tropics, this figure is about what might be expected as it is similar to those given by tropical islands with continental floras, e.g. Formosa 4, Hongkong 2.4, and much smaller than the figure given by many oceanic islands, e.g. Tahiti 12.2, Seychelles 7.8.

The ferns of Moraballi Creek have markedly South American affinities; and while 46 are only found south of a line drawn from Panama to the Lesser Antilles, only 29 extend their range to the north of this line. 35 species are recorded as terrestrial, 32 as epiphytic, while 5 are extensive climbers, 2 both epiphytic and terrestrial, and 2 found on rocks. Only 11 out of 35 terrestrial species extend to Central America or the Greater Antilles, while 16 out of 32 epiphytic species have this range. The epiphytic species are therefore mostly more widely distributed than the terrestrial species. Of the epiphytic species 11 may be classed as tree-top species, of which 6 extend to Mexico or the Greater Antilles.

*Continued from *K.B.* 1932, 229.

HYMENOPHYLLACEAE.

Trichomanes (Féea) diversifrons (Bory) Mett.

Wet, clayey sides of small stream in extreme shade, 47.

Distr. French Guiana (*Sagot* 744 !), Panama (*Cuming* 1127 !), Colombia (*Barclay* 895 !), N. Brazil (*Spruce* 2182 !) and Mexico (fide Baker).

T. (Féea) botryoides Klf.

Mixed with the preceding species, 47B.

Distr. Panama and Peru (fide Posthumus).

T. (Hemiphlebium) labiatum Jenm.

Trunk of small tree in undergrowth of Mora forest, 85; trunk of small tree in damp, not very deeply shaded place, 222.

Distr. Endemic. Only collected once before at Bartica Grove, *Jenman* 2348.

T. (Hemiphlebium) cordifolium (Fée) Alston, comb. nov.—*Didymoglossum cordifolium* Fée, Fil. Ant. t. 28, fig. 4 (1866). *T. muscoides* Sw. var. *cordifolium* Jenm. B.W.I.F. 22 (1898).

Trunk of trees to about 8 ft. in damp forest near creek, 28; base of large tree in mixed forest, 703.

Jenman states that his variety is exceedingly abundant in Trinidad and Guiana. He evidently took a very wide view of the species as he included many Old World specimens. *T. muscoides* Sw. has been reduced to *T. hymenoides* Hedw. by Lindman (Ark. Bot. i. 12). These specimens agree well with Fée's figure, which appears to represent a distinct species, separated from *T. hymenoides* Hedw. by its orbicular, cordate fronds.

T. (Hemiphlebium) Kraussi Hk. et Gr.

Twigs of small tree in undergrowth of Mora forest, 64; tree trunk in undergrowth, 320; trunk of small tree in opening in Morabukea-Greenheart forest, 742.

Distr. W. Indies to Bolivia and Brazil.

T. (Lacostea) Ankersii Parker.

Small tree in damp Mora forest, 65; tree stump in sandy swamp forest, 285; stem of young tree, 749.

Distr. Pará (*Spruce* !), Colombia (*Barclay* 905 !).

T. (Lacostea) pedicellatum Desv.

Trunk of small tree in damp place in deep shade, 25; trunk of small tree near ground in Mora forest, 58.

Distr. Lesser Antilles and Pará (*Spruce* !).

T. (Pseudachomanes) arbuscula Desv.

Upper side of mossy trunk of tree overhanging creek, almost submerged in wet season, 204; mossy rotting trunks in shady, sandy forest, 183.

Distr. French Guiana, Surinam and Brazil. (Most W. Indian specimens are referable to *T. holopterum* Kze.).

Pseudachomanes Presl (1849) is an older name than *Ptilophyllum* v.d.B. (1861) non Morris (1841); moreover the latter was originally proposed as a generic name.

T. (Neuromanens) pinnatum Hedw.

Dry, sandy bank, fairly light shade, 182.

Distr. W. Indies and Brazil.

Apparently best distinguished from *T. pennatum* Klf. by the more numerous, shorter pinnae.

T. (Neuromanens) pennatum Klf.

Floor of Morabukea forest, sandy soil, deep shade, 6, 77.

Distr. Trinidad and Colombia.

As *Neuromanens* Trevis. has been granted generic rank by Presl, Fée, Trevisan and v.d. Bosch, it seems worth retaining as a section. The name *Neurophyllum* Presl is invalidated by *Neurophyllum* Torrey et Gray. The species seem, through *T. Vittaria* DC., to be more closely allied to *Féea* than to *Ptilophyllum*.

T. (Achomanes) Martiusii Fournier in Bull. Soc. Bot. Fr. xv. 148 (? Presl).

Mossy trunks of trees near ground, margin of creek, and other light places in sandy forest, rare, 181; 92 ft. above ground in fork of Dakamaballi tree among moss, Morabukea forest, 806.

Distr. Trinidad (*Purdie* !), French Guiana (*Sagot* 777 !), near Pará (*Spruce* !).

This appears to be this species in Fournier's sense, but seems different from Martius' figure. It is referred to *T. pilosum* Raddi by Posthumus. I hesitate to propose a new name without a revision of the whole group.

The genus *Trichomanes* was first described by Linnaeus, *Corollarium Plantarum*, 29, no. 991, in 1737; he quoted only *Polypodium crispum calyciferum* Plum., which is *T. crispum* Linn. and is therefore the type. Now *T. crispum* is referred by Presl, *Hymenophyllaceae*, p. 17, to his section *Achomanes*, while *T. pyxidiferum* Linn. and *T. scandens* Linn. are referred by Presl to *Eutrichomanes*. Presl must then have regarded one of these two species as the type of *Trichomanes*. For this reason I have dropped the sectional name *Eutrichomanes*. Prantl's section *Eutrichomanes* contained no Linnean species!

T. (Crepidomanes) hymenophylloides v.d.B.

Mossy granite boulders by small stream, 790.

Distr. Tropical America and Africa.

T. (Crepidomanes) eximium Kze. sensu lat.

Mossy trunk of small tree in very shady place, 37.

Distr. Mexico to Brazil.

Both this and the preceding species are included under *T. pyxidiferum* Linn. by Posthumus.

T. (Davalliopsis) elegans Rich.

Hollow in tall mixed forest, clayey soil, rare, 203.

Distr. Lesser Antilles to Brazil and Colombia.

Hymenophyllum polyanthos (Sw.) Sw.

Trunk of small tree near ground in moist very shady place, 26; mossy trunk overhanging creek, 33; horizontal mossy branch of small tree in undergrowth in fairly well-lit place, 223; among moss on upper branch 64 ft., 544; branch of Fukadi, 80 ft. above ground, in Mora forest, 644.

Distr. Tropical America and Africa.

H. ciliatum (Sw.) Sw.

Small, mossy tree-trunk by creek, 34; upper branches of Kautaballi, among moss, over 60 ft. from ground, 521.

Distr. Mexico to Southern Brazil.

CYATHEACEAE.

Hemitelia strigosa (J. Sm.) Alston, comb. nov.—*Alsophila strigosa* J. Sm. in Journ. Bot. i. 666 (1842). *Hemitelia Parkeri* Hk. Ic. Fil. vii. t. 643 (1844). *Hemitelia multiflora* var. *Parkeri* Bak. in Mart. Fl. Bras. i. pt. 2, 314 (1870).

Sandy soil in deep shade in Morabukea forest, 16; in clearing in Greenheart forest, common in such places, 350; small clearing in low bush, 400.

Distr. French Guiana, Surinam and North Brazil.

H. guianensis Hk. Ic. Fil. vii. t. 648 (1844). *H. multiflora* Posthumus, Ferns Surinam, 30 (1928) pro parte, non Spreng.

Sandy bank of creek, edge of Morabukea forest, 1 ft. from the water, 9; edge of creek, 31; sandy, rather swampy, low forest near creek, common on creeks above camp, 180.

Distr. Endemic?

The constantly different habitats of these closely allied species are remarkable.

Amphidesmium rostratum (H. B. K.) J. Sm. in Journ. Bot. i. 201 (1842). *Metaxya rostrata* (H. B. K.) Presl, Tent. 60 (1836); Bower in Ann. Bot. xxvii. 443 450 (1913). *Alsophila rostrata* (H. B. K.) Mart. Ic. Cr. Bras. 64, t. 39 (1834). *Aspidium rostratum* H. B. K. Nov. Gen. & Sp. i. 12 (1815). *Polypodium rostratum* H. et B. ex Willd. Sp. Pl. v. 193 (1810) non Burm. f. (1768). *P. blechnoides* Rich. in Act. Soc. Nat. Hist. Par. i. 114 (1791) nomen. *P. Humboldtii* Poir. Encycl. Suppl. iv. 497 (1816). *Alsophila blechnoides* Hk. Sp. Fil. 35 (1844).

Moraballi Creek, without notes, 7.

Distr. Northern South America to Peru and Brazil.

The interrupted annulus, as figured by Bower, l.c., t. 32, p. 9, appears to constitute a good generic character.

Alsophila oblonga Kl.

On humus on the floor of Mora forest, 227; rocky forest by side of stream, 750.

Distr. Surinam.

POLYPODIACEAE.

Stigmatopteris (Peltochlaena) varians (Fée) Alston, comb. nov.—*Nephrodium varians* Fée, 11 mem. 88, t. 24, fig. 2 (1886). *Dryopteris varians* O. Ktze. Rev. Gen. ii. 814 (1891).

Bank of stream in forest, 22.

Distr. Trinidad.

A very rare species of which no specimen could be found either at the British Museum or Kew.

Thelypteris (Ctenitis) funesta (Kunze) Alston, comb. nov.—*Dryopteris funesta* (Kze.) Hieron. in Hedw. xvi. 347 (1907). *Aspidium funestum* Kze. in Linnaea, ix. 96 (1834). *Dryopteris protensa* var. *funesta* C. Chr. Mon. Dryopt. ii. 91 (1920).

Moraballi Creek, without label, 8; very deep shade on sandy bank of stream in forest, 23; loamy soil, 51.

Distr. Panama and Lesser Antilles to North Brazil.

The generic name *Filix* Hill, Useful Fam. Herb. p. 141 (1754), has not been employed because it appears to be inadequately published as a genus (see Hill's preface, p. xiii).

The generic name first occurs, as *θηλυπτερίς* (*θήλυς* = female) in the works of Theophrastus (332 B.C.) and Dioscorides (c. 100 A.D.). It was then used, according to the Loeb edition of *Theophrastus*, for *Pteridium aquilinum* (L.) Kuhn. It was taken up by Ruppius in 1718 in the "Flora Jenensis" p. 322. Ruppius has two species, *Thelypteris* (sphalmate *Thelypcteris*) *Dioscoridis* Rupp. (= *Pteridium aquilinum*) and *Thelypteris palustris*, non *ramosa* Rupp. (= *Thelypteris palustris* Salisb.). He apparently regarded *T. Dioscoridis* as the type as he discusses the differences from *Filix* under that species.

Schmidel when he took up Ruppius' genus in 1762 (I have not seen the 1747 edition) chose the second species as the type.

It has been argued (Mackenzie in Amer. Fern Journ. xvii. 117-119) that Schmidel was making use of a uninominal nomenclature: this is clearly untrue as he uses the name *Commelina* for three distinct species (tt. xxx. xl & xlix). That Schmidel regarded his names as generic is clear from p. 104 where he speaks of Micheli's genus *Sphaerocarpus*. That Schmidel considered his genera to be published is apparent from his proposal of a new genus (*Teganium*, p. 67).

Thelypteris (Meniscium) serrata (Cav.) Alston, comb. nov.—*Dryopteris serrata* (Cav.) C. Chr.

Cuyuni River : Camaria landing, on swampy ground by stream in second growth, 840.

Distr. Mexico and W. Indies, south to Brazil and Bolivia.

Tectaria plantaginea (Jacq.) Maxon in Contr. U.S. Nat. Herb. x. 494 (1908). *Polypodium plantagineum* Jacq. Coll. Bot. ii. 104, t. 3, fig. 1 (1788). *Aspidium plantagineum* Griseb. Abh. Ges. Wiss. Gött. vii. 286 (1857).

Lateritic soil on shady bank of stream in mixed forest, 752.

Distr. Costa Rica and W. Indies, southwards to Brazil.

T. trifoliata (Linn.) Cav. Descr. Pl. p. 249 (1802). *Polypodium trifoliatum* Linn. Sp. Pl. 1087 (1753). *Aspidium trifoliatum* Sw. in Schrad. Journ. Bot. 1800, 30 (1801).

With *T. plantaginea*, 753.

Distr. W. Indies to Colombia and Venezuela.

Cavanilles mentions *Polypodium trifoliatum* Linn. in his original description of *Tectaria*, but the actual transfer was not made until three years later. As it is the only species mentioned, it is clearly the type.

Cyclodium meniscoides (Willd.) Presl.

On tree trunks, 1 ft. from ground, in Morabukea forest, 15 ; in low bush, on ground and epiphytic about 2 ft. from ground, 799.

Distr. Trinidad to Peru and North Brazil.

Polybotrya caudata Kze.

Rhizome climbs on large tree to 20-30 ft., palm swamp, 803 (sterile).

Distr. Trinidad and Panama to Brazil.

Bolbitis (Anapausia) semipinnatifida (Fée) Alston, comb. nov. — *Gymnopteris semipinnatifida* Fée, Acrost. 83, t. 44 (1845).

Among rocks, on lateritic soil, on banks of small stream, 756.

Distr. Trinidad (H. Prestoe !), Venezuela (Rusby & Squires 380 !).

This species is separated from **Bolbitis aliena** (Sw.) Alston, comb. nov. (*Acrostichum alienum* Sw.), by the scattered free veinlets and broader, serrate lobes of its leaves.

The American ferns referred to *Leptochilus* by Christensen are placed under *Bolbitis* Schott by Copeland (Phil. Journ. Sci. B. xxxvii. 335). This species and its allies are, as noted by Christensen in Bot. Tidsskr. xxvi. 285, only distantly related to *Bolbitis serratifolia* (Mert.) Schott, and should form a distinct section or subgenus, for which the name *Anapausia* (Presl. pro gen.) is available. The type of *Anapausia* was *A. acuminata*, a synonym of **Bolbitis nicotianifolia** (Sw.) Alston, comb. nov. (*Acrostichum nicotianifolium* Sw.).

Oleandra articulata (Sw.) Presl, Tent. 78 (1836) ; Maxon in Contr. U.S. Nat. Herb. xvii. 394 (1913).—*Aspidium articulatum*

Sw. in Schrad. Journ. Bot. 1800, ii. 30 (1801). *A. nodosum* Willd. Sp. Pl. v. 211 (1810). *Oleandra nodosa* Presl, l.c.

Trunk of Greenheart, 57 ft. from ground, edge of Mora forest,

373.

Distr. Guatemala and W. Indies to Bolivia and S. Brazil.

Nephrolepis rivularis (Vahl) Mett.

Large clump on humus at foot of large Mora tree in damp, fairly well-lit place, 224 ; on fallen tree in light forest, 53 (sterile and therefore doubtful).

Distr. W. Indies and Southern Mexico to Brazil.

Saccoloma inaequale (Kze.) Mett.

Loamy forest floor in deep shade, 54 ; Mora forest, 153 ; floor of forest in deep shade, 225.

Distr. W. Indies and Mexico to Northern South America.

Lindsaya dubia Spreng.

Loamy soil in opening in forest, 148 ; clearing in same tuft as 113 (*L. surinamensis*), scarce, 114.

Distr. Venezuela and N. Brazil.

L. falcata Dryand.

Sandy soil, floor of forest in moist places, frequent, 21 (?) ; loamy soil in opening in forest, 147 ; low sandy forest, 184 ; wet place, 404.

Distr. Panama and Lesser Antilles, southwards to Brazil and Colombia.

L. surinamensis Posth.

Clearing, scarce, 113 ; loamy soil in opening in forest with 147 (*L. falcata*) and 148 (*L. dubia*), 154.

Distr. Surinam.

A new record for British Guiana. Identification from Posthumus' figure.

L. guianensis (Aubl.) Dryand.

Humus at base of tree, Morabukea forest, 30 ; sandy soil, Morabukea and Wallaba forest, rather light, 347 ; open Wallaba forest on alluvial soil, 465.

Distr. French Guiana and Surinam, Lesser Antilles ?

L. crenata Klotzsch.

Loamy floor of dark forest, 55.

Distr. Endemic.

This species is not represented at the British Museum or at Kew and I am indebted to Dr. C. Christensen for the identification.

L. nitidissima Rich. ex Willd. Sp. Pl. 423 (1810).—*L. lancea* Posth. Ferns. Surinam, 75 (1928).

Sandy ground in forest near creek, 32 ; in low bush on sandy creek bank, 156 ; on ground in open, rather sandy forest, 281 ; in clearing in Greenheart forest, 351 ; without notes, 467.

Distr. Trinidad and Brazil.

Asplenium serratum Linn.

Moraballi Creek, without notes, 76.

Distr. W. Indies and Mexico to Brazil.

A. cuneatum Lamk.

Among moss on large bush-rope near ground in palm swamp, 802.

Distr. W. Indies, Surinam and Venezuela.

A. salicifolium Linn. Sp. Pl. 1080 (1753) ; Maxon in Contr. U.S. Nat. Herb. x. 476 (1908). — *A. semicordatum* Radcl. ; Posth. Ferns Surinam, 82 (1928).

Fallen tree in mixed forest, 140.

Distr. Mexico and W. Indies to Colombia and Brazil.

Salpichlaena volubilis (Kl. f.) J. Sm. in Hk. Gen. t. 93 (1841) — *Blechnum volubile* Kl. Enum. 159 (1824).

Fairly light place by small creek in swamp forest, 318.

Distr. Guatemala and Lesser Antilles to Colombia and South Brazil.

S. Hookeriana (O. Ktze.) Alston, comb. nov. — *Spicanta Hookeriana* O. Ktze. Rev. Gen. ii. 821 (1891). — *Lomaria volubilis* Hk. Sp. Fil. iii. 39, t. 150 (1860). — *Blechnum volubile* var. *lomarioidea* Bak. in Mart. Fl. Bras. i. pt. 2, 428 (1870).

Rather light places by stream, 20 (sterile and therefore doubtful).

Distr. Brazil and French Guiana.

Distinguished from *S. volubilis* by its lomarioid fertile pinnules and membranous sterile leaflets.

Stenochlaena japurensis (Mart.) Griseb. ; Underw. in Bull. Torr. Bot. Cl. xxxiii. 598 (1906). — *S. marginata* Posth. Ferns Surinam, 91 (1928).

On small trees and shrubs in the undergrowth, 306 ; climbing to about 4 ft. on young tree in low bush, 758 ; near first falls of Cuyuni River, climbing up tree 10 ft., swampy low bush, 819.

Distr. French Guiana, Trinidad and Brazil.

Underwood, l.c. 595, states that " if the description is correct, the plant [*Stenochlaena marginata* (Schr.) C. Chr.] is not even a *Stenochlaena*."

Pityrogramma calomelanos (Linn.) Link, Handb. Gewäch. iii. 19 (1833), errore *calomela* ; Maxon in Contr. U.S. Nat. Herb. xvii. 173 (1913). — *Ceropteris calomelanos* (Linn.) Und. in Bull. Torr. Bot. Cl. xxix. 632 (1902).

Old camp site by creek, 202.

Distr. Tropical America, Africa and Asia. Adventive in many localities.

Pityrogramma is an older generic name for *Ceropteris*.

Adiantum (Hewardia) olivaceum Bak.

Loamy soil on steep rocky slope in mixed forest, 754.

Distr. Venezuela.

A. phyllitidis J. Sm.

With *A. olivaceum* Bak., 755. Also on lateritic soil.

Distr. Surinam, Venezuela, Peru and Guadeloupe (fide Posthumus).

A. obliquum Willd.

Cuyuni River ; Camaria landing, under bushes in secondary growth, 842.

Distr. French Guiana, Surinam and Panama.

Some of the fronds of these specimens are bipinnate and the internodes vary in length, but the distinct midribs point to this species rather than to *A. latifolium* Lamk. as interpreted by Posthumus. Posthumus' key does not work well for this species.

A. tomentosum Kl.

In deep shade in sandy hollow near river, 26.

Distr. French Guiana, Surinam and North Brazil.

A. hirtum Splitg.

Loamy soil on floor of Morabukea forest, 335.

Distr. Surinam and French Guiana.

Adiantum terminatum Kze.

Loamy soil on floor of dark forest, 52 ; in low bush, 800.

Distr. Surinam, French Guiana and North Brazil.

Only recorded from the Canuku Mts. in British Guiana, but apparently common in Surinam.

Pteridium arachnoideum (Klf.) Maxon in Journ. Wash. Ac. Sc. xiv. 89 (1924). — *Pteris arachnoidea* Kl. Enum. 190 (1824). — *Cincinnati arachnoidea* Trevis. Syll. Sporoph. Ital i. 31 (1874). — *Pteris aquilina* var. *arachnoidea* Bak. in Mart. Fl. Bras. i. pt. 2, 403, t. 24, f. 11–13 (1870). — *P. aquilina* var. *esculentum* Hk. Sp. Fil. ii. 197 (1858).

Cuyuni River ; Camaria landing, secondary growth by portage road, 839.

Distr. W. Indies and Mexico ; southwards to Argentina (fide Maxon).

Distinguished from *P. aquilinum* (L.) Kuhn and all other species except *Pteridium esculentum* (Forst.) Nakai by the presence of shallow rounded lobes in the decurrent portion of the pinnules. The fronds of *P. esculentum* are glabrous beneath, those of *P. arachnoideum* are downy on the rhachis and costa. The generic name *Filix* Ludw. (1857) appears to have a good claim to replace *Pteridium* Gled. ex Scop., which was a *nomen abortivum*.

Cochlidium linearifolium (Desv.) Maxon; C. Chr. in Bot. Ark. vi. 18 (1929).—*Monogramme linearifolia* Desv. in Berl. Mag. v. 302, t. 7, fig. 5 (1811).

Mossy branches of small trees near ground on edge of creek, 115; mossy branches of tree overhanging creek, 185; upper branches of Kokiritiballi tree, 438.

Distr. Colombia.

Hecistopteris pumila (Spreng.) J. Sm.

Trunks of small trees among mosses, near edge of creek, 27; base of small tree in Morabukea forest, 82; tree trunk in ground in low, sandy forest, 208.

Distr. Mexico and W. Indies to Brazil.

Christ, in Hedwigia xlv. 366, has described three subspecies of *H. pumila*, but I am unable from his descriptions to identify these specimens with any of them.

Polytaenium guayanense (Hieron.) Alston, comb. nov.—*Antrophyum guayanense* Hieron. in Hedw. lvii. 212 (1916).

Trunk of small tree in fairly open, sandy forest, 200; trunk of tree a few feet up, 760.

Distr. Trinidad, French Guiana and Surinam (fide Hieronymus.)

Doubtfully distinct from *P. jenmani* (Bened.) Bened. & *P. cajanense* (Desv.) Bened., of which I have seen no authentic material.

Anetium citrifolium (Linn.) Splitg.

Trunk of small tree near ground (c. 3 ft.) in swampy Mora forest, 369; among moss, creeping up trunk of small tree in undergrowth of Mora forest, 628.

Distr. Guatemala and W. Indies to Northern Brazil.

Eschatogramme Desvauxii (Kl.) C. Chr. in Dansk Bot. Ark. vi. 24 (1929).—*Taenitis Desvauxii* Kl. in Linnaea xx. 431 (1847). *Eschatogramme furcata* Posth. Ferns Surinam p. 120 (1928) non C. Chr.

Branch of Morabukea tree, 36, 73, occasional on tall trees, more rarely on 20 ft. trees; fallen from tree, 157.

Distr. Trinidad, French Guiana, Surinam to Brazil.

Polypodium (Ctenopteris) duale Maxon in Contr. U.S. Nat. Herb. xvii. 399 (1913).—*P. serrulatum* (Sw.) Mett. Fil. Hort. Lips. 30 (1856) non Sw. (1801).

Mossy branches of small trees overhanging creek, 116; on felled tree in "mainap," 349.

Distr. Mexico and W. Indies to Brazil, also in West Africa and in Mauritius.

I have not used *Eupolypodium* as a subgeneric name because Christensen (Dansk Bot. Ark. v. no. 22, 6) states that the affinity of *Polypodium vulgare* is with the subgenus *Goniophlebium*. *Ctenopteris* (Blume pro gen.) may be distinguished as a subgenus.

Polypodium (Ctenopteris) nanum Fée.

Upper branches of tall tree, 81; upper part of main trunk of tall tree, 100; trunk of small tree 6 ft. from ground in Wallaba forest, 632.

Distr. French Guiana and Brazil.

I am indebted to Dr. W. R. Maxon for the identification of this and the following species.

P. consimile Mett.

Mossy trunk of small tree in opening in Morabukea-Greenheart forest, 746.

Distr. Venezuela and Colombia.

Campyloneurum phyllitidis (Linn.) Presl, Tent. 190, t. 7, figs. 18–20 (1836).—*Polypodium phyllitidis* Linn. Sp. Pl. 1083 (1753).

Trunk of small tree 3 ft. from ground, in swampy Mora forest, 368; stem sapling, 3 ft. from ground in wet forest, 797.

Distr. W. Indies, Florida and Mexico to Uruguay.

Microsorium (Anapeltis) surinamense (Jacq.) Alston, comb. nov.—*Polypodium surinamense* Jacq. Coll. iii. 85, t. 21, fig. 3 (1798). *P. lycopodioides* var. *surinamensis* Kl. in Linnaea xx. 403 (1847).

On fallen tree in dark forest, 50; mossy branches near top of tall forest tree, 75.

Distr. French Guiana, Surinam and Brazil.

M. (Anapeltis) Thurnii (Bak.) Alston, comb. nov.—*Polypodium Thurnii* Bak. in Ann. Bot. v. 476 (1891).

Trunk of tree 10 ft. up, in swamp forest, 256.

Distr. French Guiana and Surinam.

M. (Microgramma) persicariaefolium (Schr.) Alston, comb. nov.—*Polypodium persicariaefolium* Schrad. in Goett. Gel. Anz. 867 (1824). *Microgramma persicariaefolia* Presl, Tent. 214, t. 9, fig. 7 (1836).

Near first falls on Cuyuni River, creeping on upper side of boughs of small tree overhanging river, 851.

Distr. Brazil, French Guiana and Surinam.

Copeland, in his review of *Microsorium* (Univ. Calif. Publ. xvi. 111–113, 1929), makes no mention of *Anapeltis* J. Sm. or *Microgramma* Presl. Hence it is possible that he considered that they should be regarded as distinct genera.

Marginaria ciliata (Willd.) Alston, comb. nov.—*Polypodium ciliatum* Willd. Sp. Pl. v. 144 (1810).

On trunk of tree in wet place in Mora forest, 370.

Distr. Costa Rica and Trinidad to Bolivia and Brazil.

Tidestrom (in Torreya, v. 171) retains the genus *Marginaria*, but Copeland makes no mention of it. Christensen, however, states that "it is very probable that the genus *Lepicystis*, as defined by Diels [i.e., *Marginaria*], is a natural one." (Dansk Bot. Ark. v. 22, p. 6).

M. tecta (Klf.) Alston, comb. nov. *Polypodium tectum* Klf. Enum. 87 (1824).

Upper branches of Baromalli tree, 221; upper branches of Futui tree, 344.

Distr. Colombia to Peru and South Brazil.

Elaphoglossum Herminieri (Bory & Fée) Moore.

Trunk of Dakamaballi tree in fork among moss, 92 ft. from ground Morabukea forest, 816.

Distr. Guatemala, W. Indies, French Guiana and Surinam.

E. rigidum (Aubl.) Urban in Symb. Ant. ix. 375 (1925) pro parte.—*Polypodium rigidum* Aubl. Pl. Gui. ii. 963 (1775). *Acrostichum flaccidum* Fée, Acrost. xxxiii. t. 7 (1845). *Elaphoglossum flaccidum* Moore, Ind. Fil. 356 (1862).

Trunk of fallen tree in swamp forest near creek, 29; trunk of small tree, 2 ft. from ground, in well-lit, sandy Mora forest, 600.

Distr. W. Indies and French Guiana.

Aublet's type in Herb. Mus. Brit. belongs to this species and not to *E. longifolium* J. Sm.

Elaphoglossum glabellum J. Sm.

Upper mossy branches of tall forest trees, 74.

Distr. W. Indies and Colombia to Bolivia and Brazil.

E. pteropus C. Chr.

On tree in moist forest, 143; on tree in sandy swampy forest, 282.

Distr. W. Indies and French Guiana.

SCHIZAEACEAE.

Schizaea fluminensis Miers ex Sturm, Fl. Bras. i. pt. 2, 184, t. 15, f. 2 (1859).—*Lophidium fluminense* Und. in North Am. Fl. xvi. 38 (1909).

On thick carpet of dead leaves in deep shade in Morabukea forest, 257; on thick carpet of dead leaves with saprophytes in Morabukea forest, 333.

Distr. French Guiana and Brazil.

Lygodium micans Sturm in Mart. Fl. Bras. i. pt. 2, 178 (1859).—*L. volubile* Posth. Ferns Surinam, 162 (1928) pp. non Sw.

Rather light places by stream, gregarious, 20A; forming dead masses on trees on river bank to 25 ft. on island in Cuyuni River, near Lower Camaria landing, 818.

Distr. Trinidad (Fendler 31!).

MARATTIACEAE.

Danaea simplicifolia Rudge.

On loamy soil, 332; wet herby slopes of gully in Wallaba forest, 352.

Distr. French Guiana, Surinam and Brazil.

D. elliptica Sm.

Muddy ground in Mora forest by small black-water creek, 703; stony and muddy ground by small stream, also on damp slopes near by, 751.

Distr. Mexico and W. Indies to Brazil.

LYCOPODIACEAE.

Lycopodium dichotomum Jacq.

Near first falls on Cuyuni River, about 10 ft. from ground among moss on fallen tree in Mora forest, 844.

Distr. Mexico and W. Indies to Guiana (fide Underwood & Lloyd in Bull. Torr. Bot. Club. xxxiii. III).

L. cernuum Linn.

Small clearing in low bush, 401.

Distr. Pantropic.

SELAGINELLACEAE.

Selaginella affinis A. Br. (? *S. rigida* Linden).

Under bushes in second growth forming dense herbage, 841.

Distr. French Guiana.

S. producta Bak.

Small clearing in fairly open sandy forest, 196; mossy bog near creek, 268.

Distr. Venezuela, Brazil and Trinidad.

S. dendricola Jenm.

Wet sandy bank of stream in very deep shade, scarce, 19.

Distr. Endemic.

S. Parkeri (Hk. & Gr.) Spring.

Rotting log in Morabukea forest, frequent, 14, 78.

Distr. French Guiana.

XLIII.—DECADES KEWENSES. PLANTARUM NOVARUM IN HERBARIO HORTI REGII CONSERVATARUM. DECAS CXXVIII.

1271. **Mouriria Marshallii** Burt Davy et Sandwith [Melastomaceae-Memecyleae]; *M. acutiflorae* Naud. affinis, pedicellis basi ipsa tantum articulatis, corolla ante expansionem petalorum late ovoideo-acuminata, connectivo antherarum multo longius calcarato, calcari loculis longiore differt.

Arbor excelsa usque 30 m. alta, ramulis annotinis cinereis corrugulatis glabris, hornotinis olivaceis usque rubescentibus fere laevibus glabris, internodiis 1-4 cm. longis, *Folia* lanceolata, rarius ovato-lanceolata vel elliptica, apice conspicue acuminata, basi cuneata attenuata vel obtusa, 6-11.5 cm. longa, 2-5.5 cm. lata, chartacea, glabra, costa supra valde impressa subtus prominente, nervis lateralibus circiter 10-12 utrinque subaequaliter satis immersis

distinctis sed haud conspicuis patulis marginem versus anastomosantibus; petiolus glaber, 4-6 mm. longus, 1-1.5 mm. diametro. *Inflorescentiae* in ramis annotinis axillares, umbellato-cymosae, vulgo 3-6-florae, glabrae; pedunculus brevissimus, 1-3 mm. longus vel subnullus; bracteae bracteolaeque delapsae; pedicelli costato-striati, flexuosi, 0.8-1.5 cm. longi, basi ipsa articulati ibique ut videtur bracteolati. *Calyx* late turbinatus, tubo 3-4 mm. longo extra minute lepidoto basi haud gibboso, ore ad 7.5 mm. lato subtruncato lobis vel dentibus triangularibus ad 1 mm. longis atque latis demum sinuato-reflexo. *Corolla* matura nondum expansa late ovoideo-acuminata, ad 8.5 mm. longa, basi ad 7 mm. lata, glabra nec extra furfuraceo-tomentella; petala 5, siccitate lutea, ovato-acuminata, matura fere ad 9 mm. longa, ad 6 mm. lata. *Stamina* filamentis apicem versus attenuatis ad 7.5 mm. longis; antherae loculis vix ad 2 mm. longis, dorso glandula oblonga 0.7 mm. longa instructae, connectivo postice conspicue circiter 3 mm. calcarato. *Ovarium* biloculare, vertice depresso radiato-costato atque margine lobato, stylo 1.5 cm. longo; ovula 6. *Bacca* globosa, ad 2 cm. diametro, monosperma.

TRINIDAD. New Grant, July 1931, *F. R. Andrews* in Herb. Trin. 12575 (type in Kew Herb. and in Herb. Imp. Forestry Institute, Oxford). North Trace, Victoria, June 1930, *R. C. Marshall* and *C. Swabey* in Herb. Trin. 12385. Without locality, Aug. 1876, *Prestoe* in Herb. Kew. Without locality, July 1930, *R. C. Marshall* in Herb. Imp. Forestry Institute, Oxford, 27437.

Vernacular name, "Bois Lisette."

"A big tree, reaching a height in the neighbourhood of 100 ft., with a girth of 8 ft. or so. The wood is yellowish, with a curious white streak, almost as if it were attacked by fungus; there is no doubt, however, that the streak is not due to fungus, it is typical of the species."—*Marshall*.

1272. *Isotoma anethifolia* Summerhayes [Lobeliaceae]; affinis *I. axillari* Lindl. a qua foliis angustioribus segmentis longioribus, floribus albis, corollae lobis anterioribus oblanceolatis latioribus, tubo circiter 1.4 cm. longo differt.

Herba ? perennis, erecta, usque 50 cm. alta, fere glabra. *Caules* multi, satis ramosi, teretes. *Folia* alterna, pinnatipartita, ambitu elliptico-lanceolata, usque 8 cm. longa, parte media indivisa usque 2 mm. lata, segmentis valde inaequalibus, longioribus utrinsecus 3-4 distantibus linearibus usque 2 cm. longis et 1.5 mm. latis brevioribus usque dentiformibus basin versus interdum dente brevi instructis. *Flores* ex axillis foliorum superiorum orti; pedicelli suberecti, usque 15 cm. longi. *Sepala* lineari-subulata, acuta, recurvata, 6-7 mm. longa, basi 1.5 mm. lata, inferne anguste alata. *Corolla* alba; tubus cylindricus, medio leviter constrictus, 1.3-1.5 cm. longus, 3 mm. diametro; lobi 2 posteriores oblongo-elliptici, acute acuminati, 1.2-1.5 cm. longi, 4-5 mm. lati, 3 anteriores oblanceolati, cuspidato-apiculati, 1.3-1.6 cm. longi, 6-9 mm. lati, intermedio basi callis

duobus semicircularibus instructo. *Antherae* pubescentes, 2 inferiores apice seta singula recta instructae. *Stylus* inferne pubescens, superne glaber; stigma apice dilatatum, bilabiatum, annulo pilorum instructum; ovarium obconicum, circiter 5 mm. longum. *Capsula* obconica vel cylindrico-obconica, circiter 1 cm. longa; semina nigra, oblongo-cylindrica, 0.7 mm. longa.

QUEENSLAND: Stanthorpe, in crevices of granite rocks in open forest on an exposed mountain top, 990 m., March 1930, *Hubbard* 5693 (type); flowered at Royal Botanic Gardens, Kew, in June 1932, from seed of same.

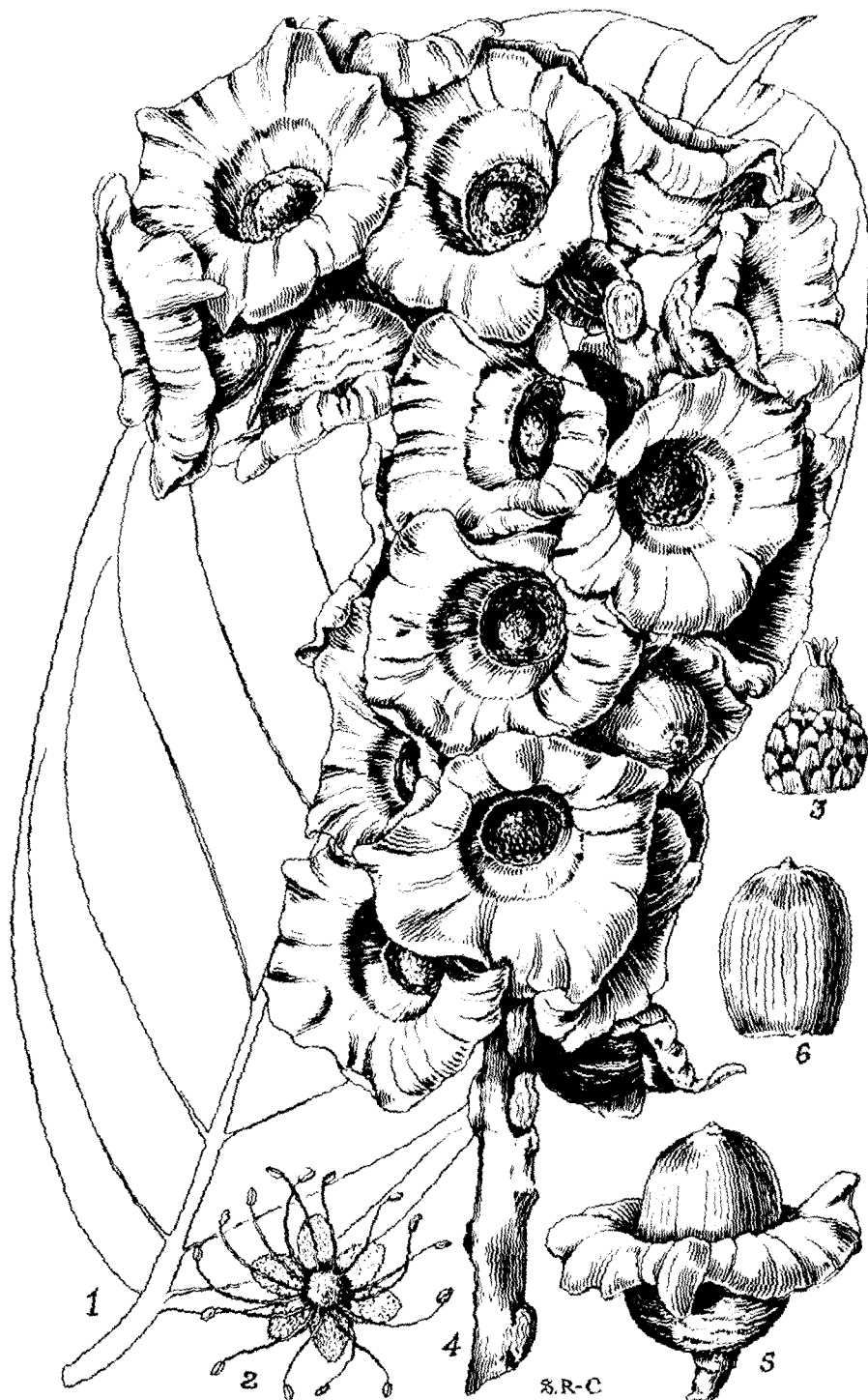
NEW SOUTH WALES: near Tenterfield, *C. Stuart*.

Flowers white, with faint mauve line down centre of anterior petal lobes. Calli at base of median anterior lobe bright green.

This species was included by Bentham under *I. axillaris* Lindl. in Flora Australiensis, but is easily distinguished by the characters given in the diagnosis. It is known at present only from the neighbourhood of the New South Wales-Queensland border as the two localities given show, but it may also occur farther south in New England.

1273. *Pasania craterophora* C. E. C. Fischer [Fagaceae]; ab omnibus congeneribus cupulis magnis crateriformibus, marginibus expansis vel recurvis differt.

Arbor excelsa. *Ramuli* brunnei vel pallide brunnei, glabri, lenticellis verruculosi; innovationes velutino-pubescentes. *Folia* rigide chartacea vel subcoriacea, oblonga, apice rotundata vel emarginata, abrupte cuspidata, basi rotundata vel brevissime cuneata, saepe subinaequilateralia, glabra, 14-35 cm. longa, 9-17 cm. lata, marginibus integris subrevolutis, costa cum nervis primariis 10-12-jugis regularibus distantibus infra prominente, secundariis inconspicuis inter primarios scalariformibus; petioli robusti, glabri, rugulosi, sicci nigri, 1-2 cm. longi. *Inflorescentia* terminalis, simplex vel ramosa, unisexualis vel spicis inferioribus ♂ superioribus ♀, nonnullis saepe inferne ♀ apicem versus ♂. *Spicae* erectae vel erecto-patentes, rhachide furfuraceo-puberula, sulcata, ♂ graciles, rectae, 8-24 cm. longae, floribus aggregatis regulariter vel interrupte dispositis; spicae ♀ (vel spicarum polygamarum partes ♀) robustae, 12-32 cm. longae, floribus solitariis raro binis. *Flos mas* 2.5 mm. diametro; perianthii lobi 6, triangulari-lanceolati, 1 mm. longi, puberuli; stamina 15, filamentis gracilibus usque 3.5 mm. longis; pistillodium hemisphaericum, velutinum. *Flos femineus* 3 mm. longus, basi bracteis numerosis minutis ligulatis brunneo-puberulis circumdatus; perianthii lobi 6-7, triangulares, intus dense albo-hirti; styli 3, nonnunquam 4, 1 mm. longi, fere erecti, subtrigoni; ovarium albo-hirtum, 2-4- (plerumque 3-) locale. *Pedunculus fructifer* robustissimus, valde curvatus (an semper?). *Fructus* congesti sed haud coalescentes. *Cupula* lignosa, crateriformis, marginibus valde revolutis saepe faciei exteriori cupulae adpressis atque sic lateraliter



Pasania craterophora C. E. C. Fischer. 1, Leaf $\times \frac{1}{2}$; 2, Male flower $\times 8$; 3, Female flower $\times 5$; 4, Infructescence $\times \frac{1}{2}$; 5, Cupule and fruit $\times \frac{1}{2}$; 6, Fruit $\times \frac{1}{2}$.

compressis ut plicae 5-7 radiantes fiant, 4.3-5.5 cm. diametro, 1.8-2.5 cm. alta, extra fere laevis, inconspicue pluriannulata, annulis circiter 7 irregularibus leviter elevatis, undique pubescens, intus basi valde umbonata; pedicelli robusti, 3-4 mm. longi. Glans a cupula libera, circiter duas partes exserta, late oblonga, 2.6-2.9 cm. longa, 2.1-2.6 cm. lata, apice rotundata, breviter apiculata, basi alte excavata, in umbone intracupulari sessilis, apice leviter puberulo excepto glabra, pericarpio lignoso 3-5 mm. crasso.

MALAY PENINSULA. Pahang: Ulu Pahang, 200-300 ft., *H. Ritchings* (type).

A tall buttressed tree, 60-70 ft. high and 5 ft. in girth $3\frac{1}{2}$ feet above ground level (immediately above the buttresses). The vernacular name "Berengan" is applied to all species of *Pasania* and *Quercus* in the region.

1274. *Eria* (§ *Xiphosium*) *Hindei* Summerhayes [Orchidaceae-Kerosphaereae]; ab *E. carinata* Gibson et *E. rosea* Lindl. floribus multo minoribus extra sparse pubescentibus, labello fere simplici facile distinguenda.

Herba epiphytica, rhizomate repente. *Pseudobulbi* 1-2 cm. distantes, ovoidei vel elongato-ovoides, 2-4 cm. longi, 1-1.5 cm. diametro, apice monophylli, cataphyllis 5-8 acutis membranaceis vaginantibus vestiti. *Folia* vernatione conduplicata, oblongo-linearum, apice breviter inaequaliter acute bilobulata, 13-17 cm. longa, 1.7-2.7 cm. lata, coriacea, basi in petiolum circiter 2-4 cm. longum angustata. *Inflorescentiae* ex axillis cataphyllorum superiorum ortae, erectae, 4-8 cm. longae, laxae multiflorae; rhachis teres, pubescens; bractae ovatae vel lanceolato-ovatae, acutae, fere glabrae, 3-4 mm. longae, ovarium pedicellatum superantes. *Flores* patentes, ovario pedicellato breviter pubescente. *Sepalum intermedium* oblongo-lanceolatum, obtusum, 5 mm. longum, 2 mm. latum; sepala lateralia oblique et leviter falcatis lanceolata, obtusa, 5.5-6 mm. longa, juxta basin 2.5-3 mm. lata; omnia sepala extra sparse breviter pubescentia, ciliata. *Petala* anguste oblonga, obtusa vel subacuta, 5 mm. longa, 1.5 mm. lata, margine minute denticulata, glabra. *Labellum* sessile, recurvatum, simplex vel obscure trilobum, ambitu ovatum, subacutum, medio concavum, 4 mm. longum, 3 mm. latum, lobulis lateralibus rotundatis ab intermedio vix sejunctis, lobo intermedio triangulari carnosio, labellum in disco callis duobus lateralibus lanceolatis apice liberis acutis et linea media incrassata instructum. *Columna* 1 mm. longa, pede fere 2 mm. longo; anthera obtusa.

ASSAM. Locality not known, communicated in 1926 by Mr. G. L. Hinde and flowered at the Royal Botanic Gardens, Kew, in 1928 and succeeding years.

Sepals and petals pinkish-buff with darker stripes. Lip dull pink, paler towards edges. Column as sepals; pollinia bright yellow.

A striking, small-flowered species of sect. *Xiphosium* which resembles *E. rosea* Lindl. extremely closely in vegetative features,

except for the rather narrower leaves, but which is totally different in the flowers. These have the appearance of sect. *Hymenaria*, the rhachis and pedicels being pubescent while the sepals are sparsely so. In my opinion *E. clausa* King & Pantling is incorrectly placed in sect. *Xiphosium* by Kraenzlin and is more at home in sect. *Hymenaria*. The sub-section *Convolutae* of sect. *Xiphosium* in Kraenzlin's monograph is best treated as a distinct section as already done by Schlechter and J. J. Smith.

1275. **Cyperus (§ Luzuloidei) Altsoni** Kükenthal [Cyperaceae-Cyperinae]; affinis *C. Hieronymi* Boeck., a qua bracteis tantum 4-5, spiculis oblongo-cylindricis 20-30 mm. longis 5 mm. latis usque ad 50-floris, necnon squamis multo longioribus stramineis obtusiusculis differt.

Rhizoma abbreviatum, lignosum. *Culmus* 25-30 cm. altus, robustus, triquetus, apice scabriusculus, basi plurifolius. *Folia* culmum superantia, 12 mm. lata, plana, nervis 3 prominentibus percursa, marginibus scabra, basin versus attenuata, apice longe acuminata; vaginae longae, durae, purpureae. *Bractae* 4-5, inferiores anthelam longe superantes. *Anthela* semicomposita, diffusa, 6-8-radiata; radii divergentes, rigidi, usque 8 cm. longi, partim indivisi, partim apice 2-5-ramulosi; radioli breves, 1 cm. longi, vel subsessiles, ex ocreis longis purpureis postice biaristatis exsurgentes. *Spiculae* 3-6-nativae digitatae, compressae, oblongo-cylindricae, 2-3 cm. longae, 5 mm. latae, dense multi- (usque 50-) florae. *Rhachilla* rigida, exalata. *Squamae* dense imbricatae, majusculae, fere 5 mm. longae, lanceolato-ovatae, obtusiusculae, valde carinatae, in dorso laete viridi trinervi scabrae, lateribus stramineis obsolete striatis celluloso-reticulatis. *Nux* parvula, quartam partem squamae aequans, late ovalis, trigona, breviter pedicellata, apiculata, atro-brunnea, dense punctulata. *Stamen* 1; filamentum dilatatum. *Stylus* et *stigmata* 3 mm. longa.

BRITISH GUIANA. Maicwac River, Kopinang River, by riverside in sand, 480 m., April 1926, Altson 492 (type).

1276. **Cyperus (§ Pulchrae) subtenax** Kükenthal [Cyperaceae-Cyperinae]; affinis *C. tenaci* Boeck., sed rhizomate elongato crasso, culmis acute triangularibus (nec obsolete trigonis), anthela capitata globosa et nux lineari-oblonga (nunquam obovato-oblonga) differt.

Rhizoma elongatum, lignosum, crassum. *Culmi* approximati, 20-40 cm. alti, graciles, stricti, acute triangulares, laeves, basi vaginis duris integris brunneis vestiti. *Folia* pauca, dimidiam partem culmi aequantia, rigida, canaliculata vel complicata, angusta. *Bractae* 2, haud longae, pungentes, ima culmum quasi continuans. *Anthela* capitata, e spicis pluribus confluentibus sessilibus formata, globosa, 8-10 mm. diametro. *Spiculae* multae, lineares, 5-6 mm. longae, 1 mm. latae, subcompressae, usque 20-florae. *Rhachilla* tenuis, exalta. *Squamae* subdense imbricatae, apice patulae, chartaceae, oblongo-ovatae, obtusae, lateribus sanguineae, e dorso

stramineo-viridi trinervi breviter mucronatae. *Nux* squamam subaequans, lineari-oblonga, trigona. *Stylus* brevis. *Stigmata* 3.

ANGOLA: Benguella, country of the Ganguellas and Ambuellas, Kassungo, 18 Oct. 1906, Gossweiler 3270 (type in Kew Herb. and in Brit. Mus. Herb.).

1277. **Isachne Meeboldii** C. E. C. Fischer [Gramineae-Paniceae]; *I. albenti* Trin. proxima, sed foliis multo longioribus pilis basi bulbosis, spiculis majoribus, glumarum setis basi bulbosis differt.

Herba perennis, caespitosa; innovationes intravaginales. *Caules* fere a basi ramosi, erecti, rigidi, glabri, usque 70 cm. alti; nodi inferiores inflati, sub inflatione constricti et colore fusciores; internodia 4-11.5 cm. longa. *Folia* caulem usque ad inflorescentiam induentia; vaginae laxae, inferiores saepe internodio longiores, glabrae, pilis rigidis basi bulbosis ciliatae; ligulae ad lineam pilorum rigidorum redactae; laminae (externae a vaginis aegre distinguendae) lineares, dimidio superiore in apicem acutum vel acuminatum angustatae, 15-30 cm. longae, 0.5-1 cm. latae, multicostatae, costa media infra glabra prominente, costis utraque pagina pilis brevibus vel longiusculis basi bulbosis plus minus vestitis, marginibus incrassatis cartilagineis scabris. *Paniculae* pyramidales, demum effusae, usque 13 cm. longae; rhachis gracilis, sulcata, glabra; rami quaquaversi, erecto-patentes, filiformes, glabri, usque 22 cm. longi, angulati; pedicelli solitarii, capillares, apice leviter ampliati. *Spiculae* globosae, 2.5 mm. longae. *Glumae* membranaceae, subaequales, suborbiculares, concavae, obtusae, indistincte 7-nerviae, exceptis setis paucis basi bulbosis in dimidio superiore sitis glabrae, 2.2-2.5 mm. longae, superiore quam inferiore paullo minore, stramineae vel plus minus purpureae. *Flosculi* 2, hermaphroditi, subaequales, hemisphaerici. *Lemmata* coriacea, orbicularia, 1.5-1.8 mm. longa, superiore quam inferiore subminore, marginibus involuta, extra puberula, pallide straminea, apice saepe purpurea vel nigra. *Paleae* coriaceae, marginibus incurvis hyalinis, parte inoperta extra puberula. *Caryopsis* non visa.

SOUTH INDIA. Mysore: Shimoga, 2000-3000 ft., Oct., *A. Meebold* 10,747 (type), 10,746; Kumsi, 2000-3000 ft., Oct., *A. Meebold* 10,745: "in rice fields, stiffly erect." (Duplicates of all 3 numbers are in Calc. Herb.)

1278. **Isachne Angladei** C. E. C. Fischer [Gramineae-Paniceae]; *I. himalaicae* Hook. fil. proxima, sed caulibus scandentibus, foliorum nervis paucioribus, marginibus haud incrassatis, pilis ligularibus multo brevioribus, spiculis glumis lemmatibus anguste ellipticis differt.

Suffrutex ramosissimus, scandens, ultra 1.2 m. longus (longitudine maxima ignota). *Caules* graciles, bambusiformes, glabri, tota longitudine foliosi; nodi tumidi, internodiis 1.8-11.5 cm. longis. *Foliorum* vaginae primum involutae, arcte clausae, dein laxae, plerumque internodiis multo breviores, interdum longiores, glabrae,

marginibus ciliatae, ad furcationes facile fractae atque deciduae; ligula e pilis brevibus rigidis sistens; laminae rigidiusculae, angustissime linearilanceolatae, acuminatae, basi rotundatae atque plus minus ciliatae, 5-15 cm. longae, 3-6 mm. latae, 7-9-costatae, glabrae, marginibus minute scaberulae. *Paniculae* pyramidales, effusae, 6-8 cm. longae, glabrae; rhachis gracilis, sulcata; rami quaquaversi, capillares, nodis tumidis et nonnunquam minute puberulis; pedicelli solitarii, capillares, apice levissime ampliati. *Spiculae* anguste elliptico-obovatae, 2-4 mm. longae. *Glumae* membranaceae, subaequales, late ovato-ellipticae, acutae vel subacutae, 2-2.4 mm. longae, concavae, 7-nerviae, glabrae vel minutissime puberulae cum setis paucis prope apicem e basibus plus minus bulbosis, pallide stramineae vel plus minus purpurascentes. *Flosculi* 2, hermaphroditi. *Lemmata* crustacea, subaequalia, anguste elliptica, naviculiformia, obtusa, 2 mm. longa, marginibus involuta, pallide straminea, apice saepe fusco-purpurea, lemmate superiore quam inferiore subminore plus minus stipitato. *Paleae* crustaceae, extra puberulae, marginibus valde incurvatis. *Stamina* 3, multum ante pistillum maturescentia, mox caduca vestigio vix ullo relicto; filamenta tenuissima. *Stigmata* e latere flosculi paullo supra medium exserta. *Caryopsis* non visa.

SOUTH INDIA. Palni Hills, Shembaganur, 6000 ft., *L. Anglade* 914 (type); 5500 ft., *van Malderen* 1283; without precise locality, *A. Saudière* 647; Anaimallai Hills, *R. H. Beddome*; High Wavy Mountains, 4000-5500 ft., May, *E. Blatter & Hallberg* 182.

1279. **Isachne Bourneorum** C.E.C. Fischer [Gramineae-Panicaceae]; *I. Kunthianae* Nees proxima, sed major, foliis linearibus vel linearilanceolatis basi angustatis caulem haud amplexantibus, vaginis laminisque glabris vel puberulis, glumis longioribus.

Herba erecta. *Caulis* decumbens, basi radicans, 0.1-1 m. altus. *Foliorum* vaginae costatae, glabrae vel pilis brevibus paucissimis praeditae, pilis longis ciliatae; ligula e serie pilorum rigidorum sistens; laminae lineares usque linearilanceolatae, rarissime ovatae, acutae vel acuminatae, 1.5-6.5 cm. longae, 3-7-11-2 mm. latae, regulariter 7-costatae, costa media haud prominente, glabrae vel pilis brevibus paucissimis praeditae, marginibus cartilagineis scaberulis basi saepe ciliis paucis basi bulbosis praeditis. *Panicula* pyramidalis, 3-7-7.5 cm. longa; rhachis et ramificationes graciles, canaliculatae, glabrae vel scaberulae, furcationibus plerumque pubescentibus; rami erecto-patentes vel fere horizontales, usque 4-5 cm. longi. *Spiculae* pedicellatae, anguste ellipticae. *Glumae* membranaceae, subaequales, lanceolatae, cuspidato-acuminatae, 5-7-nerviae, glabrae vel saepius dimidio superiore setis paucis basi bulbosis praeditae, 2.5-4 mm. longae. *Flosculi* 2, hermaphroditi. *Lemmata* dissimilia; inferius membranaceum, anguste elliptico-oblongum, concavum, obtusum, multinervium, marginibus subrevolutum, glabrum, 2-2.5 mm. longum, palea ejus simili marginibus valde incurvis; superius subcoriaceum, late

ellipticum, concavum vel hemisphaericum, nervis indistinctis, papillosum vel puberulum, marginibus leviter involutum, 1.2-1.8 mm. longum, palea plana marginibus valde incurvis. *Lodiculae* latae. *Stamina* 3, linearia, paleae fere aequilonga. *Caryopsis* non visa.

SOUTH INDIA. Palni Hills: Kodaikanal, 6500 ft., *Sir A. G. and Lady Bourne* 2491 (type); Silver Cascade riverside, Gundon Shola, Church Cliff path, Bear Shola Valley, *Sir A. G. and Lady Bourne* 1041, 1249, 1280, 1481; without precise locality, *Wight* 3380; Pumbarai, *Madras Herbarium* 16,599; Bear Shola, *K. C. Jacob*, 16,171. Nilgiri Hills: Kolakanibai, 5000 ft., *J. S. Gamble* 16,786; Terrace, 5000 ft., *J. S. Gamble*, 18,309; Naduvattam, 6000 ft., *M. A. Lawson* 4; Pykara, 7000 ft., *A. Meebold* 11,635; Gudalur Ghat woods, *Madras Herbarium* (without number or collector's name). Baba budan Hills: Kalhatti, 6000 ft., *A. Meebold* 9421.

1280. **Pogonarthria Brainii** Stent [Gramineae-Eragrostae]; affinis *P. squarrosae* Pilger, sed spiculis minoribus, glumis lemmatibusque acutis, his latioribus differt.

Gramen perenne, caespitosum. *Culmi* rigide erecti, ad 1-3 m. alti, graciles, teretes, glabri, circiter 3-4-nodes, nodis atro-purpureis, internodio supremo (pedunculo) circiter duas partes culmi aequantes. *Foliorum* vaginae superiores arcte appressae, laeves, glabrae, tenuiter striatae, rigidiusculae, internodiis breviores; vaginae inferiores solutae, plus minusve appresse pubescentes vel glabrescentes; ligulae brevissimae, membranaceae, minute ciliolatae; laminae anguste lineares, ad apicem setaceum attenuatae, ad 20 cm. longae, involutae, basi 2 mm. latae, rigidae, superiores plerumque glabrae, inferiores sparse pilosae vel glabrescentes, supra scaberulae, subtus laeves. *Panicula* linearis, contracta, stricta, 13-20 cm. longa, 1-5 cm. lata; rhachis glabra, laevis, obscure 4-angulata; rami solitarii vel saepe 2-4-approximati, flexuosi, gracillimi, subtriquetri, glabri, laeves, dense spiculati parte basali nuda 3-5 mm. longa excepta. *Spiculae* secundae, biseriatae, breviter pedicellatae, ovato- vel elliptico-oblongae, circiter 3.5 mm. longae, valde lateraliter compressae, glabrae, viridulae et purpureo-variegatae, 3-4-florae, flore supremo plus minusve redacto; rhachilla supra glumas et inter lemmata articulata, scaberula, apice articularum pilis brevibus paucis orta. *Glumae* inaequales, ovatae, acutae, uninerviae, valde carinatae, carinis scaberulis; inferior 1.5 mm. longa; superior 2 mm. longa. *Lemmata* e glumis exserta, ambitu late lanceolata vel anguste ovata, acuta, 2.3-2.5 mm. longa, valde carinata, trinervia, nervis lateralibus tenuissimis saepe obscuris, plus minusve percurrentibus; paleae lemmatibus paulo breviores, membranaceae, apice hyalinae, carinis scabridis. *Lodiculae* brevissimae, cuneatae, tenuiter subtrinerviae. *Antherae* purpureae, 1-3 mm. longae. *Ovarium* late ovatum vel globosum.

SOUTHERN RHODESIA: Salisbury; granite sand veld, 9 miles off Beatrice Road, *Brain in Govt. Herb. Salisbury* 3621 (type); Stone

Ridge Farm, Fitt 7. Nyamandhlovu District; Umgusa Spur, Pardy in Govt. Herb. Salisbury 3740.

XLIV.—NEW SOUTH AFRICAN IRIDACEAE. L. Bolus.

Homeria odorata L. Bolus; a *H. salmonca* L. Bolus floribus odoratis vespertinis sordide pallideque luteis, perianthii "tubo" infundibuliformi, stylo brevior, praecipue differt.

Planta saepius 40-62 cm. alta. *Cormus* globosus, 2-2 cm. diam., tunicis saturate brunneis sat tenuibus. *Vaginae* basales papyraceae, subtruncatae, ad 6 cm. longae. *Folium* productum 1, basale, textura firma, apice leviter induratum, pluri-nervatum, 30-53 cm. longum sine vagina clausa ad 22 cm. longa, 1-2.5 cm. latum, caule ad per 33 cm. exserto, ad 4 mm. diam.; folia spathiformia 2-5, membranacea, longe setaceo-acuminata, ad 5.5 cm. longa, cymas 2-4 in axillo ferentia. *Cymae* interdum fere patentes, saepius ad 6-florae, floribus pomeridianis vel vespertinis. *Spathae valvae* superne membranaceae, exteriores 2.5-4 cm., interiores 4-5.5 cm. longae. *Sepala* obtusa, 2-2.5 cm. longa, ad 1.1 cm. lata, in unguem 4 mm. longum gradatim attenuata, genu lacte luteo; petala ad 8 mm. lata, ungue 6 mm. longo. *Tubus* staminalis 5 mm. longus; antherae 3 mm. longae, styli ramos 1 mm. longos superantes. *Ovarium* 4-6 mm. longum. *Capsula* saepe irregulariter maculate notata, ad 1 cm. longa, ad 5 mm. diam.

Calvinia Div.; in clay at the "klip koppies," near Nieuwoudtville, Sept. 1930, L. Bolus (Bolus Herbarium, no. 19,968).

Hexaglottis nana L. Bolus; a ceteris habitu nano, cormo magno, folio producto solitario, praecipue differt.

Planta sat robusta, 10-17 cm. alta, parte infra folium ad 9 cm. longa. *Cormus* globosus, 3 cm. diam., reliquis fibrosis copiose coronatus, tunicis permultis saturate brunneis inferne interdum lamellatis superne pinnate reticulatis demum e nervis omnino compositis apice longe aristatis. *Folium* basi inflorescentiae positum, suberectum vel patens, flexuosum, textura firma, parte apicale haud visa, ad 25 cm. longum, basi ad 8 mm. medio 6 mm. latum, cum foliis spathiformibus 2-3 apice callosis 10-4 cm. longis basi ad 1.1 cm. latis subrigide papillate ciliolatum. *Cymae* 2-3-florae. *Spathae valvae* herbaceae, obtusae vel subtruncatae, nunc subaequilongae, nunc exterior longior, nunc parum brevior, 2.3-4.6 cm., interior 3-3.7 cm. longa, apice laceratae. *Perianthium* luteum, segmentis basi, ut videtur in siccis, breviter connatis ad 1.8 cm. longis. *Antherae* ad 5 mm. longae. *Stylus* 3 mm. longus, ramis 4-5 mm. *Ovarium* demum exsertum, 4-5 mm. longum.

Clanwilliam Div.; Algeria Forest Station, Cedarberg, Sept. 1930, Dora Weintraub (Bolus Herbarium, no. 19,972).

Watsonia (Euwatsonia) Ryderae L. Bolus; a *W. iridifolia* Ker. foliis latioribus subglaucis, bracteis acuminatis ab axi divergentibus, bracteolis bracteis brevioribus, differt.

Planta robusta, ad 1-28 m. alta. *Cormus* cum pluribus novellis arte adpressis ad 8 cm. diam., tunicis crassis intricate cancellatis. *Caulis* omnino vaginis vestitus vel apice parum exsertus, ad 1-2 cm. diam. *Folia* basalia 8-9, artissime equitantia, vaginis intus copiose mucilaginis, acuminata, nervo medio marginibusque inconspicuis, nervis intermediis crebris in vivis vix visis, 47-67 cm. longa, prope medium latissima, ad 5.8 cm. lata, caulina reducta 3-4, 30-11 cm. longa, laminis 10-0 cm. longis, vaginis haud ventricosis compressae carinatis. *Inflorescentia* simplex, ad 37-flora, vel demum 1-3 ramis evolutis et ad 9-floris, floribus fere erectis. *Bractee* saturate brunneae, internodia bene superantes, 4-1.5 cm. longae; bracteolae 3-1.2 cm. longae, omnino coalitae vel demum ad per 6 mm. apice liberae. *Perianthium* roseum vel subpurpureum, 5-6 cm. longum, tubo diu fere stricto, 2.8-3.7 cm. parte cylindrica 2-2.5 cm. longo, apice ad 6 mm. diam.; segmenta obovato-oblonga, obtusa, exteriora ad 0.8 cm., interiora ad 1.1 cm. lata. *Stamina* arcuata, saepe ad apicem segmentorum attingentia, antheris purpureis ad 1.1 cm. longis, polline caeruleo. *Styli rami* 6 mm. longi; stigmata 6, 2 mm. longa; ovarium inferne leviter angustatum, 4 mm. longum.

Riversdale Div.; Garcia's Pass, Nov.-Dec. 1931, Eleanor Ryder (Bolus Herbarium, no. 19,974).

Watsonia (Neuberia?) Emiliae L. Bolus; a *W. Middlemostii* L. Bolus folio producto basali solitario, floribus fere erectis, tubo perianthii longiore angustioreque, fere in modo tubi in sectione *Euwatsonia*, differt.

Planta 50-74 cm. alta, inter graciliores generis. *Cormus* ad 2.5 cm. diam., tunicis tenuibus arte intertextis vel senectissimis derumpentibus. *Caulis* subcompressus, inferne anguste 2-alatus, ad 6 mm., apice 3 mm., diam., internodiis 2.5-20 cm. longis, bene exsertis. *Folia* 5, basali ad 65 cm. longo, lamina 60 cm. longa, ad 5 mm. lata, caulina 65-5 cm., lamina 44-0 cm. longa, ad 7 mm. lata, viridia, marginibus subluteis vix incrassatis, nervo medio sat conspicuo, nervis intermediis crebris, in vivo vix visis. *Inflorescentia* 2-ramosa spica, terminali 9-11-flora, ramis erectis 2-3-floris. *Bractee* saturate brunneae, chartaceae, acuminatae, 1.5-1 cm. longae, internodiis subaequilongae; bracteolae 1.1-1 cm. longae, parte libera 1-4 mm. longa. *Perianthium* roseum, ad 4 cm. longum, tubo subinfundibuliformi ad 2.2 cm. longo apice 6 mm. diam.; segmenta obovato-oblonga, obtusa, basi alba, inferne saturate vittata, supremum evittatum, latissimum, exteriora ad 7 mm., interiora 8-9 mm., lata. *Stamina* arcuata, ad dimidium segmentorum vel infra attingentia, filamentis inclusis vel breviter exsertis, antheris purpureis ad 9 mm. longis. *Styli rami* apicem antherarum vix attingentes, ad 4 mm. longi; stigmata 6, 1-1.5 mm. longa; ovarium 2-3 mm. longum.

Riversdale Div.; Garcia's Pass, Nov.-Dec. 1931, Emily Ferguson (Bolus Herbarium, no. 19,975).

Watsonia (Neuberia) pauciflora L. Bolus; a *W. Middlemostii* L. Bolus foliis paucioribus angustioribus, bracteis latioribus, floribus erectioribus, differt.

Planta ad 25 cm. alta. *Cormus* 1.8 cm. diam., tunicis tenuissimis. *Vaginae basales* 1.5-3 cm. longae. *Folia* 4, basali 18-21 cm. longo ad 3 mm. lato, caulina 3, cum vagina 2-0.7 cm. longa 13-2 cm. longa, ad 4 mm. lata, in siccis nervo medio marginibusque leviter incrassatis. *Spica* laxa 2-3-flora, floribus diu fere erectis. *Bracteae* axem bene amplexentes, dimidio inferiore insigniter ad 1 cm. latae, 1.5-1 cm. longae; bracteolae 1-0.8 cm. longae, apice per 1 mm. liberae. *Perianthium* saturate roseum, 4-4.5 cm. longum, tubo 2-2.5 cm. longo apice 5-7 mm. diam.; segmenta obtusa exteriora ad 0.9 cm., interiora ad 1 cm. lata. *Stamina*, ut videtur in siccis, declinata, ultra dimidium segmentorum attingentia, antheris luteis 8 mm. longis. *Stigmata* 6, fere ad apicem segmenti attingentia. *Ovarium* 4 mm. longum.

Caledon Div.; near Elgin, Oct. 1931, *Eleanor Ryder* (Bolus Herbarium, no. 19,973).

Watsonia (Euwatsonia) Hutchinsonii L. Bolus; a *W. coccinea* Herb. caule longiore, foliis majoribus, perianthii segmentis inaequilongis, bracteis bracteolas superantibus, praecipue differt.

Planta culta 1-15 met. alta. *Cormus* 5 cm. diam., tunicis copiosis crassis. *Caulis* omnino vaginatus, ad 1 cm. diam. *Folia* 7 sine 3 superioribus spathiformibus 14-2.5 cm. longis ramos inflorescentiae ferentibus; radicalia 3, 66 cm., 72 cm., 60 cm. longa, 2 cm., 2.8 cm., 3.2 cm. lata; caulina 4, infimum 4 cm. supra basin positum, 45 cm. longum sine vagina clausa 11.5 cm. longa, ad 3.4 cm. latum, proximum 50 cm. longum sine vagina 19 cm. longa 2.8 cm. diam. compressa haud ventricosa, proximum 43 cm. longum sine vagina 23 cm. longa, proximum 33 cm. longum sine vagina 20 cm. longa, ramum inflorescentiae tardissime evolutum ferens, nervo medio prominente viridi, nervis intermediis inconspicuis, marginibus vix incrassatis lutescentibus. *Bracteae* obtusae, superne brunneae, 2.7-1.2 cm. longae, axem haud amplexentes; bracteolae 2.2-1 cm. longae. *Spica* terminalis sat dense 22-flora, ramis 5-9-floris. *Perianthium* laete rubrum, ad 7.9 cm. longum, tubo ad 5 cm. longo apice 6 mm. diam.; segmenta obtusa, apiculata, exteriora breviora angustioraque, ad 2.5 cm. longa, ad 6 mm. lata, interiora ad 2.9 cm. longa, ad 1 cm. lata. *Stamina* arcuata, segmenta superantia vel aequantia; filamenta inaequilonga, brevius 3.5 cm., duo longiora 3.9 cm. longa, antheris atrate purpureis 1.1 cm. longis. *Stigmata* 6, fere apicem segmenti attingentia, saepe 1 mm. longa.

Hab. Exact locality uncertain, probably south-western Cape Province, Oct. 1928, *J. Hutchinson* (National Bot. Gardens, no. 2563/30).

Watsonia (Euwatsonia) Leipoldtii L. Bolus; a *W. Wordsworthiana* Matthews et L. Bolus perianthii tubo graciliore

stricti-oreque, segmentis minoribus, stigmatibus 6 bene exsertis, praecipue differt.

Planta culta ad 1-17 met. alta. *Caulis* ad 9 mm. diam. *Folia* 7 sine 3 superioribus spathiformibus 16-3 cm. longis ramos inflorescentiae ferentibus; basalia 3, ad 52 cm. longa cum parte amplexente ad 21 cm. longa, ad 2.3 cm. lata; caulina 4, cum vagina clausa 8-20 cm. longa 62-36 cm. longa, ad 2.5 cm. lata, viridia, marginibus lutescentibus haud incrassatis, nervo medio prominente, nervis intermediis crebris vix visis. *Spica* terminalis sat laxa ad 11-flora, ramis 7-8-floris, floribus fere erectis, morientibus tantum decurvatis. *Bracteae* acutae vel obtusae, dimidio superiore membranaceo, internodiis aequilongae, 3-1.8 cm. longae; bracteolae bracteis aequilongae vel parum longiores, omnino coalitae. *Perianthium* pulchre roseum, tubo fere stricto 4.5-5 cm. longo apice 7-8 mm. diam., parte filiformi in cylindrum gradatim transeunte parumque brevius; segmenta obovato-oblonga, obtusa, 2.2-2.4 cm. longa, exteriora ad 1.1 cm., interiora ad 1.2 cm. lata. *Stamina* arcuata, apicem segmentorum fere attingentia, filamentis cum antheris pollineque albidis. *Stylus* perianthium superans, ramis ad 4 mm., ramulis ad 2 mm. longis. *Ovarium* inferne leviter angustatum, exangulatum, 6 mm. longum.

Worcester Div.; between Brand Vlei et Villiersdorp, Oct. 1929, *C. L. Leipoldt* (Bolus Herbarium, no. 19,942). Fl. in H. H. Bolus' garden, Oct.-Nov. 1930, 1931.

Watsonia (Euwatsonia) Archbelliae L. Bolus; a *W. Pillansii* L. Bolus foliis angustioribus, spica minus densa, bracteis longioribus inferioribus acutis, praecipue differt.

Planta 1-1-10 met. alta. *Cormus* cum pluribus novellis arte adpressis ad 4 cm. diam., tunicis exterioribus tenuibus, interioribus sat crassis. *Folia* 10 sine spathiformibus 2-3 ramos inflorescentiae ferentibus 6-4.5 cm. longis, viridia, marginibus haud incrassatis, nervo medio prominente, nervis intermediis crebris inconspicuis; radicalia 4, 44-56 cm. longa, ad 1 cm. lata; caulina 48-10 cm. longa, internodia omnino vaginantia, vaginis clausis 1-10 cm. longis. *Spica* terminalis 19-flora, ramis 3-4-floris. *Bracteae* rubicundae, 4.5-2.5 cm. longae, axem basi tantum amplexentes; bracteolae 3-2 cm. longae. *Perianthium* testaceo-aurantiacum, 8 cm. longum, tubo 5.3 cm. longo apice 8 mm. diam.; segmenta abrupte acuta vel obtusa, exteriora ad 1.1 cm., interiora ad 1.5 cm. lata. *Staminodia* per 1.5 mm. libera. *Stamina* arcuata, dimidium segmenti bene superantia, antheris saturate purpureis ad 1.2 cm. longis. *Stigmata* 6, leviter exserta, 2 mm. longa. *Ovarium* inferne parum angustatum, 7 mm. longum.

Natal: Underberg (south-west Natal), alt. 5120 ft., *Mrs. J. E. Archbell* (National Botanic Gardens, no. 772/30). Fl. Kirstenbosch Nov.-Dec. 1931.

Watsonia (Euwatsonia) Comptonii L. Bolus; a *W. fulgente* Klatt habitu graciliore, foliis radicalibus paucioribus lutescente viridibus, bracteis longioribus, petalis latioribus, praecipue differt.

Planta saepius 60-80 cm. alta, inter graciliores generis. *Cormus* ad 2-8 cm. diam., tunicis copiosis tenuibus, arte intertextis. *Caulis* ad 6 mm., apice saepe 3 mm. diam., internodiis superioribus ad 5 cm. exsertis. *Vaginae basales* 4.5-6.5 cm. longae. *Folia* 6-7, basalia 2-3, ad 46 cm. longa, parte amplexente ad 14 cm. longa, ad 1.6 cm. lata, viridia, nervo medio marginibusque inconspicuis, nervis intermediis vix visis, caulinarum laminis ad 21 cm., 8 cm., 5 cm., 3.1 cm. longis, vaginis clausis ad 8 cm., 11 cm., 8 cm., 1.5 cm. longis, vel in exemplari depauperato laminis ad 13 cm. longis. *Spica* terminalis, sat laxa 11-14-flora, ramis 1-2, 2-3-floris. *Bracteae* basin versus purpurascens, aliter brunneae, mox superne laceratae, acutae vel rarius acuminatae vel obtusae, 2-1 cm. longae; bracteolae fere ad apicem coalitae, 1.3-1 cm. longae. *Perianthium* aurantiacorum, 4.8-5.6 cm. longum, tubo intus albo lineato, lineis in notas albas 2 basi segmentorum desinentibus, 3.1-3.4 cm. longo apice 6 mm. diam., parte cylindrica partem filiformem parum excedente; segmenta obovato-oblonga vel late obovata, apice rotundata, exteriora 7-8.5 mm., interiora ad 1.1 cm. lata. *Stamina* arcuata, parum ultra dimidium segmentorum attingentia, filamentis aurantiacis, antheris atrate purpureis 7 mm. longis. *Stigmata* 6, fere ad apicem segmenti attingentia; ovarium 5 mm. longum.

Cape Peninsula; marsh near Smitswinkel, Nov. 19, 1931. T. M. Saller, 1840.

Var. **angustifolia** L. Bolus; folia 5, basale unicum elongatum inflorescentiam saepe superans, ad 7 mm., caulina ad 1 cm. lata.

Cape Peninsula; marsh near Red Hill, Simonstown, Dec. 1931. T. M. Saller.

XLV.—CONTRIBUTIONS TO THE FLORA OF SIAM.* ADDITAMENTUM XXXV.

Canthium brunnescens Craib, Fl. Siam. Enum. ii. 135 (1932), descr. ampl. [Rubiaceae-Vanguerieae]; a *C. cochinchinense* Pitard foliis maioribus apice acuminatis recedens.

Arbor circa 10 m. alta (ex Kerr), corolla et nervorum axillis exceptis glabra, haud armata; ramuli sicci primo fusci, mox brunnei, angulati, demum cinerei, circa 4 mm. diametro. *Folia* elliptica vel oblongo-elliptica, apice obtuse acuminata vel subacuminata, basi saepe parum inaequilateralia, cuneata vel acuminata, 7-13 cm. longa, 2.8-5 cm. lata, rigide chartacea, sicca brunnea vel fusco-brunnea, subtus parum pallidiora, costa supra conspicua vel impressa subtus prominente, nervis lateralibus utrinque 6 supra conspicuis subtus prominentibus, nervulis vix conspicuis, subtus in nervorum axillis parce pubescentia, petiolo 5-10 mm. longo supra

canaliculato suffulta; stipulae diutius persistentes, e basi deltoidea subulato-acuminatae, 4 mm. longae. *Cymae* axillares, umbelliformes, ad 15-florae, pedunculo communi circa 3 mm. longo apice bracteis duabus circa 3 mm. longis instructo suffultae; pedicelli ad 9 mm. longi; alabastra obtuse acuminata, sicco fusca. *Receptaculum* 1.25 mm. longum. *Calyx* breviter denticulatus. *Corolla* extra glabra, tubo 2 mm. longo intra apice piloso, lobis 4 deltoideis obtuse acuminatis 3 mm. longis 2 mm. latis glabris. *Antherae* 1.25 mm. longae, exsertae. *Stylus* 1.75 mm. longus, stigmatibus globosis circa 1 mm. diametro.

Korat, Kao Lêm, 700 m., by stream in evergreen forest, Kerr 9890.

Canthium calcicolum Craib, Fl. Siam. Enum. ii. 136 (1932), descr. ampl. [Rubiaceae-Vanguerieae]; a *C. umbellato* Wight eiusque affiniore foliis multo minoribus, nervis lateralibus conspicue obliquis, inflorescentia depauperata recedit.

Arbuscula circa 5 m. alta (ex Kerr), corolla excepta glabra; ramuli graciles, primo distincte angulati, cortice fusco-rubro obtecti, lenticellis pallidis conspicue longitudinaliter extensis. *Folia* lanceolata lateve lanceolata, apice obtuse acuminata vel caudato-acuminata, basi cuneata, saepe parum inaequilateralia, 3-5 cm. longa, 1-1.4 cm. lata, subcoriacea, sicca plus minusve brunnescentia, subtus pallidiora, costa supra conspicua subtus prominente, nervis lateralibus utrinque 4-5 supra conspicuis subtus prominulis obliquis bene intra marginem anastomosantibus, nervulis rete laxum supra conspicuum subtus prominulum efficientibus, petiolo 2-3 mm. longo suffulta; stipulae diu persistentes, circa 2 mm. longae. *Cymae* axillares, umbelliformes, floribus ad 10 saepe paucioribus haud rarius solitariis, pedunculo communi usque ad 4 mm. longo apice parvi-bracteato suffultae, floribus parvis pedicellis circa 5 mm. longis suffultis; flores aperti haud visi. *Receptaculum* 1 mm. longum, glabrum, sicco fuscum. *Calyx* 0.5 mm. longus, lobis deltoideis brevibus. *Corolla* extra glabra, intra apice villosa. *Antherae* 1.5 mm. longae. *Stylus* glaber. *Fructus* 5 mm. longus, 3.5 mm. diametro.

Patalung, Kaw Hua Tek, 50 m., evergreen on rocky limestone hill, Kerr 19,294.

Canthium calvum Craib, Fl. Siam. Enum. ii. 136 (1932), descr. ampl. [Rubiaceae-Vanguerieae]; a *C. horrido* Blume foliis brevioribus pro longitudine latioribus apice rotundatis retusis glabris recedit.

Frutex circa 3 m. altus (ex Kerr); ramuli glabrescentes, cortice brunneo vel cinereo-brunneo obtecti, lenticellis haud conspicuis, spinis rectis axillaribus 7 mm. longis armati. *Folia* late elliptica, elliptico-rotundata, vel elliptico-obovata, apice rotundata, retusa, basi cuneata vel cuneato-truncata, 10-17 mm. longa, 8-13 mm. lata, rigide chartacea, sicco supra luteo-viridia, subtus pallide viridia, pagina utraque glabra, costa supra conspicua vel parum impressa subtus prominente, nervis lateralibus utrinque

*Continued from K.B. 1932, 289.

3-4 bene intra marginem anastomosantibus supra subconspicuis subtus subprominulis, nervulis subobscuris, margine parum recurva, petiolo 1-3 mm. longo supra canaliculato suffulta; stipulae deciduae. *Flores* virides (ex *Kerr*), per 1-3 ramulis abbreviatis axillaribus gesti; pedicelli ad 2 mm. longi, glabri, apice bracteolis duabus oppositis inter se connatis 0.75 mm. longis instructi. *Receptaculum* 1-2.5 mm. longum, glabrum. *Calycis* tubus 1 mm. longus, 5-denticulatus. *Corollae* tubus vix 2 mm. longus, extra glaber, intra fere medio pilis deflexis adpressis longiusculis dense ornatus, lobi 2 mm. longi, 1-2.5 mm. lati, acuminati, glabri. *Filamenta* ad corollae tubi apicem affixa, 0.5 mm. longa, glabra; antherae paululo ultra 1 mm. longae, connectivo apice producto. *Stylus* 2.5 mm. longus, inferne incrassatus et pubescens, stigmate mitriformi 0.75 mm. longo longitudinaliter costato.

Sakon, Wanawu, 200 m., evergreen by river, *Kerr* 8056.

Canthium ferrugineum *Craib*, Fl. Siam. Enum. ii. 138 (1932), descr. ampl. [Rubiaceae-Vanguerieae]; a speciebus aliis spinis rectis armatis indumento ferrugineo ramulorum et foliorum et forma foliorum distinguendum.

Frutex circa 3 m. altus (ex *Kerr*); ramuli inventute densius ferrugineo-hirsuti, mox glabri, cortice cinereo obtekti, lenticellis inconspicuis, spinis rectis gracilibus ad 1 cm. longis sparsis armati. *Folia* oblongo-elliptica, elliptica, vel oblongo-lanceolata, apice subacuminata, basi rotundata vel fere truncata, interdum parum inaequilateralia, 3-6 cm. longa, 1.3-2.7 cm. lata, rigide chartacea, sicca viridia vel saepe parum lutescentia, supra ad costam ferrugineo-subhirsuta, aliter pilis ferrugineis sat rigidis sparse instructa, subtus ad costam nervosque laterales pilis ferrugineis divergentibus sat rigidis dense tecta, aliter molliter ferrugineo-pubescentia, costa supra impressa subtus prominente, nervis lateralibus utrinque 4-6 supra impressis subtus prominulis, nervulis tantum paucis subconspicuis, margine plus minusve recurva, densius ciliata, petiolo 2-6 mm. longo dense ferrugineo-hirsuto suffulta; stipulae deltoideae, acutae, 3 mm. longae, dorso dense adpresse ferrugineo-pubescentes, deciduae. *Flores* per 1-3, axillares, subsessiles; alabastra medio constricta, apice sparse breviter ferrugineo-pubescentia. *Receptaculum* breve, ferrugineo-pubescentia. *Calyx* receptaculo subaequilongus, extra adpresse ferrugineo-pubescentia, lobis brevibus. *Corollae* tubus 3 mm. longus, extra glaber, intra pilis deflexis longiusculis adpressis dense sericeis, lobi 4, oblongo-lanceolati, 4 mm. longi, 2 mm. lati, dorso apice parce ferrugineo-pubescentes, arete reflexi. *Stamina* 4, filamentis brevibus reflexis. *Stylus* exsertus, 4 mm. longus, inferne paulo incrassatus et pubescens, stigmate 1 mm. longo.

Ranawng, La-un, 10 m., scrub, *Kerr* 16,438.

Canthium horridulum *Craib*, Fl. Siam. Enum. ii. 139 (1932), descr. ampl. [Rubiaceae-Vanguerieae]; a *C. horrido* Blume foliis

minoribus pro rata latioribus saepe apice retusis subtus ad nervorum axillas conspicue pilosis, floribus subsessilibus recedit.

Frutex circa 3 m. altus (ex *Kerr*); ramuli primo adpresse ferrugineo-pubescentes, mox glabri, cortice brunneo vel cinereo-brunneo obtekti, lenticellis haud conspicuis, spinis axillaribus rectis saepissime mox recurvis circa 4 mm. longis armati. *Folia* late elliptica vel subovata, apice rotundata obtusave, saepe retusa, basi late cuneata vel subrotundata, usque ad 1.8 cm. longa et 1.3 cm. lata, coriacea, sicco saepissime plus minusve lutescentia, supra ad costam pilis paucis brevibus ferrugineis subtus ad costam pilis longiusculis sparsis instructa praeterea subtus in nervorum axillis breviter pilosa, costa supra impressa subtus prominente, nervis lateralibus utrinque 4-5 intra marginem anastomosantibus supra impressis subtus prominulis, nervulis obscuris, margine ciliata, petiolo circa 2 mm. longo suffulta; stipulae parvae, deciduae. *Flores* solitarii vel saepissime gemini, ramulis axillaribus brevibus gesti; pedicelli circa 2 mm. longi, glabri vel pilis paucis instructi, apicem versus bracteolis duabus oppositis inter se connatis 1 mm. longis instructi. *Receptaculum* circa 1 mm. longum, glabrum. *Calycis* tubus 1 mm. longus, denticulatus vel subdenticulatus. *Corollae* tubus 3 mm. longus, extra glaber, intra pilis tubo paulo brevioribus deflexis adpressis dense ornatus, lobi 5, lanceolato-oblongi, breviter acuminati, 3.75 mm. longi, 1.5 mm. lati, mox reflexi. *Discus* densius ferrugineo-puberuli. *Stamina* 5, filamentis ad corollae tubi apicem positis 1 mm. longis mox reflexis, antheris 1.5 mm. longis. *Stylus* 4 mm. longus, inferne adpresse pubescens, aliter glaber, stigmate mitriformi vix 1 mm. longo longitudinaliter costato. *Fructus* subglobosus, 8 mm. diametro.

Songkla, Tapa, under 50 m., savannah, *Kerr* 14,717.

Canthium longipes *Geddes* apud *Craib*, Fl. Siam. Enum. ii. 140 (1932), descr. ampl. [Rubiaceae-Vanguerieae]; a *C. filipendulo* Pierre foliis sicco fuscis, floribus minoribus haud solitariis, stylo brevior, a *C. aciculato* Ridl. foliis minoribus, pedicellis elongatis tenuibus recedit.

Frutex 3-5 m. altus (ex *Winit*); ramuli graciles, breviter subadpresse hirsuti, cortice rubro-brunneo obtekti, spinis rectis gracilibus ad 1.2 cm. longis armati. *Folia* elliptica vel ovato-elliptica, apice obtuse acuminata, basi cuneata, 2-4 cm. longa, 1-2 cm. lata, sicca fusciscentia, subtus pallidiora, supra ad costam breviter hirsuta, aliter sparse setosa, subtus ad costam nervosque laterales setosa, ad nervorum axillas densius setosa, aliter sparse setosa, costa supra conspicua vel prominula subtus prominente, nervis lateralibus utrinque 4 supra conspicuis subtus prominulis, nervulis rete gracile efficientibus, margine setuloso-ciliata, petiolo 2-4 mm. longo breviter hirsuto suffulta; stipulae ad 3.5 mm. longae, apice longius attenuatae, deciduae. *Flores* lutei (ex *Winit*), rarissime solitarii, pedunculis saepissime geminis 3-12 mm. longis flores 2-3 gerentibus cum pedicellis gracilibus sicco fuscis glabris vel

sparse hirsutis; pedicelli ad 11 mm. longi. *Receptaculum* breve, parce hirsutum. *Calycis* segmenta 4, receptaculo conspicue breviora. *Corollae* tubus 3.5 mm. longus, extra glaber, intra barbatus, lobi 4, ovato-lanceolati, acuti, 1.5 mm. longi, glabri. *Stamina* 4, ad corollae tubi apicem affixa. *Stylus* 4 mm. longus, hirsutus.

Lampang, Mè Sung, 150 m., evergreen forest, Winit 1727.

***Canthium nitidum* Craib**, Fl. Siam. Enum. ii. 141 (1932), descr. ampl. [Rubiaceae-Vanguerieae]; a *C. umbellato* Wight eiusque affiniorebus foliis minoribus, a *C. calcicolo* Craib foliis parum maioribus, floribus magis numerosis pedicellis conspicue puberulis suffultis recedit.

Arbor circa 8 m. alta (ex Kerr), inflorescentia excepta glabra; ramuli fusco-rubri vel fuscii, subgraciles, lenticellis saepissime parvis rotundatis. *Folia* elliptica vel late elliptica, apice obtuse acuminata vel caudato-acuminata, basi cuneata, ad 6.7 cm. longa et 3 cm. lata, rigide chartacea, sicca supra fusciscentia, nitida, subtus viridia, interdum fusciscentia, costa supra conspicua vel subprominula subtus prominente, nervis lateralibus utrinque 4-6 obliquis supra subprominulis subtus prominulis intra marginem anastomosantibus, nervulis rete laxum pagina utraque subprominulum efficientibus, petiolo ad 5 mm. longo suffulta; stipulae subulato-acuminatae, diu persistentes, circa 3 mm. longae. *Cymae* axillares, umbelliformes, pedunculo communi ad 2 mm. longo apice parvi-bracteato suffultae, floribus ad 10 pedicellis circa 5 mm. longis puberulis sicco fuscis suffultis. *Receptaculum* sicco fuscum, sparse puberulum, circa 1 mm. longum. *Calycis* segmenta saepissime deltoidea, circa 0.75 mm. longa. *Corollae* tubus 2 mm. longus, extra glaber, intra apice villosus, lobi 5, tubo paululo longiores, circa 1 mm. lati. *Stamina* ad corollae tubi apicem posita, filamentis antheris subaequilongis 1 mm. longis glabris. *Stylus* stigmatem 0.5 mm. longo incluso 6 mm. longus, glaber.

Surat, Kaw Prap, 10 m., evergreen forest, Kerr 12,521.

***Canthium quadratum* Craib**, Fl. Siam. Enum. ii. 142 (1932), descr. ampl. [Rubiaceae-Vanguerieae]; a *C. aciculato* Ridl. foliis minoribus, floribus maioribus, pedicellis et receptaculis glabris vel subglabris recedit.

Ramuli graciles, primo sparse breviter adpresse hirsuti, mox glabri, cortice rubro-brunneo obtecti, longitudinaliter striati, lenticellis inconspicuis, spinis axillaribus rectis ad 1.5 cm. longis armati. *Folia* oblonga vel oblongo-lanceolata, apice longius obtuse acuminata, basi rotundata, cordatula, 2-4.5 cm. longa, 1-2 cm. lata, rigide chartacea, sicco viridia, subtus pallidiora, pagina superiore ad costam setulosa, aliter setulis sparsis plus minusve deciduis instructa, inferiore ad costam nervosque laterales setulosa, in nervorum axillis hirsuta, et aliter setulis sparsis instructa, costa supra prominula subtus prominente, nervis lateralibus utrinque 4-5 supra conspicuis subtus prominulis, nervulis rete gracile sub oculo armato pagina

utraque conspicuum formantibus, margine pauperius setuloso-ciliata, petiolo 1-2 mm. longo suffulta; stipulae deciduae. *Flores* pauci, ramulis axillaribus abbreviatis gesti, solitarii, pedicellis glabris vel subglabris 5 mm. longis circa 1.5 mm. supra basem bracteolis in cupulam connatis 0.5 mm. longis instructis suffulti; alabastra apice rotundata, glabra. *Receptaculum* vix 1 mm. longum, glabrum. *Calycis* tubus receptaculo paululo brevior, apice subdenticulatus. *Corollae* tubus 2.5 mm. longus, apice 2.5 mm. diametro, extra glaber, intra pilis deflexis apice affixis dense sericeus, lobi 5, oblongo-lineares, 4 mm. longi, basi 1.75 mm. lati. *Stamina* reflexa, filamentis circa 1 mm. longis ad corollae tubi apicem positae glabris, antheris 2 mm. longis, connectivo apice in processum quadratum producto. *Stylus* 5 mm. longus, inferne incrassatus et breviter subhirsutus; stigma 1 mm. longum, apice 2 mm. diametro, concavum, longitudinaliter costatum.

Ranawng, Kao Pawta Chongdong, 700 m., scrubby evergreen, Kerr 16,760.

***Canthium sarmentosum* Craib**, Fl. Siam. Enum. ii. 143 (1932), descr. ampl. [Rubiaceae-Vanguerieae]; a *C. parvifolio* Roxb. floribus distincte pedicellatis inter alia recedit.

Frutex circa 1.5 m. altus (an etiam scandens?)—ex Kerr; ramuli graciles, primo dense adpresse ferrugineo-hirsuti, mox glabrescentes, cortice rubro-brunneo obtecti, lenticellis inconspicuis. *Folia* ovato-lanceolata, apice angustata vel subacuminata, obtusa, basi late cuneata vel rotundato-cuneata, 1.5-2.7 cm. longa, 0.7-1.5 cm. lata, rigide chartacea, sicca saepe lutescentia, supra ad costam breviter ferrugineo-hirsuta, aliter sparse ferrugineo-hirsuta, subtus ad costam subdense ferrugineo-hirsuta, aliter sparse ferrugineo-hirsuta, costa supra impressa subtus prominente, nervis lateralibus utrinque 3-4 supra impressis subtus prominulis, margine demum parum revoluta, densius hirsuto-ciliata, petiolo circa 2 mm. longo dense adpresse ferrugineo-hirsuto suffulta; stipulae breves, deciduae. *Flores* luteo-albi (ex Kerr), axillares, gemini vel solitarii, pedicellis usque ad 5 mm. longis glabris vel subglabris apicem versus bracteolis duabus parvis dorso apicem versus pauci-pilosis instructis suffulti. *Receptaculum* 0.75 mm. longum, fere glabrum. *Calycis* tubus receptaculo brevior, dentes parvae, ciliatae. *Corollae* tubus 1.75 mm. longus, extra glaber, intra longe sericeus, lobi 4, subovati, acuminati, circa 2 mm. longi, dorso apicem versus pilis paucis brevibus instructi. *Stamina* 4, ad corollae tubi apicem posita, antheris circa 0.6 mm. longis. *Stylus* 1.75 mm. longus, inferne breviter hirsutus. *Fructus* subglobosus, 8-9 mm. diametro.

Pattani, Betong, 200 m., scrub, Kerr 7638.

***Canthium stellulatum* Craib**, Fl. Siam. Enum. ii. 143 (1932), descr. ampl. [Rubiaceae-Vanguerieae]; a *C. tavoyano* (Parker) floribus conspicue minoribus distinguendum.

Frutex circa 2 m. altus (ex *Kerr*) ; ramuli graciles, primo sparse adpresse hirsuti, mox glabri, cortice brunneo vel fusco-brunneo obtecti, lenticellis parvis subconspicuis, spinis axillaribus rectis ad 1.7 cm. longis armati. *Folia* saepissime oblongo-elliptica lateve elliptica, rarius ovato-lanceolata vel elliptico-obovata, apice obtuse acuminata, basi cuneata lateve cuneata, 2.5-6 cm. longa, 0.8-2.4 cm. lata, membranaceo-chartacea, supra viridia vel plus minusve fusciscentia, subtus pallidiora, supra ad costam subsparse setuloso-hirsuta, aliter setis paucis instructa, subtus ad costam nervosque laterales subsparse hirsuta, aliter sparse hirsuta, costa supra prominula subtus conspicua, nervis lateralibus utrinque 4-6 pagina utraque conspicuis, nervulis rete laxum efficientibus, margine hirsuto-ciliata, petiolo 2-3 mm. longo adpresse hirsuto suffulta; stipulae longe acuminatae, 3 mm. longae, dorso adpresse hirsutae, deciduae. *Pedunculi* e ramulis abbreviatis axillaribus orti, breves vel ad 4 mm. longi, flores solitarios vel saepissime geminos gerentes, apice parvi-bracteati; pedicelli ad 13 mm. longi, graciles, glabri; alabastra ambitu oblonga, acuminata, corollae lobis paulo ante anthesin apice stellatim divergentibus. *Receptaculum* circa 0.75 mm. longum, glabrum, sicco fuscum. *Calyx* 1 mm. longus, glaber, lobis 4 deltoideis acutis vel apiculatis dorso carinatis. *Corollae* tubus 4 mm. longus, extra glaber, intra pilis deflexis apice insertis dense sericeus, lobi 4, mox arcte reflexi, tubo paulo breviores, basi fere 2 mm. lati, glabri. *Stamina* reflexa, filamentis circa 0.75 mm. longis. *Stylus* exsertus, 6 mm. longus, basi apiceque exceptis pilis oblique erectis instructus; stigmata duo, 0.75 mm. longa.

Patalung, Ban Kram, 100 m., scrub, *Kerr* 15,299.

***Canthium strigosum* Craib**, Fl. Siam. Enum. ii. 143 (1932), descr. ampl. [Rubiaceae-Vanguerieae]; a speciebus aliis ramulis strigosis, foliis breviter petiolatis basi rotundatis cordatulis, corollae tubo conspicue inflato recedit.

Frutex circa 2 m. altus (ex *Kerr*) ; ramuli inventute strigosi, mox glabri, cortice fusco-rubro obtecti, lenticellis parvis rotundatis vel oblongis conspicuis, spinis axillaribus rectis vel subrectis ad 1 cm. longis armati. *Folia* oblonga, oblongo-ovata, ovatave, apice acute vel subacute acuminata, basi rotundata, cordatula, 6-9.5 cm. longa, 2.5-3.4 cm. lata, chartacea, sicca viridia, subtus pallidiora, pagina utraque sparse sed praesertim ad costam et inferiore etiam ad nervos strigosa, costa supra conspicua vel prominula subtus prominente, nervis lateralibus utrinque 6-7 supra conspicuis subtus prominulis, nervulis paucis pagina utraque subconspicuis, margine strigoso-ciliata, petiolo 2-3 mm. longo strigoso suffulta; stipulae deciduae, 3-4 mm. longae, acuminatae, dorso strigosae. *Cymae* axillares, circa 9-florae, petiolo dimidio longiores, pedunculo communi brevi suffultae; pedicelli circa 1 mm. longi, sparse adpresse hirsuti; alabastra medio constricta, basi inflata, apice rotundata, brevissime obtuse acuminata. *Receptaculum* 1 mm. longum, sparse adpresse hirsutum, sicco fuscum. *Calyx* receptaculo brevior; segmenta

inter se inaequalia, deltoidea, acuta, ciliolata. *Corolla* extra glabra; tubus inflatus, circa 1.5 mm. longus et 3 mm. diametro, intra pilis deflexis apice affixis dense sericeus; lobi 5, circa 2.5 mm. longi et 1.5 mm. lati. *Stamina* 5, ad corollae tubi apicem affixa, filamentis brevibus, antheris 1.5 mm. longis. *Stylus* cum stigmate circa 0.75 mm. longo 2.5 mm. longus, basi incrassatus et pilis brevibus oblique erectis instructus.

Trang, Kao Sung, 900 m., evergreen forest, *Kerr* 15,268.

***Canthium strychnoides* Craib**, Fl. Siam. Enum. ii. 144 (1932), descr. ampl. [Rubiaceae-Vanguerieae]; inter species armatas foliis maioribus ob corticem pallidum, nervos laterales paucos, calycem pro rata elongato-tubulosum distinguendum.

Ramuli primo crispatis puberuli, mox glabri, cortice cinereo vel stramineo-cinereo obtecti, lenticellis haud conspicuis, spinis axillaribus rectis 7-15 mm. longis sparse armati. *Folia* oblongo-elliptica, elliptica, vel elliptico-lanceolata, rarius subovata, apice obtuse acuminata, basi cuneata, acuminata, vel rarius rotundata, 6-10 cm. longa, 2.5-4.7 cm. lata, chartacea, vel rigide chartacea, sicca viridia vel iuniora fusciscentia, ad nervorum axillas pagina inferiore breviter barbata, aliter glabra, costa supra impressa subtus prominente, nervis lateralibus utrinque 4-6 supra conspicuis vel leviter impressis subtus subprominentibus bene intra marginem anastomosantibus, nervulis obscuris, petiolo usque ad 12 mm. longo glabro supra canaliculato suffulta; stipulae deciduae. *Flores* ramulis abbreviatis axillaribus gesti, solitarii vel gemini, pedicellis circa 5 mm. longis glabris sub apicem bracteolis in cupulam connatis instructis suffulti; alabastra acuminata, medio paulo constricta; flores sublutei (ex *Kiah*). *Receptaculum* vix 2 mm. longum, glabrum. *Calyx* tubulosus, 5-6 mm. longus, apice subtruncatus vel irregulariter parvi-denticulatus, glaber. *Corollae* tubus 7 mm. longus, circa 4 mm. diametro, extra glaber, intra pilis infra apicem affixis deflexis fere ad tubi medium attingentibus dense instructus, lobi 5, crassi, 6 mm. longi, 3 mm. lati, glabri. *Filamenta* circa 1.5 mm. longa, glabra, antheris 4 mm. longis, connectivo apice deltoideo-producto. *Stylus* 9 mm. longus, superne glaber, inferne pilis oblique erectis breviter hirsutus, stigmate mox bilobulato paululo ultra 2 mm. longo.

Bachaw, *Kiah*, 24,305.

***Canthium subaureum* Craib**, Fl. Siam. Enum. ii. 144 (1932), descr. ampl. [Rubiaceae-Vanguerieae]; a *C. parvifolio* Roxb. foliis sicco luteo-viridibus supra glabris inter alia recedit.

Frutex circa 3 m. altus (ex *Kerr*) ; ramuli primo adpresse ferrugineo-pubescentes, longitudinaliter plus minusve costati, mox plus minusve glabrescentes, cortice brunneo obtecti, lenticellis haud conspicuis, spinis axillaribus rectis ad 1.8 cm. longis armati. *Folia* saepissime elliptica vel oblongo-ovata, apice obtusa rotundatave, basi rotundata, 1.5-2.6 cm. longa, 1-1.5 cm. lata, sicca parum

lutescentia, chartacea vel rigide chartacea, pagina superiore glabra, inferiore ad costam pilis rigidis subaureis sparse instructa, ad nervos laterales pilis similibus hic et illic instructa, et in nervorum axillis hirsuta, costa supra impressa subtus prominente, nervis lateralibus utrinque 3 supra impressis subtus prominulis sed marginem versus evanidis, nervulis obscuris, margine pauperius hirsuto-ciliata, petiolo circa 2 mm. longo suffulta; stipulae anguste deltoideae, 2 mm. longae, inter se liberae, deciduae. *Flores* albi (ex *Kerr*), pauci, axillares, infra spinas orti; pedicelli usque ad 1 mm. longi, glabri, apice bracteolis duabus parvis oppositis instructi. *Receptaculum* 1-2.5 mm. longum, glabrum. *Calycis* tubus receptaculo paulo brevior, denticulatus, glaber. *Corollae* tubus 2.5 mm. longus, extra glaber, intra pilis longiusculis deflexis adpressis dense tectus, lobi 5, late lanceolati, subacuti, 3.5 mm. longi, 1.5 mm. lati, mox reflexi, glabri. *Stamina* 5, ad corollae tubi apicem affixa, filamentis reflexis brevibus, antheris 1.5 mm. longis papillois. *Stylus* ad 2 mm. exsertus, inferne paulo incrassatus, puberulus, stigmate longitudinaliter costato 1 mm. longo.

Prachuap, Hui Yang, near sea-level, scrub, *Kerr* 10,733.

XLVI.—AFRICAN ORCHIDS: IV.* V. S. SUMMERHAYES.

Cynosorchis parva *Summerhayes*, sp. nov.; statura parva, racemis 1-2-floris, labelli forma, calcaris labello circiter duplo longiore valde distincta.

Herba terrestris, parva, usque 15 cm. alta. *Tubera* cylindrico-ellipsoidea, circiter 1 cm. longa. *Folia* radicalia, 3-5, late linearia vel anguste lanceolata, acuta, plus minusve recurvata, 1-2.5 cm. longa, 2-4 mm. lata. *Scapus* erectus, gracilis, apice 1-2-florus, saepissime infra medium cataphyllo singulo lanceolato acuminato instructus; bracteae lanceolatae, acuminatae, 4-8 mm. longae, ovario pedicellato multo breviores. *Flores* erecti, partim virides, partim albi; pedicellus cum ovario 1.3-2.7 cm. longus. *Sepalum* intermedium erectum, ovatum, acutum, 4-5.5 mm. longum, 2.75-4.5 mm. latum; sepala lateralalia patentia, oblique lanceolato-ovata, acuta, 5-6.5 mm. longa, 2.5-3.5 mm. lata. *Petala* lineari-ligulata, acuta, leviter incurvata, 3.5-5 mm. longa, 0.7-1 mm. lata. *Labellum* album, trilobum, ambitu obtriangulare; pars basalis indivisa 1.6-2.5 mm. longa; lobus intermedius e basi angusta ± subito dilatatus, fere flabellatus, apice obcordatus apiculo interjecto, 4-6 mm. longus, 4-5 mm. latus; lobi laterales lineari-oblongi vel ligulati, obtusi vel subacuti, basi a lobo intermedio angulo 45° divergentes, 4.5-6.5 mm. longi, 1-1.6 mm. lati; calcar dependens, cylindricum, dimidio superiore paulo inflatum, subacutum, 11-16 mm. longum. *Anthera* erecta, apice rotundata, 1.6-2.5 mm. alta, canalibus leviter incurvatis 1-1.5 mm. longis. *Stigmata* crassa, apice clavato-truncata, 1.5-1.8 mm. longa, latere superiore duobus

trientibus inferioribus rostellis lobis lateralibus adnata; rostellis lobus intermedius triangulari-dentatus, brevis vel brevissimus.

NORTHERN NIGERIA. Vom, Bauchi Plateau, 900-1350 m., *Dent Young*; plains between Hephham and Ropp, 1380 m., July 1921, *Lely* 361; Bauchi Plateau, grass plains, June 1930, *Lely* P337 (type); no exact locality, *Nelson* 9.

SOUTHERN NIGERIA. Bamenda District, Bum, in grassland among boulders, 1200 m., May and June 1931, *Maitland* 1398, 1669.

This pretty little species seems to be very distinct in its combination of characters from all other species which have been described. The Cameroons specimens are slightly smaller in most parts than the others but in essential features are identical. There are apparently no near relatives of *C. parva* in Tropical Africa, but some of the Mascarene species approach it in certain features.

Habenaria armatissima *Rehb. f.* in *Otia Bot. Hamburg.* ii. 98 (1881).—*H. eburnea* *Ridl.* in *Journ. Bot.* xv. 293 (1886). *H. Lugardii* *Rolfe* in *Dyer, Fl. Trop. Afr.* vii. 228 (1898). *H. Dinteriana* *Kraenzl.* in *Vierteljahrsschr. Nat. Ges. Zürich*, lxxiv. 106 (1929).

There seemed no valid reason, except perhaps geographical distribution, for separating *H. armatissima* and *H. Lugardii* in the Flora of Tropical Africa, and re-examination of the material shows no essential differences. Some of the differences in the descriptions, e.g. the relative lengths of the lobes of the lip, are indeed incorrect, since in both "species" the middle lobe is much shorter than the side lobes.

A flower from the type specimen of *H. Dinteriana* communicated to Kew by Dr. Dinter agrees in essential structure with those of *H. armatissima*, while the descriptions in other respects are identical.

The case of *H. eburnea* *Ridl.* is different. This species was described as possessing simple petals, and this character was accepted by Rolfe. However, the strong resemblance of the specimen to the other species cited above, and the total dissimilarity from all other species of sect. *Diphyllae* with simple petals, led me to re-examine the type specimen in the British Museum, by kind permission of the Keeper of the Department of Botany. As a result the petals were found to be bipartite and the species to agree in all respects with *H. armatissima* *Rehb. f.*

These reductions extend the distribution of the species considerably so that it now stretches from Lake Tsad and Abyssinia in the north to Hereroland, Ngamiland and the Zambesi in the south.

Habenaria (§ Bilabrellae) Dalzielii *Summerhayes*, sp. nov.; inter species sectionis sepalo intermedio obovato, petalis duobus trientibus superioribus tantum bilobis, calcaris gracili apice haud inflato 5-7 mm. longo facile distinguenda.

Herba terrestris, glabra, usque 90 cm. alta. *Tuber* globosum, 8-9 mm. diametro, glabrum. *Caulis* erectus, teres, basi radicibus numerosis glabris instructus. *Folia* circiter 8, 4 inferiora linearia, acuta, basi vaginantia, 5-27 cm. longa, 7-12 mm. lata, superiora

*Continued from *K.B.* 1932, 193.

subito decrescentia, sursum in bracteas abeuntia. *Racemus* 13-16 cm. longus, 4-5 cm. diametro, laxe multiflorus; bracteae lanceolatae, acuminatae, 7-13 mm. longae. *Flores* erecto-patentes vel adscendentes, virides, pedicello cum ovario 2-3 cm. longo. *Sepalum* intermedium obovatum, subacutum, basi cuneatum, 6-7 mm. longum, 3-4 mm. latum; sepala lateraliter oblique semi-obovata, lateraliter apiculata, 7-10 mm. longa, 4 mm. lata. *Petala* duobus tridentibus superioribus biloba; pars indivisa 2-3 mm. longa, 1.5-2 mm. lata; lobus posterior lanceolatus, acutus, 4-5 mm. longus, basi 1-2 mm. latus; lobus anterior lineari-lanceolatus vel linearis, acutus vel acutissimus, 5-6 mm. longus, basi 0.5 mm. latus. *Labellum* ex ungue angusta 1-2 mm. longa tripartitum; partitio intermedia linearis, obtusa, 8-10 mm. longa; partitiones laterales anguste lineares, intermedia angustiores, 8.5-10.5 mm. longae; calcar gracile, apice haud inflatum, leviter incurvatum, 5-7 mm. longum. *Anthera* inclinata, 3 mm. alta, canalibus porrectis apice valde incurvatis gracilibus 4-4.5 mm. longis. *Brachia stigmatifera* gracilia, apice oblique capitata, 6-7 mm. longa; ovarium 7-9 mm. longum.

SIERRE LEONE. Hill Station, Oct. 1926, *Deighton* 2173 (in part).

NORTHERN NIGERIA. Kilba country, in a swamp, single specimen, Aug. 1909, *Dalziel* 222 (Type).

A very characteristic member of sect. *Bilabrellae*, but easily distinguished by the characters given in the diagnosis, together with the obovate dorsal sepal and almost equal lobes of the lip. The pedicels often have a peculiar sharp upward bend just below the ovary. Under his no. 2173 *Deighton* also collected a specimen of the abnormal form of *H. anaphysemata* Rehb. f.

***Habenaria* (§ *Bilabrellae*) *linguiformis* Summerhayes, sp. nov.**; affinis *H. Hochstetterianae* Kraenzl. a qua foliis brevioribus, petali partitione anteriore late linearis angustiore, labelli lobo intermedio lateralibus satis longiore, antherae canalibus rectis nec apice incurvatis, staminodiis simplicibus linguiformibus differt.

Herba terrestris, erecta, ultra 30 cm. alta. *Folia* infima ad vaginas redacta, intermedia anguste lanceolata vel lineari-lanceolata, acuta, plus minusve recurvata, 4-6 cm. longa, 9-12 mm. lata, superiora in bracteas abeuntia. *Racemus* 10 cm. longus, 3 cm. diametro, laxiuscule 18-florus; bracteae anguste lanceolatae, acuminatae, 9-15 mm. longae. *Flores* erecto-patentes, partim virides, partim albi, pro sectione mediocres; pedicelli cum ovario circiter 2 cm. longi. *Sepalum* intermedium elliptico-obovatum, obtusum, concavum, 6 mm. longum, 2 mm. latum; sepala lateraliter oblique obovata, lateraliter apiculata, 7 mm. longa, 3.5 mm. lata. *Petala* bipartita; partitio posterior linearis, 5 mm. longa, papillosa; partitio anterior late linearis, dimidio superiore leviter angustata, acuta, 8 mm. longa, 0.7-0.8 mm. lata, papillosa. *Labellum* tripartitum; partitiones lineari-filiformes, intermedia 10 mm. longa, laterales 6-7 mm. longae intermedia breviores;

calcar inferne filiforme, apicem versus paulo ampliatus, plus minusve incurvatum, 18 mm. longum. *Anthera* subreclinata, 2 mm. alta, canalibus porrectis apice non incurvatis 4 mm. longis; staminodia simplicia, linguiformia, circiter 1.5 mm. longa. *Brachia stigmatifera* porrecta, apice oblique clavata, 5-6 mm. longa; rostellum lobus intermedius lineari-dentiformis, fere 1.5 mm. longus; ovarium 9-10 mm. longum.

NORTHERN NIGERIA. Plain between Bukuru and Hephram, 1290 m., July 1921, *Lely* 343A.

A typical member of the section, closely allied to *H. Hochstetteriana* Kraenzl., an East African species, but differing in a number of minor points. It was collected with *H. limnophila* Summerhayes, but not distinguished by the collector.

***Habenaria* (§ *Bilabrellae*) *Maitlandii* Summerhayes, sp. nov.**; a *H. limnophila* Summerhayes calcar dimidio superiore sensim dilatato apice clavato obtuso differt.

Herba terrestris, glabra, 25-35 cm. alta, caule erecto terete. *Folia* inferiora circiter 3, linearia, acuta, basi vaginantia, usque 10 cm. longa, 10-14 mm. lata, superiora 3-4, lanceolata, acuminata, sursum decrescentia in bracteas abeuntia. *Racemus* laxiuscule 10-15-florus, 7-11 cm. longus, 3-4 cm. diametro; bracteae lanceolatae, acuminatae, 1-2 cm. longae. *Flores* suberecti, albi, pedicello cum ovario 2-2.5 cm. longo. *Sepalum* intermedium ellipticum, subacutum, 5-6 mm. longum, 3 mm. latum, reflexum; sepala lateraliter oblique obovata, lateraliter apiculata, 7-8 mm. longa, 4-5 mm. lata, reflexa. *Petala* bipartita, papillosa; partitio posterior linearis, 5-6 mm. longa; partitio anterior e basi angustiore linearis-lanceolata, apice sensim angustata, 8-9 mm. longa, 1-2 mm. lata. *Labellum* ex ungue fere 2 mm. longa tripartitum; partitio intermedia linearis, acuta, 10 mm. longa, circiter 0.75 mm. lata; partitiones laterales anguste lineares, 7-8 mm. longae, 0.4 mm. latae; calcar dependens, 10-11 mm. longum, dimidio superiore sensim dilatatum, apice clavatum, obtusum. *Anthera* erecta, 2-3 mm. alta, canalibus gracilibus 4-5 mm. longis; staminodia biloba, fere 1 mm. longa. *Brachia stigmatifera* gracilia, apice capitata, 4-5 mm. longa; rostellum lobus intermedius triangulari-subulatus, acutissimus, 1.75 mm. longus; ovarium 8-9 mm. longum.

SOUTHERN NIGERIA. Bamenda District, Uchan, on mountain slope among grass, 1680 m., June 1931, *Maitland* 1386.

Another typical species of sect. *Bilabrellae*, very similar to *H. limnophila* Summerhayes but differing in its rather less stiff growth and particularly in the shape of the spur. There are also other slight floral differences which are not easily expressed in words.

***Habenaria* (§ *Bilabrellae*) *pauper* Summerhayes, sp. nov.**; inter species sectionis floribus parvis, petali partitione posteriore quam anterior brevior et latior, labelli lobo intermedio lateralibus fere duplo longiore distincta.

Herba terrestris, gracilis, glabra, circiter 30 cm. alta. *Caulis* erectus, teres, dimidio inferiore paucifolius, dimidio superiore foliis pluribus bracteiformibus instructus. *Folia* 3, linearia, acuta, basi vaginantia, 4-8 cm. longa, 3-7 mm. lata. *Racemus* 4 cm. longus, 1 cm. diametro; bractae lanceolatae, acuminatae, 5-7 mm. longae. *Flores* suberecti, albi; pedicelli cum ovario 6-8 mm. longi. *Sepalum* intermedium elliptico-ovatum, 3 mm. longum, 1.5-2 mm. latum; sepala lateraliter oblique obovata, latere posteriore fere recta, lateraliter apiculata, 3 mm. longa, 2.5 mm. lata. *Petala* bipartita; partitio posterior linearis, 2.7 mm. longa; partitio anterior lanceolata-ligulata, acuta, margine anteriore sub apice dente parvo instructa, 2.5 mm. longa, 0.7-0.8 mm. lata. *Labellum* ex ungue 0.5 mm. longa tripartitum; lobus intermedius linearis, 5-5.5 mm. longus, 0.3 mm. latus; lobi laterales lineari-filiformes, 3 mm. longi; calcar dependens, dimidio superiore sensim inflatum, obtusum, 6 mm. longum. *Anthera* erecta, 1.5 mm. alta, canalibus gracilibus leviter incurvatis 2.5 mm. longis. *Brachia stigmatifera* crassiuscula, apice capitatum incrassata, 2.5 mm. longa; rostellum lobus intermedius e basi anguste triangulari subulatus, acutus, 1 mm. longus; ovarium 6-costatum, 4.5 mm. longum.

SOUTHERN NIGERIA. Bamenda Station, among stones and boulders in grassland, 1500 m., May 1931, Mailland 1562.

The species, which is unfortunately represented by a single specimen, has flowers which conform to the normal type in sect. *Bilabrellae*, excepting that the dorsal sepal is not reflexed, but which are much smaller than most others I have seen of this type. *H. dives* Rehb. f. and its relatives, which have almost equally small flowers, form, however, a distinct and rather anomalous group within the section.

Habenaria (§ Plantagineae) prionocraspedon Summerhayes, sp. nov.; *H. Englerianae* Kraenzl. affinis, a qua floribus minoribus, labelli lobis lateralibus semi-ovatis, calcar 5-6 cm. longo facile distinguenda.

Herba terrestris, erecta, ultra 35 cm. alta, basi non visa. *Caulis* teres, e basi fere usque inflorescentiam foliatus. *Folia* 5, elliptico-vel oblongo-lanceolata, acuta, apice ipso breviter setaceo-acuminata, basi vaginantia, 12-18 cm. longa, 3.5-5.5 cm. lata. *Racemus* 13 cm. longus, 10 cm. diametro, dense multiflorus; bractae inferiores foliosae, ceterae minores, lanceolatae, acuminatae, pedicello cum ovario saepius breviores. *Flores* subpatentes, ut videtur albi. *Sepalum* intermedium late lanceolatum, acutum, concavum, erectum, 16-17 mm. longum, 6 mm. latum; sepala lateraliter deflexa, oblique semi-ovata, falcatis acuminata, 18 mm. longa, 7 mm. lata. *Petala* simplicia, lineari-lanceolata, leviter recurvata, acuta, 16 mm. longa, 3 mm. lata. *Labellum* ex ungue cuneata trilobatum, in toto 3 cm. longum, 2.5 cm. latum; lobus intermedius ligulatus, subacutus, 15 mm. longus, 3 mm. latus; lobi laterales late semi-ovati ex intermedio leviter divergentes, basi integri, superne serrato-pectinati,

16 mm. longi, infra medium 11 mm. lati; calcar inferne gracile, dimidio superiore sensum inflatum, clavatum, apice obtusum, satis incurvatum, 5-6 cm. longum. *Anthera* erecta, 5-6 mm. alta, canalibus crassiusculis leviter incurvatis 2.5 mm. longis; staminodia parva, rotundata, 1 mm. longa et lata. *Brachia stigmatifera* clavata, obtusa, apice connata, circiter 7 mm. longa; rostellum lobus intermedius anguste triangularis, acutissimus, leviter concavus, 2.5 mm. longus.

SOUTHERN NIGERIA. Ogoja District, Boshi, 1050 m., Rosevear 61/29.

This beautiful species, which is closely allied to *H. Engleriana* Kraenzl., finds its nearest relatives otherwise in India where sect. *Plantagineae* is well represented. Unlike sect. *Multipartitae*, which has a similar distribution, there are no representatives of the former section as yet known from East Africa. The Indian species of sect. *Plantagineae*, however, either have strikingly different flowers or else the leaf arrangement is quite different. The usual type consists of a group of large leaves near the base of the stem and a number of reduced bract-like leaves in the upper half. In the two West African species the true foliage leaves occur up the stem to the base of the inflorescence.

Satyrion (§ Eusatyrion) fimbriatum Summerhayes, sp. nov.; affine *S. membranaceo* Sw. et *S. Principi* Bolus, ab illo rostellum lobo intermedio triangulari acuto nec ampliatus semiorbiculatus, ab hoc statura foliis floribusque minoribus, florum colore, stigmate integro differt.

Herba terrestris usque 40 cm. alta; tubera ovoidea, circiter 1 cm. longa. *Folia* 2, radicalia, humistrata, ovata vel suborbiculata, subacuta vel obtusa, 3-7 cm. longa, 2.5-6 cm. lata, ut videtur subcarnosa. *Scapus* erectus, teres, glaber, vaginis 3-5 lanceolatis acuminatis membranaceis subdistantibus instructus. *Racemus* cylindricus, 6-10 cm. longus, circiter 2.5 cm. diametro, subdense 5-16-florus; bractae lanceolatae vel elliptico-lanceolatae, acutae vel acuminatae, ovarium pedicellatum superantes, sub anthesi dimidio superiore recurvatae. *Sepalum* intermedium ligulato-oblancheolatum, obtusum, 8-10 mm. longum, 2-2.5 mm. latum; sepala lateraliter curvatim oblongo-lanceolata, subacuta, 8-11.5 mm. longa, 2.5-3 mm. lata; omnia sepala cum petalis basi adnata. *Petala* elliptico-oblancheolata, subacuta, superne marginibus lacerato-fimbriatis, 8-10.5 mm. longa, 2.5-3.5 mm. lata. *Labellum* late ellipsoideum, leviter cucullatum, in toto 9.5-12 mm. longum, inferne 6-7 mm. latum, in apicem suborbicularem ± reflexum marginibus lacerato-fimbriatis 3.5-4 mm. longum productum; calcaria gracilia, ovario ± adpressa, cylindrica, circiter 3 cm. longa. *Columna* incurvata, 3-5 mm. longa; labium stigmatiferum transverse oblongo-ellipticum, 1.5-2 mm. altum, 3-4 mm. latum; rostellum basi quadratum, lobis lateralibus brevissimis dentiformibus, lobo

intermedio triangulari acuto, totum rostellum 1.5-2 mm. longum, basi 1.25-2 mm. latum.

KENYA COLONY. Kinangop Plateau, Aberdare Mts., lower slopes of Kipipiri, in open grassland close to forest edge, 2490 m., *Honoré* 1877 (type); Tinderet, Mrs. Mainwaring 1287.

Flowers rose coloured or pale pink, scentless.

A remarkable species whose nearest relatives are the two South African species mentioned in the diagnosis. The most striking feature is the lacerate or fimbriate margins of the petals and of the apex of the lip. The occurrence of a new species of this affinity so remote geographically from the two older species is particularly interesting, especially as neither of the southern species occurs in Natal or the Transvaal.

XLVII.—THE GENUS STROBILANTHOPSIS.

E. MILNE-REDHEAD.

The genus *Strobilanthis* was founded in 1900 by Spencer Moore on a specimen collected by Rand at Fort Gibbs in Southern Rhodesia, and named *S. hircina*. The genus remained monotypic until 1911, when Moore transferred to it the Angolan plant, *Hygrophila glutinifolia* Lindau, and two years later he described yet a third species, *Strobilanthis Rogersii*, from the Belgian Congo.

Moore apparently was very doubtful whether Rand's specimen deserved generic distinction, and proposed the new genus *Strobilanthis* somewhat unwillingly. Further material, however, has shown that he was undoubtedly correct in referring it to a new genus. *Strobilanthis* seems to be most closely related to the genera *Mellera* and *Dyschoriste*, and forms, as Moore suggested, a connecting link between the subtribes *Euruellieae* and *Strobilantheae* as understood by Clarke, to which these two genera respectively belong. It agrees with *Mellera* in its glandular calyx, with long strap-shaped segments, in its pollen, and in its unpleasant goat-like scent, but is readily separable on account of its subsessile leaves, its almost regular corollas with upright subequal lobes, and its usually two-seeded capsule. *Mellera* has markedly petioled leaves, strongly zygomorphic corollas, and capsules with more than four seeds. *Strobilanthis* differs from *Dyschoriste* in its calyx and its two-seeded capsule.

Volume v. part 1 of The Flora of Tropical Africa, published in 1899, contains the description of *Dyschoriste linifolia*, a species founded by C. B. Clarke on a specimen in the Hooker Herbarium at Kew which was collected by Sir John Kirk in the Highlands of the Batoka Country (Northern Rhodesia) between July and October 1860, and to which T. Anderson gave the manuscript name, *Calophanes linifolius*. Clarke adopted Anderson's manuscript epithet, *linifolius*, for this species, and referred it to the genus *Dyschoriste* Nees (1832), which just antedates the genus *Calophanes* Don (1833).

In his description of *Dyschoriste linifolia*, Clarke states that the calyx is divided two-thirds of the way down, and a drawing made by that author on the type sheet shows three of the segments two-thirds, and two slightly less than half, the total length of the calyx. An examination of the type material reveals that the calyx-segments are free almost to the base; the calyx is about 18 mm. long, while the segments are about 16.5 mm. long, giving a length of about 1.5 mm. for the calyx-tube.

The linear strap-shaped lobes, very short tube and densely glandular indumentum of the calyx, and the almost regular corolla, together with the peculiar goat-like smell which is noticeable when the inflorescence is boiled, at once place the plant in the genus *Strobilanthis* S. Moore.

It appears that Moore overlooked *Dyschoriste linifolia* when he founded the genus *Strobilanthis*, and a comparison of *S. hircina* with *S. linifolia* reveals the rather greater development of the lateral shoots in Kirk's specimen to be the chief point of difference. The writer does not consider that this and other minor differences justify the specific separation of *S. hircina* from *S. linifolia*.

Strobilanthis linifolia shows great variation in the size of its calyx and corolla; the flowers of specimens gathered in the same collecting may be far from uniform in this respect, whilst those from different localities often vary to a still greater degree. The leaves of this species fall into three classes, namely, those of the primary, secondary and tertiary shoots, and the appearance of the specimens is greatly influenced by the presence or absence of the secondary or of the primary and secondary leaves. The primary leaves are rather large, sometimes as much as 7 cm. long, and are evidently developed during the wet season. The secondary leaves are similar to those of the primary shoots, but are considerably smaller. Whilst the primary leaves have usually fallen by the beginning of the dry season, the secondary leaves are frequently persistent during the flowering period. The small leaves of the short tertiary flowering shoots may be either folded or expanded, and this character again greatly influences the general appearance of the specimens. Specimens may be found which appear to differ widely from each other, but, after a careful examination of all the material in the Herbaria at Kew and at the British Museum, the writer cannot find any satisfactory reasons for believing that more than one species is represented by the material here cited, and accordingly *S. glutinifolia* and *S. Rogersii* should be considered as being conspecific with *S. linifolia*.

The description of a new species, *S. prostrata*, very close to, but apparently distinct from, *S. linifolia*, is appended.

The genus *Strobilanthis* appears to be endemic in the south tropical African plateau, having been recorded from the Katanga province of the Belgian Congo, from Angola, from both Northern and Southern Rhodesia and from Nyasaland. *S. linifolia*, grows in the savannah country, often in stony places and on kopjes, but it is also to

be found growing in the dry loamy or sometimes sandy soils of the *Brachystegia* or *Cryptosepalum* woodlands, where it is one of the last herbs to continue in flower after the end of the rains. *S. prostrata* is known only from the Kalahari sand area of the Mwinilunga District of Northern Rhodesia, where the writer found it growing in rather loose dry sand in open spaces in the *Cryptosepalum* woodland.

1. *Strobilanthisopsis linifolia* (T. Anders. ex C. B. Cl.) Milne-Redhead, comb. nov. — *Calophanes linifolius* T. Anders. ms. in Herb. Kew., et ex C. B. Cl. in Fl. Trop. Afr. v. 76 (1899), pro syn. *Dyschoriste linifolia* (T. Anders. ex C. B. Cl.) C. B. Cl. in Fl. Trop. Afr. v. 76 (1899). *Strobilanthisopsis hircina* S. Moore in Journ. Bot. xxxviii, 202 (1900); Fl. Trop. Afr. v. 511 (1900); Engl. u. Prantl, Pflanzenfam. Nachtr. iii, 322 (1908). *Hygrophila glutinifolia* Lindau in Warb. Kunene-Sambesi Exped. 374 (1903). *Strobilanthisopsis glutinifolia* (Lindau) S. Moore in Journ. Bot. xlix, 296 (1911); S. Moore in Journ. Bot. li, 213 (1913). *Strobilanthisopsis Rogersii* S. Moore in Journ. Bot. li, 188 (1913).

NORTHERN RHODESIA. Highlands of Batoka Country, without precise locality, July Oct. 1860, Kirk s.n. (typus *S. linifoliae* in Herb. Kew.). N'dola District: N'dola, Oct. 1906, Allen 318: "bushy herb growing in loamy soil"; on sand at 1500 m. altitude at Bwana M'Kubwa, July 1909, Rogers 8368. Broken Hill District: in stony places in *Brachystegia* wood, at 1260 m. altitude, 45 Km. south-west of Broken Hill, 13 July 1930, Hutchinson & Gillett 3609: "herb with strong rank smell; flowers mauve"; between Lusaka and Broken Hill, 13 July 1930, Pole Evans 2850. Mpika District: common on kopjes at 1700 m. altitude 51 Km. north-east of Serenge Corner, 25 July 1930, Hutchinson & Gillett 4077: "plant 6 dm. high, flowers pale mauve." Fort Rosebery District: in dry semi-cultivated soil near villages by Lake Bangweolo, at 900 m. altitude, May 1924, Jelf 3 (Herb. Mus. Brit.): "shrubby plant 0.9 m. high with slight scent; flowers pale yellow." Mumbwa District: Chinenga, June July 1911, Mrs. Macaulay 833: "flowers blue." Mwinilunga District: on sand in *Cryptosepalum* woodland near R. Wamibobo, 6 Aug. 1930, Milne-Redhead 841: "perennial herb with very aromatic unpleasant scent; calyx very glandular; flowers lilac with orange throat and honey-guide."

SOUTHERN RHODESIA. Fort Gibbs, Sept. 1898, Rand 640 (typus *S. hircinae* in Herb. Mus. Brit.): "the plant has a rank disagreeable odour." Senoia, among rocks, Sept. 1926, Rand 254 (Herb. Mus. Brit.): "small undershrub covered with glandular hairs and with a rank odour; flowers purple."

NYASALAND. Narawitawa (or Namwitawa) Mountain at 1600–2000 m. altitude, Sept. 1902, McClunie 77: "plant rarely over 3 dm. high."

ANGOLA. In sandy places under trees between R. Longa and R. Lazingua, at 1350 m. altitude, 18 April 1900, Baum 830 (typus *S. glutinifoliae*). In mixed woods in company with *Plectranthus*

dus N.E. Br. and *Dicoma elegans* Welw. in rocky situations on Mt. Amaral, Cunene, 2 Aug. 1905, Gossweiler 1835 (Herb. Mus. Brit.): "a suffruticose herb 6 dm. high; primary stems erect, branched, sparsely leafy; corolla tube brownish, rim violet-coloured." Common in herb grown short thickets at Kassuango, Kuiriri, 10 April 1906, Gossweiler 2979 (Herb. Mus. Brit.): "a suffruticose densely branched undershrub of greyish green coloration; branches ascending, rigid; leaves thick, sub-fleshy, glandular hairy, with a goatly odour; flowers ascending, campanulate; tube brownish, blue on outside; limb pale bluish with five equal lobes."

BELGIAN CONGO. Near Sakania, 1200 m. altitude, 18 Aug. 1911, Rogers 10021. Kamatanda, about 120 Km. north of Elisabethville, Oct. 1912, Rogers 10329 (typus *S. Rogersii* in Herb. Mus. Brit.). Elisabethville, at 1200 m. altitude, Rogers 26255 (Herb. Mus. Brit.): "viscid and aromatic plant growing up to 1.8 m. high." Elisabethville, 27 May 1912, Bequaert 463 (Herb. Brux.).

2. *Strobilanthisopsis prostrata* Milne-Redhead, sp. nov.; a *S. linifolia* (T. Anders. ex C. B. Cl.) Milne-Redhead, habitu prostrato, foliis glabris differt.

Herba perennis; caules e caudice centrali undique humistrati, 6–7 dm. longi, valde ramosi, basin versus lignosi, apicem versus glanduloso-pubescentes. *Folia* caulium principalium delapsa; folia ramorum axillarium oblongo-oblancoolata, apice subacuta, basi attenuata, sessilia, utrinque glabra, 2.5 cm. longa, vix 5 mm. lata. *Inflorescentiae* axillares, 1–3-flores; bracteae lineares, circiter 8 mm. longae, dense glanduloso-hirsutae. *Calyx* fere usque ad basin 5-partitus, 16–21 mm. longus, tubo 1.5 mm. longo inclusio; segmenta subaequalia, linearia, vix 1 mm. lata, apice rotundata, dense glanduloso-hirsuta. *Corolla* lilacina 30 mm. longa, extra breviter glanduloso-pubescent; tubus 22 mm. longus, parte inferiore cylindrica 10 mm. longa, 2 mm. diametro, parte superiore aliquanto expansa, fauce aurantiaca valde venoso-palatifera; lobi 5, subaequales, obovato-oblongi, apice plus minusve emarginati, 8 mm. longi, 5–6 mm. lati. *Stamina* 4; filamenta parte inferiore per paria lateralalia (posticum cum antico) ope membranae angustissimae 16 mm. connata et tubo corollae 16 mm. inde a basi adnata (i.e. parte connata libera nulla), parte superiore libera, illa filamentum postici circiter 5 mm. longa, antici circiter 6 mm. longa; antherae 2.5 mm. longae, basi mucronatae. *Ovarium* 4-ovulatum, oblongum, 3 mm. altum, apicem versus breviter et parce glanduloso- et eglanduloso-pubescent; discus breviter cupuliformis. *Capsula* 2-sperma, oblonga, aliquanto compressa, apice acuminata, basi attenuata, 15 mm. longa, supra breviter glanduloso-pubescent.

NORTHERN RHODESIA. Mwinilunga District: on sand in *Cryptosepalum* woodland a few kilometres south of Mwinilunga, 26 Aug. 1930, Milne-Redhead 971 (typus in Herb. Kew.). Prostrate perennial with branches radiating from central rootstock; leaves glabrous; inflorescence glandular with goatly smell; flowers lilac with orange throat.

XLVIII.—PLANTS NEW TO ASSAM : V.* C. E. C. FISCHER.

***Sorbus expansa* Koehne** [Pomaceae].

Known from China.

Delei Valley, Chibao, 6000 ft., *Kingdon Ward* 8077. "A shrub or small tree of the mixed forest, chiefly in open situations along the ridge."

***Sorbus Wenzigiana* Koehne** [Pomaceae].

Hitherto known from China.

Delei Valley, 12,000–13,000 ft., fls. June, *Kingdon Ward* 8384. "Scrubby shrub with black bark and knobby stems rising a little above the scrub *Rhododendrons*. Fls. reddish-crimson."

***Potentilla microphylla* Don** [Rosaceae].

Described from Garhwal to Sikkim.

Delei Valley, Kaso, 4000 ft., fls. July, *Kingdon Ward* 8407. "Forms flat cushions on the sodden alpine turf slopes where there is still plenty of snow. Fls. buttercup-yellow."

***Potentilla monanthes* Lindl. var. *sibthorpioides* Hook. f.** [Rosaceae].

Reported only from Sikkim.

Delei Valley, Kaso, 13,000 ft., fls. July, *Kingdon Ward* 8426. "A flat rosette-plant on alpine slopes among patches of dwarf Juniper. Fls. bright-yellow."

***Rubus pectinarius* Focke** [Rubiaceae].

Known from China.

Delei Valley, 10,000–11,000 ft. Fls. Aug., *Kingdon Ward* 8601. "Creeping plant with erect flowering shoots, forming a loose carpet on open slopes in the *Rhododendron-Abies* forest. Fls. dark-pink."

***Chasalia lushaiensis* C. E. C. Fischer** [Rubiaceae].

This species, originally described from specimens from the Lushai Hills, has been found by the same collector in fruit in the Garo Hills.

Tura Mountain, 4000 ft., fr. Oct., *Mrs. N. E. Parry* 790, 792.

Fruit subglobose or more or less didymous and then wider in one direction than long, 6–7 mm. long, up to 9 mm. wide, smooth, black. Seeds hemispheric, inner face deeply concave. Lushai name: *Ampangthum*.

***Paederia Cruddasiana* Prain** [Rubiaceae].

Found in the Kachin Hills.

Garo Hills, Tura, 1300 ft., fls. and fr. Oct., *Mrs. N. E. Parry* 742. "Flowers dull blueish-white, deep reddish-mauve within the tube." Garo name: *Pasin*.

The plant is described as quite glabrous except the corolla, but the syntype specimens at Kew have the upper part of the rhachis of the inflorescence and its divisions minutely puberulous and the bract.

*Continued from *K.B.* 1932, 203.

ciliate. In the Garo Hills specimens the indumentum is sometimes denser.

***Colquhounia Seguini* Van.** [Labiatae].

From W. China.

S. Lushai Hills, near Lungleh, 4000 ft., fl. and fr. Feb., *W. J. L. Wenger* 436. "A straggling bush in moderately thick forest. Fl. dull-red."

This specimen seems to be half-way between the typical form and var. *pilosa* Rehd., being more pilose than the former but less densely so than the latter.

***Molineria oligantha* C. E. C. Fischer**, sp. nov. [Amaryllidaceae]; *M. Finlaysonianae* Baker similis, scapis 2–3-floris, bracteis floribusque multo majoribus differt.

A herb; root fibrous; base of stem thickened by the persistent widened bases of the leaf-petioles. Leaves several, narrowly elliptic-lanceolate, acuminate at both ends, plicate, 16–30 cm. long, 1.7–3.8 cm. wide, glabrous, margins sometimes bearing minute, distant glands; petioles 6–15 cm. long, eventually breaking up into fibres. Racemes 1–2, radical, 2–3-flowered, 8–10 cm. long, slender gradually thickening up to the first flower, thinly fulvous-tomentose. Bracts lanceolate, finely acuminate, 1.9–2 cm. long, margins sparsely fulvous-villous. Pedicels 5–6 mm. long, thinly fulvous-hairy. Perianth 3 cm. diam., segments in 2 rows; the 3 outer elliptic-oblong, acute, thick, 1.1 cm. long, with an apical tuft of hairs, glabrous or with a line of fulvous hairs on the back; the 3 inner subcircular or broadly oblong, obtuse, petaloid, 1 cm. long, glabrous. Stamens 6, free; filaments very short; anthers linear-oblong, obtuse, base shortly 2-lobed, 6 mm. long. Ovary 1.1 cm. long, densely fulvous-villous; 3-celled; ovules several, subdiscoïd; style linear, 8 mm. long, apex clavate. Fruit not seen.

Delei Valley, 7000–8000 ft., fls. May, *Kingdon Ward* 8190. "Undergrowth in the temperate rain-forest. Flowers bright sulphur-yellow, sweetly fragrant."

XLIX.—LAUGERIA "VAHL" = TEREBRARIA KUNTZE.

T. A. SPRAGUE.

A new genus of Rubiaceae was described by J. D. Hooker in Benth. et Hook. f. Gen. Pl. ii. 101 (1863) under the name "*Laugeria*, Vahl, Ecl. 26, t. 10, non Jacq." Vahl, however, proposed no genus of that name: what he did was to publish descriptions of one old species (Symb. Bot. iii. 40: 1794) and two new species of the pre-existing genus *Laugieria* Jacq. (1760), using the spelling "*Laugeria*" adopted by Linné in 1767 (Syst. ed. 12, 177). Hooker founded a new genus on one of the new species, *L. resinosa* Vahl, and should therefore have given it a new generic name. The name "*Laugeria* Vahl" was, nevertheless, accepted without question by K. Schumann in Engler & Prantl, Nat. Pflanzenfam. iv. Abt. 4, 96

(1891), Hitchcock in Miss. Bot. Gard. Rep. iv. 93 (1893), Urban, Symb. Ant. iv. 592 (1911), Wernham in Journ. Bot. 1916, 332, and Britton & Wilson, Bot. Porto Rico & Virgin Isl. 238 (1925).

In 1903, Otto Kuntze, who was a very accurate and painstaking bibliographical worker, detected the error, and reduced *Laugeria* "Vahl" Hook. f. to *Terebraria* DC. (1830). De Candolle, however, should not be cited as the author of *Terebraria*, as he merely cited *Terebraria* Sessé as a synonym of *Guettarda resinosa* (Vahl) Pers. *Terebraria*, as a valid generic name, dates from 1903, when it was adopted by Kuntze in place of *Laugeria* Hook. f. The synonymy and distribution of the genus and its two species are as follows:—

Terebraria Kuntze in Post et Kuntze Lexic. Gen. Phan. 552 (1903). *Laugeria* Hook. f. in Benth. et Hook. f. Gen. Pl. ii. 101 (1863), non *Laugieria* Jacq. (1760); Dalla Torre et Harms, Gen. Siphonog. 501 (1905).

T. resinosa (Vahl) Sprague, comb. nov. *Laugeria resinosa* Vahl, Ecl. i. 27 (1796); Urb. Symb. Antill. iv. 592 (1911); Britton & P. Wils. Bot. Porto Rico & Virgin Isl. 238 (1925). *Guettarda resinosa* Pers. Syn. i. 201 (1805). *Stenostomum resinosum* Griseb. Fl. Brit. W. Ind. 334 (1861). *Antirrhoea resinosa* Cook & Coll. in Contrib. U. S. Nat. Herb. viii. 82 (1903).

Distrib. Porto Rico, Montserrat (loc. typ.) Dominica, Martinique St. Vincent.

T. densiflora (Griseb.) Sprague, comb. nov. *Stenostomum densiflorum* Wright ex Griseb. Cat. Pl. Cub. 132 (1866); Britton & Millsp. Bahama Fl. 415 (1920). *Laugeria densiflora* Hitchcock in Miss. Bot. Gard. Rep. iv. 93 (1893).

Distrib. Bahamas, Cuba (loc. typ.), Haiti.

The two species are superficially similar, but may easily be distinguished by the venation, which is more or less parallel and at right angles to the midrib with oblong or linear areoles in *T. resinosa*, and closely and irregularly reticulate with isodiametric or short areoles in *T. densiflora*.

L.—MISCELLANEOUS NOTES.

Hay Collection of Flower Paintings and Wood Specimens.

A bequest by the late Dr. Alfred Hay of his collection of wood specimens and flower paintings has recently been received at Kew. Dr. Hay spent many years in India. He was attached at one time to the Royal Indian Engineering College, Coopers Hill, and later (1908-23) was Professor of Electrical Technology at the Indian Institute of Science, Bangalore. It was during vacation periods spent largely in the hills in Mysore that Dr. Hay was able to devote leisure hours to his hobby of illustrating the rich and varied flora of his surroundings.

The numerous paintings, which are in water-colours (body-colours) and unmounted, constitute a valuable addition to the collection of illustrations at Kew. Although the individual pictures are in some instances incomplete, in the majority of them flowers, fruit and leaves are faithfully depicted. Great pains appear to have been taken by the artist in maintaining accuracy of detail and colouring, and the talent displayed is of a high order.

The wood specimens consist mainly of small hand-specimens and of plank-specimens several feet in length. About two dozen different species are represented among the plank-specimens, many of which are beautifully figured. The hand specimens of Indian woods, numbering over two hundred and all specifically named, include many little-known Indian woods. They were received neatly housed in a specially made pull-drawer cabinet. A useful set of some of the more important timbers of British Guiana is also included among the miscellaneous hand-specimens.

Cacao.—The appearance of a second edition* of this well-known work on *Cacao* by Dr. C. J. J. Van Hall will be welcomed by all those in any way interested in this crop. This new edition incorporates the results of most of the important work that has been done on *Cacao* since the appearance of the first edition in 1914. As work of this sort is very scattered and appears in the literature of several different countries, Dr. Van Hall has rendered a great service in having collected and presented it in a condensed and readily available form. Although similar in appearance to the first edition, and consisting of approximately the same number of pages, there are important additions and modifications in the subject matter. The first alteration that claims attention is the substitution of the word *Cacao* for *Cocoa* on the title page. This is fitting, inasmuch as the book is concerned with the production of the *Cacao* bean rather than with its manufacture into cocoa or cocoa products. A chapter which was devoted to the cocoa and chocolate industry in the original edition has now been entirely omitted, no doubt because cocoa and chocolate manufacture is so fully dealt with in other works. Its place is taken by a discussion entitled "Some characteristics of the Marketable Bean," which is of far greater value to the practical producer.

Among the important new features is the chapter devoted to selection. Here the author outlines the methods employed in improving the crop and indicates the progress that has been made. Vegetative propagation in *Cacao*—in common with many other tropical plantation crops—has assumed considerable importance in recent years. The author wisely devotes special attention to this aspect of *Cacao* cultivation and improvement, and outlines the improved technique in budding that has been evolved. Under the heading of botanical characteristics the important advances that

**Cacao*, by Dr. C. J. J. Van Hall. Second edition, revised, pp. xi+514, with 176 illustrations. Macmillan & Co., Ltd., St. Martin's Street, London, 1932. Price 28s.

have been made in the cytology of the plant are dealt with and reference is made to the researches of such workers as Cheesman, Kuyper, Heyn and others. The excellent illustrations that appear of wild *Cacao* of the Forastero type are of particular interest. This wild *Cacao* was first brought to light by Stabel in remote parts of Surinam (see *Kew Bulletin*, 1930, 1).

A large amount of additional information on diseases and insect pests is incorporated and a summary is given of much of the important work relating thereto that has been done on the Gold Coast. The chapter on *Cacao*-growing countries, the most extensive and perhaps the most important in the work, has been brought thoroughly up-to-date. Great changes have obviously taken place in the relative importance of different countries as *Cacao* producers since 1914, and also in the methods of cultivation and preparation employed. A noteworthy inclusion here is a chart showing the exports of individual *Cacao*-producing countries from the period 1830-39 to the present time.

F. N. H.

Appendices to the Kew Bulletin. In future Appendix I of the Bulletin, "The Review of the Work of the...Gardens...", will be bound up in the volume for the year to which it refers, instead of in the volume for the subsequent year as at present, and the issue of the "List of Seeds...", as Appendix II, will be discontinued. As a result of these two changes the volume for the year 1932 will contain two Appendices, namely the "Reviews" for the years 1931 and 1932. Subsequent volumes will contain only one Appendix, namely the "Review" for the current year.

The "List of Seeds" will continue to be issued as a separate publication and those who have in the past received this list for the purpose of seed-exchange will continue to do so. Those, on the other hand, who have received it only as part of the Bulletin and who do not exchange seeds with the Gardens, will not receive it in future. Copies, however, will be available for purchase from H. M. Stationery Office. In order to form an estimate of the number of copies required, the Director would be glad if those readers who wish to purchase the "List" in the future would communicate with him before October 31, 1932.

Mr. Adams' Works on Diatomaceae.—In the note on this subject, *Kew Bulletin*, 1932, 250, the statement that Mr. Adams' collections contained "21,000 slides comprising over 1,000,000 diatoms" should read "comprising over 100,000 diatoms."

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BULLETIN OF MISCELLANEOUS INFORMATION No. 8 1932 ROYAL BOTANIC GARDENS, KEW

LI.—CANTHIUM IN BRITISH EAST AFRICA.

A. A. BULLOCK.

INTRODUCTION.

Dr. Robyns's excellent monograph of the tribe Vanguerieae* has rendered that tribe of Rubiaceae one of the easiest of the family to deal with in the herbarium, with the exception of the genus *Canthium* Lam., the study of which Dr. Robyns deferred. At Mr. J. Hutchinson's suggestion the writer has attempted to arrange systematically the East African species of this difficult genus; the present arrangement, however, is to be regarded as purely tentative, the material available for study being in many cases incomplete or too scanty to give any idea of the range of specific variation. British East Africa as here understood includes the Uganda Protectorate, Kenya Colony, and the Mandated Territory of Tanganyika.

In addition to the material in the Kew Herbarium, where the benefit of Mr. Hutchinson's advice and criticism has always been obtainable, the writer is indebted to the authorities at the British Museum (Natural History) for facilities for study in the herbarium there, to Dr. Diels for the loan of much type and other material from the Berlin Herbarium, and to Dr. Burt Davy for the loan of material from the herbarium of the Imperial Forestry Institute, Oxford.

A relatively large number of new combinations has been found necessary owing to the persistent use by some authors of the Linnean name *Plectronia* for the genus. The reasons for abandoning this name are here restated. Some hitherto undescribed species are also included, some of which it has been necessary to describe from rather poor or incomplete material. The key is more or less descriptive, and the characters mentioned are contrasted as far as possible; it is therefore necessary to read each pair of contrasted portions completely, and not to rely too much on the opening phrase. The drawings are the work of Miss S. Ross-Craig, to whom the author is much indebted.

Except where otherwise stated, all the specimens cited have been examined, and those not to be seen at Kew are followed by the following abbreviations indicating the herbarium in which they are contained:—

Ber.=Berlin.

B.M.=British Museum (Natural History).

Oxf.=Oxford (Imperial Forestry Institute).

Am.=Amani (Tanganyika).

* Robyns in Bull. Jard. Bot. Brux. xi. fasc. 1 (1928).

HISTORY AND NOMENCLATURE.

The genus *Plectronia* was founded by Linnaeus¹ on a specimen preserved in the Linnean herbarium and on a figure published by Burmann² as "*Rhamnus* foliis subrotundo-acuminatis, fructu racemoso." The association of this figure with the Linnean specimen under *Plectronia* was unfortunate, since the specimen and figure are referable to two widely separated families, Oliniaceae and Rubiaceae respectively.

It is not clear whether Thunberg³ was aware of this discrepancy when he described his genus *Olinia* (*O. cymosa*), but there is not the least doubt that it is identical with Linnaeus' specimen of *Plectronia*. To obviate nomenclatural difficulties in this case Sprague⁴ has proposed the conservation of *Olinia* Thunb. against *Plectronia* Linn. There remains, however, the difficulty presented by Linnaeus' citation of Burmann's figure under the name *Plectronia*.

Lamarek⁵ in 1795 described the genus *Canthium*, and Burmann's figure (2) is, in the opinion of most modern authors, referable to it. De Candolle⁶, neglecting the Linnean specimen, referred both *Plectronia* and *Canthium* to the Rubiaceae, and maintained both genera, in addition to *Phallaria*, a genus established by Schumacher⁷ to accommodate two West African species, but afterwards reduced to *Canthium* by A. Richard⁸. Bentham and Hooker⁹, and also Schumann¹⁰, regarded *Plectronia* and *Canthium* as synonymous, and these authors therefore used the older Linnean name. In 1898, however, Hiern¹¹ and later Robyns¹² pointed out that the synonymy was not complete.* It appears, in fact, that the name *Plectronia* as applied to Burmann's figure, and hence to the Rubiaceae, is based on a wrong identification. The earliest legitimate name for the plant represented by Burmann's figure is therefore *Canthium* Lam. The synonymy given below (p. 358) is not by any means complete for the genus as a whole, but it includes all the more important references, which lead to any further information required by future workers.

As regards the species, nomenclatural difficulties are rarely encountered. In this revision only one new name (*C. euryoides* Bullock) is proposed in place of an earlier illegitimate name (*C.*

nitens Hiern), and one new name for a species transferred from *Plectronia* to *Canthium*, on account of preoccupation of the specific epithet (*P. lamprophylla* K. Schum. becomes *C. micans* Bullock). This is, of course, due to the fact that most of the African species have been described since the publication of the Index Kewensis and of the third volume of the Flora of Tropical Africa, and have a very short nomenclatural history.

VALUE OF CHARACTERS.

The genus, as represented in East Africa, includes several highly critical small groups of species, but in general the specific limits are fairly readily discernible. Four primary series are tentatively suggested, though further subdivision, especially of the *Pedunculate Series*, will be necessary.

The *Pedunculate Series*, including 30 species, is characterised by a cymosely branched inflorescence, the typical form being shown in figure 1, illustrating *C. venosum*. This becomes variously modified in other species, an extreme case being *C. Robynsianum* (figure 2). In *C. bibracteatum* the cyme branches once only (or not at all), the two arms terminating in many-flowered false umbels, while in *C. subopacum* the inflorescence is branched from the extreme base, a fact which led Schumann and Krause to describe the flowers as fasciculate. Although the pentamery or tetramery of the flowers of this series proves useful,* it was found that a more natural arrangement was made possible by first separating all the very hairy species from those which have almost or quite glabrous stems and leaves. In the latter it is usually found that the inflorescence branches are finely puberulous, as for example in *C. vulgare* and *C. rubrocostatum*. In general, the hirsute species are scrambling plants, the branchlets being inserted at right angles to the main stem, while the glabrous species are usually erect shrubs or trees. Exceptions are the fairly common *C. zanzibaricum*, which is sometimes rather densely pubescent in the young stage, but rapidly becomes glabrous, and the less common but widely distributed *C. venosum*, which sometimes retains its indumentum, especially on the branches, even when mature. The indumentum of various groups of species is very characteristic. In the *C. Gueinzii* group, for instance, the stems are very densely hairy, the indumentum in some cases being shortly tomentellous with an admixture of long, more or less stiff, setose hairs, the latter being exclusively present on the lower surface of the leaves and especially on the inflorescence branches. In the *C. vulgare* group, on the other hand, the stems and leaves are, as a rule, perfectly glabrous and the inflorescence branches are finely puberulous; this group includes only trees and erect shrubs with ascending branchlets.

* Some species are included of which flowers have not been seen; in several cases the remains of the calyx in the fruiting stage has given the necessary information, and in a few the position of the species has been inferred from its general affinities.

¹Linn. Mant. 6 (1767).

²Burm. Pl. Afr. 257, t. 94 (1739).

³Thunb. in Roem. Arch. ii. 4 (1799).

⁴Sprague in Prop. Brit. Bot. 85 (1929).

⁵Lam. Encycl. i. 602 (1795).

⁶DC. Prodr. iv. 619 (1830).

⁷Schum. et Thonn. Pl. Guin. 112 (1827).

⁸A. Rich. Tent. Fl. Abyss. i. 350 (1847).

⁹Benth. et Hook. f. Gen. Pl. ii. 110 (1873).

¹⁰K. Schum. in Engl. et Prantl. Nat. Pflanzenfam. iv. Abt. 4, 91 (1897).

¹¹Hiern, Cat. Welw. Afr. Pl. i. 472 (1898).

¹²Robyns in Bull. Jard. Bot. Brux. xi. fasc. 1. 7 (1928).

* Without any discussion Hiern had previously used the name *Canthium* for this genus in the Flora of Tropical Africa, iii. 132 (1877).

The mode of growth of the erect species shows two interesting forms. *C. vulgare* and its allies produce elongated shoots with several pairs of leaves, the stipules being early deciduous, leaving only a faint scar; whereas *C. crassum*, *C. Siebenlistii* and their allies produce but one pair of leaves each season, the stipules are very persistent, become woody, and the internodes are often much abbreviated. The extreme case of this last condition is seen in *C. pseudoverticillatum* where the leaves appear to be in whorls of four owing to the extreme shortness of the opposite branchlets. *C. Robynsianum* also produces very short internodes, but one of the axillary buds in each pair of leaves is usually dormant. In a few cases specific limits are ill-defined, especially in the *C. Gueinzii* alliance. The species overlap both in characters and distribution, and it seems certain that hybridisation has taken place.

Leaf-shapes, excepting apical and basal characters, although usually mentioned, have not been used to any great extent in differentiating species. This is not on account of pronounced variability, nor even because most of the species produce similar leaves; shape and texture are in fact highly specific characters, but the personal factor encountered when describing them renders their use confusing, and it was not considered advisable to depend upon them.

As a rule, reduction in the number of flowers in each cyme, as in *C. capium* compared with *C. Gueinzii*, is accompanied by the development of stouter, shorter pedicels, and a further corresponding development is seen in the production of fewer, much larger fruits. The case of *C. Robynsianum* is an exception. Here, as shown in figure 2, the cymes are reduced to about three small flowers, but the pedicels have remained extremely slender.

The modified cymes found in *C. bibracteatum* and *C. subopacum* (see above, p. 355) provide interesting connections with the *Anomalous* and *Fasciculate Series* respectively. Both are rather anomalous members of the group in which they are placed here; and in general appearance *C. subopacum* more strongly resembles some of the *Fasciculate Series* than any other species, while the resemblance between *C. bibracteatum* and the *Anomalous Series* is also most marked.

The main types of flower structure met with in the genus are illustrated in figures 1-4. The flower characters are not of great value in specific differentiation, but *C. Kaessneri* can be separated easily on account of its large corolla. The *Spinose* and *Anomalous Series* have very small flowers, but otherwise variation in size is not marked. The shape of the stigma and anthers is of serial value.

ECOLOGICAL DISTRIBUTION AND GROWTH FORM.

The *Spinose Series*, represented here by *C. glaucum*, includes spiny shrubs or trees of the coastal and fringing forests. *C. glaucum* itself has been collected only near the coast in Kenya Colony, but its

more southern counterpart, *C. Frangula*,* occurs far inland on the banks of the Zambesi.

The *Anomalous Series*, comprising erect trees and shrubs, is also entirely eastern in range, and constitutes an endemic group confined to the littoral and sublittoral regions, penetrating inland only where the soil is exceptionally saline. Its species are somewhat anomalous in the genus, with characteristic coriaceous leaves and large membranous stipules. They are linked taxonomically with the *Pedunculate Series* by *C. bibracteatum*, which is a shrub or small tree of similar habit, confined on the mainland to the eastern littoral, but extending through Zanzibar and Pemba to the more distant Mascarene Islands; it is the only species considered here which extends farther from the mainland than Zanzibar and Pemba.

The *Fasciculate Series* includes, in the main, trees and erect shrubs of the subtropical rain forests, though several of the group occur in the tropical rain forests of West Africa, and some, such as *C. recurvifolium*, are littoral thorn-scrub shrubs. *C. euryoides* is found westwards to the Niger river as well as in East Africa, and *C. Kaessneri* is known from only three localities—one in Kenya Colony, one in Tanganyika and one in Portuguese East Africa.

The most interesting but at the same time most complex group is undoubtedly the *Pedunculate Series*, which for distribution purposes may be split up into three main groups which are also fairly distinct taxonomically. They will be referred to as shown in the "key" below, and though such a classification is naturally imperfect, the great majority of the species concerned fit into it very well.

Erect glabrous trees and shrubs:

Branchlets elongated, with several pairs of leaves.....
C. vulgare group.

Branchlets short, with only one pair of leaves.....
C. lactescens group.

Scrambling (or sometimes erect) coarsely hairy shrubs with elongated branchlets inserted at right angles...*C. Gueinzii* group.

The *C. vulgare* group are typically trees or erect shrubs of the rain forest areas, some of which produce good timber.

Trees and shrubs of quite different aspect are included in the *C. lactescens* group. These are plants of the fire-swept open woodlands and deciduous (*Brachystegia*) forests. They frequently develop a thick bark which serves as a protection against fire. Each branchlet produces only one pair of leaves each season, and the internodes are often much abbreviated.

The last group is the most complex of all, and contains the most numerous apparent contradictions. The species seem to be to a great extent independent of environmental conditions, and produce different habit forms to suit the particular conditions to which they are exposed. Typically, however, they are scrambling shrubs of the

* See note in enumeration under *C. glaucum* Hiern.

rain and fringing forests, but some of them at least thrive also as erect shrubs of the open woodlands and deciduous forest lands. They appear to be deciduous or evergreen according to the type of country in which they occur, and correlated with this great flexibility their geographical range is equally extensive. *C. Guinizii* itself is the most widely distributed species in Africa, while *C. zanzibaricum*, *C. venosum*, *C. sylvaticum* and *C. scabrosum* have also very extensive geographical ranges.

CANTHIUM Lam.

Lam. Encycl. i. 602 (1785)*; DC. Prodr. iv. 473 (1830); A. Rich. Tent. Fl. Abyss. i. 350 (1847); Hiern in Oliv. Fl. Trop. Afr. iii. 132 (1877), et Cat. Welw. Afr. Pl. i. 472 (1898); Baill. Adans. xii. 179 (1878), partim; Robyns in Bull. Jard. Bot. Brux. xi. fasc. 1. (1928), in clavi et obs.; Hutch. et J.M. Dalz. Fl. W. Trop. Afr. ii. 112 (1931). *Phallaria* Schum. in Schum. et Thonn. Beskr. Guin. Pl. 112 (1827); DC. Prodr. iv. 619 (1830).

Plectronia DC. Prodr. iv. 475 (1830); Benth. et Hook. f. Gen. Pl. ii. 110 (1873); K. Schum. in Engl. et Prantl, Nat. Pflanzenfam. iv. Abt. 4, 91 (1897), et in Engl. Hochgebergssfl. Trop. Afr. 399 (1892), et in Engl. Pflanzenw. Ost-Afr. C. 385 (1895); non Linn. Mant. 6. (1767), nec Lour. Fl. Cochinch. 162 (1790).

Keetia Phillips, Gen. S. Afr. Fl. Pl. 587 (1926), et in Bothalia, ii. 368 (1927).

Calyx: tube (i.e. the portion adnate to the inferior ovary) short, obconic, turbinate, hemispherical or globose; limb very short, cupular or annular, truncate or 4-5-dentate, usually persistent. *Corolla*: tube short, cylindrical or broadly funnel-shaped, villous at the throat, glabrous outside; limb 4-5-lobed, lobes valvate, erect, spreading or reflexed, as long as or longer than the tube, rarely shorter, oblong or triangular, acute or subacute, glabrous outside or sometimes strigose-pilose towards the apex. *Stamens* 4-5, inserted at or just below the throat of the corolla; filaments very short, filiform, or almost obsolete; anthers dorso-basifixed, oblong, obtuse or very obscurely mucronate. *Disk* annular, fleshy. *Ovary* invariably 2-locular; style usually exserted, or sometimes scarcely as long as the corolla-tube, often more than twice as long as the corolla-tube; stigma capitate, mitriform or subglobose, truncate at the base and apex, or somewhat deeply bilobed, often sulcate. *Ovules* solitary, anatropous, pendulous. *Drupes* didymous or by abortion one-celled; cells globose or ellipsoid.—*Shrubs* or *trees*, armed or unarmed, often scandent, with terete or square branchlets. *Leaves* opposite, chartaceous or coriaceous, shortly petiolate. *Stipules* interpetiolar, triangular, acuminate or long-cuspidate, or ovate-lanceolate and acute, persistent or often early deciduous.

* For dates of publication of the parts of this work see Journ. Bot. xlv. 318 (1906).

Flowers axillary in pedunculate corymbose cymes, often modified, or in sessile fascicles, or rarely solitary, white, cream or greenish. *Fruits* small or rarely attaining 3 cm. or more in diameter, woody or fleshy.

KEY TO SERIES.*

Shrubs or trees armed with supra-axillary spines.....
I. *Spinose Series* (p. 359).

Shrubs or trees without spines:

Inflorescence a pedunculate or sessile cyme (sometimes much modified); corolla-lobes usually spreading or reflexed (erect in *C. Robynsianum*, *C. telidosma* and *C. microdon*).....
II. *Pedunculate Series* (p. 360).

Inflorescence a sessile fascicle, or flowers solitary:

Corolla-lobes spreading or reflexed; stigma longer than its diameter, deeply 2-cleft; stipules more or less coriaceous (margins often membranous) usually subulate or long acuminate from a broad triangular base.....

III. *Fasciculate Series* (p. 381).

Corolla-lobes erect; stigma subglobose, entire; stipules membranous, ovate or lanceolate, subacute or acute, but not subulate or long acuminate as above.....

IV. *Anomalous Series* (p. 386).

I.—SPINOSE SERIES.

Small glabrous forest tree armed with supra-axillary spines about 1 cm. long; leaves produced in single pairs on the very short lateral shoots, elliptic, 2-2.5 cm. long and about 1.5 cm. broad, apex obtuse or subacute, rounded to cuneate at the base, thinly herbaceous; flowers in shortly-pedunculate false umbels; peduncle 5 mm. long; pedicels 6-8 mm. long; calyx deeply 5-dentate; corolla apiculate, 2.5 mm. long in bud.....

1. *C. glaucum*.

1. ***Canthium glaucum*** Hiern in Oliv. Fl. Trop. Afr. iii. 134 (1877), partim, quoad specim. keniense.—*Plectronia glauca* K. Schum. in Engl. Pflanzenw. Ost-Afr. C. 386 (1895), quoad specim. keniense.

KENYA COLONY. "Somali Coast; Sola River," April, *Kirk s.n.* (type). Arabuko, Malindi District, a small somewhat scandent forest tree up to 20 ft. high, with greenish flowers, March, *Graham* 2352.

It is many years since Hutchinson recorded in a manuscript note in the Kew Herbarium the fact that Kirk's Zambesi-land specimen

* Since only a portion of the genus is under consideration the series employed here are not intended to have any nomenclatural value, and Latin names are not, therefore, applied to them. The *Spinose Series*, it may be noted, corresponds with Schumann's section *Armatae*, but the others are not paralleled in any other classification.

collected at Tette, and cited by Hiern under this name, is not conspecific. *C. glaucum* had not been collected since the first specimen was sent to Kew until Mr. Graham's excellent material was received in 1930, and this leaves no doubt that the Zambesi specimen belongs to a distinct though closely allied species. I have been unable to trace the exact location of the Sola River, but it seems likely that it is included in the Malindi District. The Zambesi plant is identical with *C. Frangula* S. Moore, described in the account of Mr. C. F. M. Swynnerton's Gazaland plants in the Journal of the Linnean Society (Botany), vol. xl. p. 89 (1911).

II.—PEDUNCULATE SERIES.

*Peduncle more or less well developed, always readily distinguishable (very short and filiform in *C. Robynsianum*).

†Branchlets elongated, always with many pairs of leaves (except *C. indutum*) more less densely pubescent, setose, woolly tomentose or tomentellous, or if only slightly pubescent, then flowers 4-merous :

Leaves shortly and densely tomentose below and/or branchlets densely woolly tomentose (see below).....30. *C. crassum*

Leaves never tomentose below ; branchlets at most shortly tomentellous, never woolly :

Corolla-lobes strigulose-pilose outside :

Cymes 1-2-flowered ; ovary very densely golden-pubescent, globose ; leaves ovate to ovate-lanceolate or elliptic, apex obtuse or subacute, rounded at the base, about 2-4 cm. long and 1-2 cm. broad, thinly hispidulous above, more densely so below, especially on the nerves (see also in the *Fasciculate Series* below)

2. *C. telidosma*

Cymes 3- or more-flowered ; ovary thinly pubescent, minute ; leaves very much as above, but smaller, glabrous above except on the midrib, and very thinly hispidulous below.....3. *C. microdon*

Corolla-lobes glabrous outside :

‡Leaves pubescent or hispidulous all over the upper surface :

Leaves long-attenuate or acute at the base, apex rounded, oblanceolate to oblong or oblong-elliptic, about 6 cm. long and 1.5-3 cm. broad, hispidulous above and below, minutely scabrescent above ; flowers in very shortly-pedunculate glomerulate cymes ; calyx subacutely 5-dentate ; corolla rounded in bud, 4 mm. long ; branchlets hispidulous, bark greyish-brown.....4. *C. sordidum*

Leaves acute at the base, acute or acuminate at the apex (see below).....13. *C. huillense*.

Leaves rounded to subcordate at the base, apex obtuse to acuminate :

Branchlets rather thinly spreading-setose (see below)

9. *C. hispidum*

Branchlets densely tomentellous :

Leaves elliptic or broadly oblong-elliptic, apex obtuse, rounded at the base, 4-6.5 cm. long, 2.5-4 cm. broad, velvety-pubescent, especially on the midrib and 3-5 pairs of lateral nerves below, drying bluish-black ; petioles 5-8 mm. long ; branchlets short, developing only one pair of leaves each growth-season ; bark very light greyish-brown, powdery.....5. *C. indutum*

Leaves lanceolate to oblong, acutely acuminate, subcordate at the base, 6-11 cm. long, 2.5-5 cm. (or more) broad, long-pubescent especially on the midrib and 7-9 pairs of lateral nerves below, scabrescent above, drying greenish-brown ; petioles 2-4 mm. long ; branchlets elongated with several pairs of leaves ; bark dark brown, smooth.....6. *C. scabrosum*

‡‡Leaves glabrous above or adpressed-pubescent only on the midrib and lateral nerves (rarely a few scattered setae present) :

§Branchlets tomentellous with sometimes a few spreading setae also present ; leaf-margins not ciliate :

Leaves rounded, not cordate at the base, oblong-elliptic to ovate or obovate, abruptly narrowed to the broadly rounded apex, minutely mucronulate, 5-6.5 cm. long and up to 4 cm. broad, glabrous above, pubescent below, the midrib and 5-6 pairs of lateral nerves densely tomentellous, sometimes becoming almost glabrous in age, tertiary veins not impressed above ; petioles tomentose ; calyx tomentose, with 5 triangular teeth.....7. *C. purpurascens*

Leaves distinctly cordate at the base, oblong or rather broadly oblong-lanceolate, acutely and rather gradually acuminate, up to 10 cm. long and 4 cm. broad, adpressed pubescent on the midrib and 6-8 pairs of lateral nerves above, tertiary veins impressed, hispidulous below, especially on the nerves ; petioles hispid ; calyx triangular-5-dentate, setose-pubescent, but less densely so than the slender pedicels.....8. *C. Gueinzii*

Leaves rounded to subacute at the base, apex abruptly acuminate, rather thinly adpressed or

spreading pubescent on the nerves below (see below).....11. *C. sylvaticum*

§§Branchlets persistently thinly spreading long-setose; leaves oblong to narrowly oblong-ovate, acutely acuminate, subcordate at the base, up to 14 cm. long and 5 cm. broad, thinly setose-pubescent below, especially on the midrib and 6-8 pairs of lateral nerves and sometimes with a few scattered setae above, margins thinly ciliate, tertiary veins not impressed above.....9. *C. hispidum*.

§§§Branchlets adpressed pubescent or puberulous, more or less glabrescent (very glabrescent in *C. charadrophilum*); leaves acute to rounded at the base; Drupes comparatively small, the cells not exceeding 8 mm. diam., fairly numerous in each infructescence; Leaves markedly parallel-venose above (see below) 14. *C. venosum*

Leaves not as above, tertiary veins rarely visible above: Calyx rather deeply and acutely triangular-dentate; inflorescence-branches long-pubescent; scrambling shrubs with the branchlets inserted at right-angles; leaves narrowly oblong to oblong-elliptic: Inflorescence lax, multiflorous; branchlets rather thinly pubescent, glabrescent; leaves up to 10 cm. long and 3.5 cm. broad; internodes very long, up to 6 cm. long..... 10. *C. charadrophilum*

Inflorescence rather congested; branchlets rather densely pubescent; leaves about 7-9 cm. long and up to 4 cm. broad; internodes about 2-3 cm. long...11. *C. sylvaticum*

Calyx subtruncate or minutely denticulate; inflorescence-branches shortly pubescent; leaves ovate, 3-5 cm. long, 1.5-3 cm. broad, subacute to acuminate, rather shortly pubescent on the midrib and lateral nerves, especially below, or sometimes almost glabrous; pedicels slender, 5-8 mm. long, densely shortly pubescent; an erect shrub with ascending branchlets.....13. *C. huillense*

Drupes large, the cells at least 1.5 cm. diam., about 2 in each infructescence; leaves broadly elliptic, abruptly acuminate, 8-10 cm. long, 3-5 cm. broad, thinly adpressed-pubescent on the midrib and lateral nerves; branchlets inserted at right-angles, bark grey.....12. *C. Brownii*

††Branchlets much abbreviated and bifoliate, or elongated, multifoliate and glabrous, or if slightly pubescent or puberulous then flowers 5-merous; inflorescence cymose or subumbellate:

‡Flowers 4-merous:

Inflorescence a dichasial cyme:

Leaves markedly parallel-venose above, lanceolate to rather narrowly ovate, up to 12 cm. long and 4.5 cm. broad, acute to acutely acuminate, cuneate to rounded at the base, glabrous when mature except in the axils of the 4-5 pairs of lateral nerves below, drying rusty brown; bark greyish; drupes small, numerous, didymous or globose.....14. *C. venosum*

Leaves not as above, tertiary nerves, when visible, reticulate:

Scrambling shrubs with the branchlets inserted at right angles:

Leaves oblong, acute or subacute, acute at the base, about 7.5 cm. long and up to 3 cm. broad, thinly pilose on the nerves below.....15. *C. syringodorum*

Leaves elliptic to oblong, acuminate, rounded to abruptly acute at the base, about 10 cm. long and 5 cm. broad, thinly pubescent on the nerves below

16. *C. zanzibaricum*

Trees or erect shrubs with ascending branchlets; leaves completely glabrous; inflorescence-branches puberulous:

Leaves with the midrib and lateral nerves (and sometimes the whole surface) below distinctly red in colour, ovate to oblong-elliptic, shortly and obtusely acuminate, acute to broadly rounded at the base, up to 12 cm. long and 6 cm. broad; petiole 5-8 mm. long; calyx truncate to undulately 4-lobed or 4-dentate, glabrous or very minutely ciliate on the edges of the lobes; corolla 5 mm. long; the ovary slightly exceeding 2 mm. in length.....17. *C. rubrocostatum*

Leaves not red below:

Branchlets subterete to obtusely subquadrangular; leaves ovate to oblong-ovate, acuminate, acute at the base, 6-12 cm. long, 2.5-5 cm. broad, with about 4 pairs of lateral nerves, green below.....18. *C. vulgare*

Branchlets acutely 4-angled; leaves very much as in *C. vulgare*, but usually rather larger, and with about 6 pairs of lateral nerves, drying blackish and shining.....19. *C. melanophengos*

- Inflorescence unbranched or branching once dichasially, the branches terminating in many-flowered false umbels of pedicellate flowers; leaves elliptic, scarcely acuminate, acute or cuneate at the base, 6-10 cm. long, 3-5 cm. broad, with about 6 pairs of lateral nerves, drying almost black or dark reddish-brown; fruit 1-celled and globose, or didymous; a small tree.....20. *C. bibracteatum*
- ††Flowers 5-merous; erect shrubs or trees (rarely semi-scandent):
- Branchlets and leaves slightly pubescent when very young; branchlets elongated, multifoliate (see above).....10. *C. charadrophilum*.
- Branchlets and leaves completely glabrous, or branchlets abbreviated and bifoliate:
- §Stipules deciduous, not persisting beyond the current growth-season:
- Cymes multiflorous; leaves oblong-lanceolate, shortly acuminate, mucronulate, acute at the base, 6-11 cm. long, 3.5-4.5 cm. broad; calyx subulately 5-dentate.....21. *C. sclerocarpum*
- Cymes about 8-15-flowered; leaves elliptic, ovate, or oblong:
- Leaves scarcely acuminate, broadly rounded at the base, broadly elliptic, 7-8 cm. long, 3.5-5 cm. broad, slightly discolourous; branchlets with a light-coloured epidermis; bark almost white; fruit one-celled, ellipsoidal, about 3 cm. long.....22. *C. Stuhlmannii*
- Leaves gradually or abruptly acuminate, usually cuneate at the base; branchlets dark-coloured:
- Mature leaves slightly discolourous, ovate or oblong-elliptic, 11-14 cm. long, 4-6 cm. broad, abruptly acuminate, acumen 1-1.5 cm. long, acute or shortly cuneate at the base, with about 5 pairs of lateral nerves; cyme-branches with a line of spreading pilose hairs on one side.....23. *C. ruwenzoriense*
- Mature leaves strongly discolourous, narrowly elliptic to oblong-elliptic, 4-7.5 cm. long, 2-3 cm. broad, gradually acuminate, usually cuneate at the base, with about 4-5 pairs of lateral nerves; bark yellowish; fruit often 2-celled, broadly ellipsoidal, 1.5-2 cm. diam.; cyme-branches with a few adpressed hairs, not in one line.....24. *C. captum*
- §§Stipules very persistent, becoming woody:
- ||Cymes with not more than 20 flowers; peduncle 1 cm. long or less:

Leafy shoots elongated, producing more than one pair of leaves each season; cymes about 12-flowered, borne in the axils of fallen leaves, peduncle up to 1 cm. long; leaves elliptic, oblong-elliptic or ovate, up to 12 cm. long and 6.5 cm. broad, shortly acuminate, with 4-6 pairs of lateral nerves; stipules long-acuminate, up to 2 cm. long; bark light-coloured, branchlets smooth.....

25. *C. keniense*

Leafy shoots very short, producing only one pair of leaves each season; cymes 3-10-flowered, peduncle not more than 5 mm. long:

Shoots (except the terminal one) in lateral opposite pairs, each with a pair of leaves, the latter appearing as though borne in whorls of 4 on the older branchlets; leaves narrowly elliptic to oblanceolate or obovate, 3-5 cm. long, 1-2 cm. broad, slightly acuminate, cuneate at the base, with about 3 pairs of lateral nerves.....

26. *C. pseudoverticillatum*

Shoots not as a rule in opposite pairs, the leaves obviously opposite, not apparently whorled as above:

Cymes 3-5-flowered, with very slender peduncles and pedicels, the peduncle often not more than 2 mm. long, pedicels 3-4 mm. long; leaves elliptic, 3.5-7 cm. long, 2-4.5 cm. broad, abruptly acuminate, acute at the base, with about 3 pairs of lateral nerves; bark soon becoming greyish-white and powdery...

27. *C. Robynsianum*

Cymes up to about 10-flowered, peduncle about 5 mm. long, fairly stout; leaves elliptic to sub-rhomboid, 4.5-8 cm. long, 3.5-4.5 cm. broad, abruptly acuminate, rounded to cuneate at the base, with 5-6 pairs of lateral nerves; bark purplish-brown and wrinkled...

28. *C. Siebenlistii*

|||Cymes with more than 20 flowers; peduncle 2 cm. long or more:

Leafy shoots with only one pair of leaves; stipules triangular, subacute, leathery, 1.5 cm. long; leaves oblong-elliptic, ovate or suborbicular, apex triangular, subacute, cuneate to cordate at the base, usually up to 9 cm. long and 6.5 cm. broad, but sometimes (pollard shoots?) 8-14 cm. diam.; petioles 1.5 cm. long; peduncles about 2.5 cm. long, puberulous, later glabrescent; pedicels very

short; corolla rounded in bud, 2.5 mm. long.....
29. *C. lactescens*

Leafy shoots with more than one pair of leaves;
stipules lanceolate, long acuminate, 1 cm. long;
leaves obovate, obtuse to rounded, but sometimes
almost acuminate at the apex, cuneate at the
base, up to 14 cm. long and 8 cm. broad, glabrous
above, glabrous or shortly tomentellous below;
peduncle about 2 cm. long, pedicels 1-3 mm. long;
branchlets glabrous or rarely lanate-tomentose,
corolla acute in bud, 5 mm. long...30. *C. crassum*

**Peduncle obsolete, cymes branched from the base and flowers
appearing to be fasciculate; leaves narrowly lanceolate-elliptic,
acuminate, subacute at the base, about 8 cm. long and 3 cm.
broad, glabrous, lateral nerves numerous, very slender, distinct
above, very indistinct below.....31. *C. subopacum*

2. ***Canthium telidosma*** (K. Schum.) S. Moore in Journ. Linn. Soc. Bot. xl. 87 (1911).—*Plectronia telidosma* K. Schum. in Engl. Bot. Jahrb. xxiii. 460 (1897).

TANGANYIKA TERRITORY. Longuza, Dec., Zimmermann G. 6113 (partly). Usambara, Feb. Stuhlmann 6690 (type, Ber.).

The flowers were described as solitary by Schumann, and in the type specimen this is indeed the case. In Zimmermann's specimen, however, there are frequently two or more flowers borne on a common peduncle. In order to facilitate determination, this plant has been inserted also in the key to the *Fasciculate Series*, but there is no doubt that its general affinities are with the following species, which Zimmermann collected under the same number.

3. ***Canthium microdon*** S. Moore in Journ. Linn. Soc. Bot. xl. 86 (1911).

TANGANYIKA TERRITORY. Longuza, Dec., Zimmermann G. 6113 (partly).

Also in Gazaland (Sweynerton 552, at the British Museum). The Tanganyika specimen is rather poor, and shows more numerous flowers per cyme than the type from Gazaland. In all other characters, however, they are identical.

4. ***Canthium sordidum*** (K. Schum.) Bullock, comb. nov.—*Plectronia sordida* K. Schum. in Engl. Pflanzenw. Ost-Afr. C. 386 (1895).

TANGANYIKA TERRITORY. Umpeke, Stuhlmann 860 (type, Ber.); Kibwesi, Ukambwane, 3000 ft., Dec., Scheffler 28.

5. ***Canthium indutum*** Bullock, sp. nov.

Frutex scandens, ramis junioribus velutinis, ramulis lateralibus abbreviatis 2-foliatis. *Folia* sicco nigra, ovata, apice obtusa, basi rotundata, circiter 4-6.5 cm. longa et 2.5-5 cm. lata, utrinque breviter pubescentia, nervis lateralibus utrinsecus 3-4, petiolis

velutinis 5 mm. longis. *Flores* non visi, ut videtur in cymas corymbosas multifloras dispositi.

TANGANYIKA TERRITORY. Kondoa-Irangi District, Jan., Burt 1294.

The very incomplete material of this species shows evident affinity with *Canthium Junodii* Burt Davy, from the Transvaal and Nyasaland.

6. ***Canthium scabrosum*** Bullock, sp. nov.

Frutex scandens pubescens, ramis angulo recto patentibus. *Folia* oblongo-lanceolata vel oblonga, apice longe acuminata, basi subcordata vel rotundata, 6-11 cm. longa, 2.5-5 cm. lata, utraque pagina dense pilosa, pagina superiore scabrescentia; ramuli ex axillis foliorum parvorum ovato-cordatorum orti. *Stipulae* pilosae, caducae, longe cuspidatae, 1 cm. longae. *Cymae* pedunculatae, dichasiales, multiflorae, pedunculo usque 1 cm. longo, pedicellis 3 mm. longis, bracteis linearibus, inferioribus circiter 5 mm. longis. *Calyx* subcampanulatus, 2.5 mm. longus, lobis triangularibus, tubo minus dense pilosis. *Corolla* alabastro apice rotundata, 5 mm. longa, lobis sub anthesin ovatis deflexis 2.5 mm. longis, fauce dense villosa. *Drupa* didyma, subglobosa, circiter 1 cm. diametro, striguloso-pilosa.—*Canthium hispidum* S. Moore in Journ. Linn. Soc. Bot. xxxvii. 161 (1905), non Benth. (1849).

UGANDA PROTECTORATE. Entebbe, Fyffe s.n. (type). Without exact locality, a shrub with greenish flowers, Dec., Bagshawe 54 (B.M.).

TANGANYIKA TERRITORY. Kyimbila District, Bulambya-Hembo, Oct., Stolz 1618. Namanyere, Konongo and Massiba, Dec., Sweynerton 21; 722 (B.M.).

As regards the East African specimens, this species is very distinct in its very densely hairy calyx, and in the scabridity of the upper surface of the mature leaf. Although the leaves are broader, a specimen from the Malange District, Angola (Gossweiler 1251) shows the same characters, but others show very evident affinities with *C. Gueinzii* Sond., and *C. rufivillosum* Robyns ex Hutch. & J. M. Dalz.* A specimen collected by Dr. Mildbraed (No. 9542) in the Cameroons is reminiscent of *C. Gueinzii*, but the indumentum is much longer than in that species, and the scabridity of the upper surface of the leaves, though slight, is quite obvious. Excellent material recently collected in north-western Northern Rhodesia by Mr. E. Milne-Redhead (No. 813, barren material, and No. 976, fruiting material) is in some respects like *C. rufivillosum*, but its indumentum is less dense, even in the young (barren) state, while the fruiting material leaves no doubt that it is conspecific with Gossweiler's Angolan specimen (No. 1251), and with the East African material from which the species has been mainly described. Mr. Milne-Redhead's notes on his two collections of this plant,

* Hutch. et J. M. Dalz. Fl. W. Trop. Afr. ii. 113 (1931).

together with those attached to the other specimens mentioned are appended :

CAMEROONS. Buar-Buala, 3500 ft., June, *Mildbraed* 9542.

ANGOLA. Malange District, near the Governor's Palace and Post Office, in waste places not reached by the annual fires, a woody climber not uncommon in shady places, climbing over neighbouring shrubs, Aug. (fr.), *Gossweiler* 1251 (Kew & B.M.).

NORTHERN RHODESIA. River Kasengiko, Camp 12*, a shrub or trailer among other shrubs in *Cryptosepalum* woodland, with tawny pubescence, Aug. (barren), *Milne-Redhead* 813. River Lunga, below Mwinilunga, a shrub up to 15 ft. high with pendulous branches and green fruits, Aug. (fruit), *Milne-Redhead* 976. Thirty miles north of Kasama, a shrub, 15 ft., in the *Brachystegia* woodland, July (fruit), *Hutchinson & Gillett* 3808.

7. *Canthium purpurascens* Bullock, sp. nov.

Frutex subscandens, ramulis patentibus dense tomentellis demum glabrescentibus, cortice flavido-albo. *Folia* sicco purpurea, oblongo-elliptica usque ovata vel obovata, apice abrupte et breviter angustato-rotundata, minute mucronulata, basi (saepae inaequaliter) rotundata, 5-6.5 cm. longa et usque 4 cm. lata, supra glabra, infra pubescentia, costa et nervis lateralibus (utrinsecus 5-6) molliter dense tomentosa, demum subglabrescentia; petioli circiter 7-8 mm. longi, tomentosi; stipulae mox deciduae, triangulari-cuspidatae. *Cymae* pedunculatae, corymbosae, multiflorae; flores, ut videtur 5-meri, non visi. *Calyx* statu fructifero tomentosus, 5-dentatus. *Drupa* esculenta, didyma vel abortu 1-locularis, loculis subglobosis vel ellipticis 1 cm. longis.

TANGANYIKA TERRITORY. Rufiji, 50 ft., semi-climbing shrub, fairly common in black alluvial soil in full sun, Dec., *Musk* 67.

8. *Canthium Gueinzii* Sond. in *Linnaea*, xxiii. 54 (1850), et in *Harv. et Sond. Fl. Cap.* iii. 16 (1864-5); S. Moore in *Journ. Linn. Soc.* xl. 89 (1911); Bullock in *Hook. Ic. Pl.* t. 3170 (1932).—*Plectronia Gueinzii* (Sond.) Sim, *For. Fl. Cape Col.* 241 (1907); Bews, *Fl. Natal and Zululand* 198 (1921). *Plectronia hispida* Battiscombe, *Cat. Trees and Woody Pl. of Kenya Col.* 106 (1926), partim, non *Canthium hispidum* Benth. (1849). *Keetia transvaalensis* Phillips, *Gen. S. Afr. Fl. Pl.* 587 (1926), et in *Bothalia*, ii. 369 (1927). *Canthium hispidum* Robyns in *Notizblatt Bot. Gart. Berlin*, x. 616 (1929), non Benth. (1849).

A scandent shrub climbing over trees in the forest with fragrant white or creamy flowers. The mature leaves are glabrous on the upper surface, except on the midrib and lateral nerves; the tertiary veins are slightly impressed, a character which serves to distinguish this species from its several close allies.

UGANDA PROTECTORATE. Common. Exsicc.—*Snowden* 861; *Sc. Elliott* 7913.

KENYA COLONY. Common. Exsicc.—*Graham* 1757. *Battiscombe* 203. *R. E. & T. C. E. Fries* 1627; 1764. *Snowden* 634. *Rammell* 1078. *Dümmer* 1685. *Moon* 752. *Powell* 135. *Dale* 2423.

TANGANYIKA TERRITORY. Common. Exsicc.—*Thomson* s.n. *Burt* 960; 1752. *Swynnerton* 761 (B.M.). *Lynes D.g.* 122; *F.j.* 66; *F.r.* 51.

This is perhaps the most widely distributed species of *Canthium* in Africa. It ranges from Abyssinia and the Sudan southwards to the Transvaal and Natal, where it was collected by Dr. Gueinzus, and westwards through Rhodesia to Angola in the south, and to the Cameroons Mt. in the north. In altitude it ranges from near sea-level to about 8000 ft.

9. *Canthium hispidum* Benth. in *Hook. f. Nig. Fl.* 409 (1849); Hiern in *Oliv. Fl. Trop. Afr.* iii. 140 (1877); et *Cat. Welw. Afr. Pl.* i. 476 (1898); Hutch. et J. M. Dalz. *Fl. W. Trop. Afr.* ii. 115 (1931).—*Plectronia hispida* (Benth.) K. Schum. in *Engl. Pflanzenw. Ost-Afr.* C. 386 (1895), saltem partim; K. Krause in *Mildbr. Wiss. Ergebn. Deutsch. Zentr.-Afr. Exped.* 1907-8, ii. 326 (1914); K. Krause in *R. E. Fries, Wiss. Ergebn. Schwed. Rhod.-Kongo Exped.* 1911-12, i. Nachtr. 15 (1921), incl. var. *glabrescens* K. Schum.

TANGANYIKA TERRITORY. Derema, Usambara, *Scheffler* 193. Sigi, March, *Soleman* 5933. Amani, 3000 ft., a common climber in the forest, flowers cream, Apr., *Burt* 426. Lvani, Jan., *Braun* 1030 (Am.); Oct., *Engler* 3363 (Am.). Monga, Feb., *Zimmermann* 6109 (Am.); 6110.

Also in Rhodesia, westwards and northwards through the Belgian Congo and Upper Guinea, but apparently not occurring further north on the eastern side of Africa, where it is entirely replaced by *C. Gueinzi* Sond. A number of specimens not referable to either *C. Gueinzii* or *C. hispidum*, *sensu stricto*, have been seen, of which the following are examples.—Kymbila District, *Stolz* 577. Moshi Rain Forest, 2300 ft., Jan., *Lewis* 216, Amani, "*Herb. Amani*." 390. Amani, Apr., *Braun* 1862 (Am.).

10. *Canthium charadrophilum* (K. Krause) Bullock, comb. nov.—*Plectronia charadrophila* K. Krause in *Engl. Bot. Jahrb.* lvii. 36 (1920).

TANGANYIKA TERRITORY. Bundeli Mts., Kymbila District, 4000 ft., a scrambling shrub 30 ft. high, with yellowish flowers, growing at the edge of the forest, Oct., *Stolz* 124 (type, Ber.).

This species is readily distinguished from the following by its very lax habit. It is very closely allied to the preceding.

11. *Canthium sylvaticum* Hiern, *Cat. Welw. Afr. Pl.* i. 477 (1898).—*Plectronia silvatica* (Hiern) K. Schum. in *Just, Jahresb.* 1898, 393 (1900). *Plectronia cuspido-stipulata* K. Schum. ex *Engl.* in *Abh.*

* Camp 12 of the Aerial Survey of the Zambesi Basin, 1930.

Preuss. Akad. Wiss. (1894) 53, nomen. *Plectronia hispida* Battiscombe, Cat. Trees and Woody Pl. of Kenya Col. 106 (1926), partim, non K. Schum. (1895) et non *Canthium hispidum* Benth. (1849).

UGANDA PROTECTORATE. Victoria Nyanza: Sese Is.; Bungala Is., 3700 ft., Dec., *Maitland* 393; Bubembe Is., 3700 ft. Dec., *Mailland* 400; without exact locality, *Carpenter* 8; 11 (Jan. 1913). Entebbe, a common plant at the edge of the forest, Oct., *Mailland* 174. Changa, Feb., *Sc. Elliott* 7192. Toro District; Ibanda Hill, Nov., *Maitland ex Liebenberg* 1075.

KENYA COLONY. Shimba Hills, a climbing shrub with white flowers, *Gardner* 1435. Nyanza Basin, 4500–5000 ft., *Moon* 584.

TANGANYIKA TERRITORY. Mlalo, March, *Holst* 2426. Mt. Kilimanjaro: Mashani, 4000–5000 ft., a shrub with white flowers, Feb.–Apr. *Haarer* 189; 1030; Marangu, 5000 ft., Oct., *Volkens* 1105a; *Grote* 5070.

Also in Angola. Hiern described this species from one of Dr. Welwitsch's specimens (No. 3134). It is readily distinguished from *C. hispidum* and *C. Guinzii* by its discolourous leaves, with fine distinct reticulate venation on the lower surface.

12. ***Canthium Brownii* Bullock, sp. nov.**

Frutex scandens, ramis angulo recto patentibus subglabris pallide griseis, ramulis junioribus teretibus ferrugineo-pubescentibus glabrescentibus. *Folia* elliptica, apice breviter acuminate, basi cuneata vel acuta, 5–10 cm. longa, 3–5 cm. lata, costa et nervis lateralibus (utrinsecus 5–6) leviter adpresso-strigoso-pubescentia infra praesertim, petiolis ferrugineo-pubescentibus 7–10 mm. longis. *Cymae* dense multiflorae. *Calyx* pubescens, 4-dentatus. *Corolla* alabastro 3 mm. longa, 4-lobata. *Drupa* globosa vel didyma, loculis circiter 1.3 cm. diametro.

UGANDA PROTECTORATE. Entebbe, 3900 ft., a scrambling shrub with white flowers, June, *E. Brown* 233 (type). Kimuri, 4000 ft., a scandent shrub of the forest edge with white flowers, July, *Dümmer* 3238.

13. ***Canthium huillense* Hiern**, Cat. Welw. Afr., Pl. i. 476 (1898).—*Plectronia huillensis* (Hiern) K. Schum. in Just, Jahresb. 1898, 393 (1900). *Plectronia heliotropiodora* K. Schum. et K. Krause in Engl. Bot. Jahrb. xxxix. 540 (1907).

TANGANYIKA TERRITORY. Lake Tanganyika, Dec., *Bohm* 68. Mnemia, Kondoia-Irangi District, Dec., *Burt* 5395. Irangi, 6400 ft., common, March, *Lynes l.g.* 225a. Dodoma District, 4000 ft., a shrub in the *Berlinia* forest, Dec., *Burt* 994. Without exact locality, *Busse* 1295 (Am.).

The type of *Plectronia heliotropiodora* was collected by *Busse* (No. 875) in Ruanda. The leaves, which are very young, are very densely pubescent on both surfaces. There is no doubt, however, that it is conspecific.

Dr. Welwitsch's specimens (Nos. 3145; 3146) from Angola are almost glabrous, but otherwise indistinguishable from those cited above; the latter are also identical with the following Rhodesian and Transvaal specimens:—

RHODESIA. Katuba Stream, N.W. Rhodesia, on ant hills, Dec., *Kässner* 2258. Victoria Falls, a shrub 2–2½ ft. high, Jan., *Allen* 250. Salisbury, 4800 ft., *Eyles* 6175. Matopo Hills, Mar., *Eyles* 6306. Without exact locality, S. Rhodesia, Dec., *Jack in Herb.* *Eyles* 5052. Between Kubango and Kuibo, 4000 ft., Dec., *Baum* 502.

TRANSVAAL. Macalisberg, Dec., *Burke s.n.* Daspoort Rand, below River Redoubt, Oct., *Pole-Evans* 164. Woodstock, Rustenberg District, a tree 5–8 ft. high with masses of small cream flowers, Nov., *Pegler* 2002. Warm Baths, Waterberg District, Jan., *Burt* *Davy* 2328. Without locality, *Zeyher in Herb. Wallich.* 763.

14. ***Canthium venosum* (Oliv.) Hiern** in Oliv. Fl. Trop. Afr. iii. 144 (1877); Hutch. et J. M. Dalz. Fl. W. Trop. Afr. ii. 115 (1931). [Figure 1].—*Plectronia venosa* Oliv. in Trans. Linn. Soc. Lond. xxix. 85, t. 49 (1873). *Canthium venosum* var. *pubescens* Hiern, l.c. *Canthium Barteri* Hiern, l.c. 143. *Plectronia Barteri* (Hiern.) De Wild. et Th. Dur. in Ann. Mus. Congo, Sér. 2, i. pt. 2, 33 (1900). *Canthium sphaerocarpum* Schweinf., MS. in Herb. Mus. Brit. et Herb. Kew. *Plectronia myriantha* K. Krause in Mildbr. Wiss. Ergebn. Deutsch. Zentr.-Afr. Exped. 1907–8, ii. 327 (1911), non Schlect. et K. Krause in Engl. Bot. Jahrb. xl. Beibl. 92, 43 (1908).

UGANDA PROTECTORATE. Madi Woods, Dec., *Speke & Grant s.n.* (type). Kitamilo, Buvuma, Mar., *Maitland ex Liebenberg* 1266. Nile Distr., shrub 10–15 ft. high, *Dawe* 913. Sozi Point, Bugala Is., Sese, 3850 ft., a climbing shrub with green flowers, common in scrub forest, Nov., *Eggeling ex Brasnett* 255. Mabira Forest, Mulange, 4000 ft., Jan., *Dümmer* 4367. Mouth of Bakora R., a shrub with greenish-white flowers, Jan., *Bagshawe* 140 (B.M.).

TANGANYIKA TERRITORY. Longuza, Dec., *Zimmermann* 6116. Monga, Nov., *Zimmermann* 6117. Without exact locality, *Busse* 2620 (Am.).

Also in West Africa from Nigeria to French Guinea, Cameroons, Sudan, Congo, Northern Rhodesia and Angola (*Gossweiler* 1233). The single specimen of *C. sphaerocarpum* (*Schweinfurth* 1387) which has been seen at the British Museum Herbarium, is merely a narrow-leaved form of this species, but the Kew specimen of the same collection is quite typical in this respect, as also is *Schweinfurth* 2487 in the Kew Herbarium. A further specimen (*Broun* 43) from Bahr-el-Ghazal, has very large (up to 15 cm. long) leaves. A specimen collected by Hutchinson and Gillett (No. 3610) twenty-eight miles south of Broken Hill in Northern Rhodesia in July, 1930, has some leaves almost rotundate, but is nevertheless certainly referable to this species. Hutchinson and Gillett obtained typical specimens (No. 4051) six miles north of Kasama. The type of *P. myriantha* was collected by Dr. Mildbraed (No. 684) in the Virunga Mountains.



Fig. 1. *Canthium venosum* (Oliv.) Hiern; A, habit; B, flower; C, pistil and calyx; D, flower laid open; E, anther; F, infructescence; F', drupe in longitudinal section.

15. *Canthium syringodorum* (K. Schum.) Bullock, comb. nov.—*Plectronia syringodora* K. Schum. in Engl. Pflanzenw. Ost-Afr. C. 386 (1895).

TANGANYIKA TERRITORY. Karema, Lake Tanganyika, *Bohm 23a* (type, Ber.). Walla River, *Bohm 92a* (not seen, Ber.). Also in the Belgian Congo.

16. *Canthium zanzibaricum* Klotzsch in Peters, Reise Mossamb. Bot. 291 (1861); Hiern. in Oliv. Fl. Trop. Afr. iii. 138 (1877), incl. var. *glabristyle* Hiern, l.c. 139.—*Plectronia zanzibarica* (Klotzsch) Vatke. in Oesterr. Bot. Zeit. xxv. 231 (1875); Engl. in Abh. Preuss. Akad. Wiss. 26 (1894). *Canthium gracile* Hiern in Oliv. Fl. Trop. Afr. iii. 139 (1877), et Cat. Welw. Afr. Pl. i. 474 (1898). ? *Plectronia subcordata* K. Schum. in Engl. Pflanzenw. Ost-Afr. C. 386 (1895), non *Canthium subcordatum* DC. Prodr. iv. 473 (1830). *Canthium tenuiflorum* Welw. ex Hiern, Cat. Welw. Afr. Pl. i. 477 (1898). *Plectronia tenuiflora* (Hiern) K. Schum in Just, Jahresb. 1898, 393 (1900).

UGANDA PROTECTORATE. Masaka, Kyotira District, a rambler, Oct., *Mailland 852*. Toro, 5000 ft., *Snowden 42*. Buddu, 4000 ft., *Dawe 33*.

KENYA COLONY. Mombasa, *Wakefield s.n.* Rabai Ravine, Fimboni, Nov., *Taylor s.n.* (B.M.).

TANGANYIKA TERRITORY. Amboni, *Holst 2721*; *Kässner 5*; *Braun 3495* (Am.). Without exact locality, *Marshall 39*. Kivindani, March, *Braun 1557* (Am.); *Stuhlmann 8320* (Am.).

ZANZIBAR IS. A very common scrambling shrub with white flowers. Exsicc.—*Hildebrandt 1157*; *Kirk 55*; *s.n.*; *Kuntze s.n.*; *Greenway 1266*; *Taylor 18/2*; *24/3*; *Vaughan 1518*.

PEMBA IS. Ole, a straggling shrub with white flowers, *Vaughan 288* (B.M.). Makongwe Isl., a very common white-flowered shrub with an unpleasant odour, Feb., *Greenway 1412*.

Also in Angola. The Zanzibar specimens are very constant in all characters except the degree of hairiness of the style, and it becomes necessary to discard Hiern's var. *glabristyle*. On the mainland variation is more pronounced, and the determinations of the Uganda specimens at any rate are to be regarded as merely tentative. A specimen collected by *Braun* (No. 5589, Herb. Amani.) in the Bukoba District, differs in its narrower leaves and more hairy inflorescence. This form also occurs in Uganda [*Changu, Sc. Elliott 7192* (B.M.)].

17. *Canthium rubrocostatum* Robyns in Notizblatt. Bot. Gart. Berlin, x. 616 (1929).

KENYA COLONY. Kiringa District, a small tree with sweet-scented flowers, Mar., *Fries 2107* (type). Solai Forest, 7800 ft., a medium-sized tree, *Gardner 1a* (Oxf.). Katimok Forest, Kamasa District, 7000–8000 ft., a tree 30 ft. or more high, growing as an understorey in the forest, with light grey bark and reddish leaves, Oct., *Dale 2437*. S.E. Mt. Elgon, 6500–7500 ft., a tree 20–30 ft. high, Dec. (fr.), *Jackson ex Lugard 322*.

TANGANYIKA TERRITORY. Dereima, Usambara, *Scheffler* 151.

The red colouration of the nerves on the lower surface of the leaves renders this species strikingly distinct. The red colour sometimes tinges the whole leaf, as indicated by Mr. Dale's notes above. Dr. Robyns allies this species to *C. Mannii* Hiern, a West African plant, but it is much more closely related to *C. vulgare* (*infra*) from which it is distinguished by the red colouration of the leaves and the larger, rather less numerous flowers.

18. **Canthium vulgare** (K. Schum.) Bullock, comb. nov.—*Plectronia vulgaris* K. Schum. in Engl. Pflanzenw. Ost-Afr. C. 386 (1895); K. Krause in Mildbr. Wiss. Ergebn. Deutsch. Zentr.-Afr. Exped. 1907-8, ii. 326 (1914). *Canthium golungense* Hiern, Cat. Welw. Afr. Pl. i. 478 (1898). *Canthium golungense* var. *parviflorum* S. Moore in Journ. Linn. Soc. Bot. xxxvii. 161 (1905). *Plectronia golungensis* (Hiern) K. Schum. in Just, Jahrb. 1898, 393 (1900).

UGANDA PROTECTORATE. Many localities, 3000-5000 ft., a tree of the forest, bush and grasslands 15-30 ft. high, or occasionally reduced to the stature of a small shrub, with profuse white flowers. Exsicc.—*Carpenter* 8 (July 1913). *Dümmer* 890; 1204. *Fyffe* 30. *Mailland* 69. *Sc. Elliot* 7220; 7418 (B.M.). *Snowden* 401; 1923. *Brasnett* 95; 418. *Bagshawe* 209 (B.M.); 1147 (B.M.).

KENYA COLONY. Mowesa, a somewhat scandent shrub, 10 ft., flowers white and scented, *Graham* 1823.

TANGANYIKA TERRITORY. Rubiri Forest, Bukira District, 4000 ft., a timber tree in the temperate rain forest, Nov., *Wigg* 315. Kome Is., Victoria Nyanza, 4000 ft., a heavily branched tree used for knee-pieces for dhows, April, *Bancroft* 181. Amboni, July, *Holst* 2717. Without exact locality, river junction, on bushy slopes, a shrub 4-6 ft. high, Aug., *Mildbraed* 682 (Ber.). Bukoba, Feb., April, *Stuhlmann* 1060; 1547; 3242; 3620; 3750; 3978 (cited by K. Schumann—not seen—Ber.). Muansa, *Stuhlmann* 4661 (Ber.). Victoria Nyanza coast, Speke Gulf, common among granite rock boulder kopjes, 3740 ft., an evergreen shrub with minute flowers, June, *Burt* 2470.

Also in Gazaland (*Swynnerton* 6211 at the British Museum), the Belgian Congo, Angola and Southern Nigeria (*Mailland* 1721), and probably also in French Guinea and Sierra Leone. This species was described from Dr. Stuhlmann's specimens, and there is no doubt that these are identical with *C. golungense* var. *parviflorum* described by Spencer Moore from Dr. Bagshawe's Uganda plant. Whether the writer is correct in reducing Hiern's Angolan *C. golungense* is more debatable. The only difference observed is in the rather laxer habit and generally somewhat larger leaves of the Angolan plant, both characters which might be expected in a shade form. Two other specimens, one from French Guinea (*Pobeguini* 704) labelled "*Canthium* sp." in the Kew Herbarium and one from Sierra Leone (*Deighton* 1199) labelled "*Canthium horizontale*" in the British Museum Herbarium, seem to be referable to this species.

They differ from the Angolan plants only in the rather more densely pubescent inflorescence. The notes attached to these two sheets are appended in full, since they greatly extend the hitherto known range of this species.

Pobeguini 704:—French Guinea; Juin, 1901; "Arbre moyen de 10 a 12 m. de haut; feuillage vert vonce brillant; fleurs nombreuses, blanches, odorantes." *Deighton* 1199:—Sierra Leone; "tree 15 ft.; fls. white, unpleasant smell."

**C. vulgare* may be regarded as the nearest African ally of *C. didymum* Gaertn. from Malaya.

19. **Canthium melanophengos** Bullock, sp. nov.

Arbor magna, glabra, ramulis prominente 4-angularibus usque subteretibus, ramis pallide brunneis, lenticellis prominentibus longitudinaliter elongatis. *Folia* sicco fere nigra, supra nitida, anguste ovata, apice gradatim acuminata, basi plerumque rotundata, 6-10 cm. longa, 2.5-4.5 cm. lata, nervis lateralibus utrinsecus 7-8, petiolis 5-7 mm. longis. *Cymae* dense multiflorae. *Calyx* ut videtur subtruncatus. *Corolla* non visa. *Drupae* plerumque abortu 1-loculares, numerosae, globosae, 7-9 mm. diametro.

KENYA COLONY. Morigo's and Tusu, Mt. Kenya, 6600-7000 ft., a large timber tree, *Rammell* 1054.

TANGANYIKA TERRITORY. Rukarara, Rugeji Forest, 6500 ft., a large tree with a tall straight trunk and very hard wood, Aug., *Mildbraed* 1015 (type, Ber.).

20. **Canthium bibracteatum** (Baker) Hiern in Oliv. Fl. Trop. Afr. iii. 145 (1877).—*Plectronia bibracteata* Baker, Fl. Maurit. 146 (1877).

KENYA COLONY. Kwale, a small tree with green flowers "with five red members" and pear-shaped, hard yellow fruits, *Graham* 1653.

TANGANYIKA TERRITORY. Amboni, June, *Holst* 2713. Dar-es-Salam, *Holtz* 319; 885; 2026; 2866 (all Ber.); *Braun* 885 (Ber.); *Stuhlmann* 6341 (Ber.); *Kruger* 16 (Ber.).

ZANZIBAR IS. Without notes, *Kirk* s.n. A common shrub with yellow berries, 6-10 ft. high, growing on coral rock in open and closed bush formations, Feb., *Greenway* 1309. Kurekive-Kilima Kzall, a shrub or small tree up to 15 ft. high, much branched, flowers cream, fruits eaten by natives, Dec., *Greenway* 2643. Without notes, *Vaughan* 1040; 1453; 1536.

Also in the Mascarene Islands. The *locus classicus* is Mauritius. So far as has been ascertained this is the only East African species of *Canthium* which occurs so far away from the mainland; it is also one of the most constant in its specific characters.

21. **Canthium sclerocarpum** (K. Schum.) Bullock, comb. nov.—*Plectronia sclerocarpha* K. Schum. in Engl. Bot. Jahrb. xxxiv. 334 (1904).

TANGANYIKA TERRITORY. Lungusa, East Usambara, 300-550 ft. Sept., *Engler* 389 (type, Ber.).

This species is very closely allied to *C. Afzelianum* Hiern, described from a Sierra Leone plant collected by Afzelius, and later recorded from the Anglo-Egyptian Sudan (Brown s.n.; *Snowden* 1703). A specimen from N. Rhodesia (Macaulay 835, from Mumbwa) differs from *C. Afzelianum* in the more hairy inflorescence and somewhat longer and less coriaceous stipules. Further material will probably disclose that these plants and *C. sclerocarpum* are identical. *C. congense* described by Hiern from "Lower Guinea, Congo" (Chr. Smith s.n., at B.M.) may also belong here.

22. **Canthium Stuhlmannii** Bullock, sp. nov.

Frutex vel *arbor* glabra. *Folia* late elliptica, apice vix acuminata, basi late rotundata, 7-8 cm. longa, 3.5-5 cm. lata, paullo discoloria, petiolis usque 1 cm. longis; stipulae longe subulatae, basi latae, *Cymae* ut videtur pauciflorae. *Drupa* unilocularis, ellipsoidea, 3 cm. longa, 2 cm. lata.

TANGANYIKA TERRITORY. Usaramo, Stuhlmann 7007 (type, Ber.).

This is perhaps the most imperfectly known of all the new species described here; it is included merely for the record, but will need to be redescribed when more complete material becomes available.

23. **Canthium ruwenzoriense** Bullock, sp. nov.

Frutex vel *arbor* parva, glabra, 2-4 m. alta. *Folia* ovata vel oblongo-elliptica, apice abrupte et obtuse acuminate, basi acuta vel breviter cuneata, 11-14 cm. longa, 4-6 cm. lata, paullo discoloria, nervis lateralibus utrinsecus circiter 5, petiolis usque 1 cm. longis; stipulae 6 mm. longae, subulatae, basi latae, mox deciduae. *Cymae* circiter 10-florae, pedunculis 1-1.5 cm. longis, pedicellis 3-4 mm. longis unilateraliter pilosis. *Calyx* 5-lobatus, lobis anguste triangularibus. *Corolla* alabastro 5 mm. longa, apice acuta. *Drupa* non visa.

UGANDA PROTECTORATE. Butagu Valley, W. Ruwenzori, 6000-7000 ft., a shrubby tree 8-12 ft. high with bluish-green leaves and greenish flowers, Feb., *Mildbraed* 2692 (type, Ber.).

24. **Canthium captum** Bullock, sp. nov.

Frutex vel *arbor* parva, omnino glabra, 2-4 m. alta, ramulis teretibus adscendentibus atratis, ramis vetustioribus cortice pallide flavo. *Folia* elliptica vel oblongo-elliptica, apice obtuse longe acuminata, basi plerumque cuneata, 4-7.5 cm. longa, 2-3 cm. lata, nervis lateralibus utrinsecus circiter 6, supra nitide flavido-viridia, infra griseo-viridia, petiolis circiter 5-8 mm. longis; stipulae subsistentes, vix lignosae, subulatae, basi latae. *Cymae* usque 12-florae, pedunculis circiter 8 mm. longis, pedicellis usque 6 mm. longis. *Calyx* profunde 5-lobatus, lobis patentibus triangularibus 1.5 mm. longis. *Corolla* (non visa) "luteo-viridis." *Drupa* saepe 2-locularis, ellipsoidea vel leviter compressa, circiter 1.5 cm. diametro.

TANGANYIKA TERRITORY. Kyimbila District: in the bamboo forest, a shrub about 6 ft. high with greenish-yellow flowers, glossy leaves, green with a yellowish tinge above, greyish-green below, ovary brown, Nov., *Stolz* 2293 (type); Bundali, 6200 ft., a shrubby tree 12-14 ft. high, with glossy greyish fruits $\frac{3}{8}$ in. in diameter, with white dots, the leaves glossy, dark green with a yellowish tinge, March, *Stolz* 2558. Usambara: Kwai, Makambaberg, *Holtz* 792a (Ber.); 828 (Ber.).

This is very closely allied to the Abyssinian *C. oligocarpum* Hiern, the resemblance being particularly noticeable in the Holtz specimens cited.

25. **Canthium kenienne** Bullock, sp. nov.

Arbor parva, 8-10 m. alta, omnino glabra, ramulis teretibus laevibus elongatis multifoliatis, cortice demum pallido et deciduo. *Folia* elliptica usque ovata, apice acuminata, basi rotundata usque cuneata, usque 12 cm. longa et 6.5 cm. lata, nervis lateralibus utrinsecus 4-6; stipulae persistentes, longe acuminatae, usque 2 cm. longae. *Cymae* circiter 12-20-florae, ramulis leviter pilosis, pedunculis usque 1 cm. longis. *Calyx* minutus, truncatus vel obsolete undulato-denticulatus. *Corolla* 4 mm. longa, 5-loba, tubo 2 mm. longo, lobis patentibus vel reflexis 2 mm. longis. *Drupa* abortu 1-locularis, oblongo-elliptica, 1.3 cm. longa.

KENYA COLONY. Nairobi to Kikuyu, 5500-7000 ft., common, a small tree, 25-30 ft. high, *Battiscombe* 872. Ngong, 5500 ft., *MacDonald* 830. Arabuko, a small deciduous shrub or tree with green flowers, growing as an understory in the *Brachystegia* forest, *Graham* 1711. Without exact locality, *Conservator of Forests* (1926) 28 (Oxf.).

26. **Canthium pseudoverticillatum** S. Moore in Journ. Bot. xliii. 352 (1903).—*Plectronia microterantha* K. Schum. et K. Krause in Engl. Bot. Jahrb. xxxix. 541 (1907).

KENYA COLONY. Shimba Hills, western slopes, 1500 ft., March, *Kässner* 383 (type); 416 (B.M.).

The verticillate appearance of the leaves in this species is due to the abbreviation of the opposite lateral branchlets. *Plectronia microterantha* was described from a specimen of the same number as S. Moore's type.

27. **Canthium Robynsianum** Bullock, sp. nov. [Figure 2].

Frutex erectus, glaber, cortice griseo-luteo, ramulis lateralibus brevibus 2-foliatis, internodiis brevissimis. *Folia* elliptica usque subrotundata, apice late et breviter acuminata, basi acuta vel subcuneata, 4-7 cm. longa, 2.5-4 cm. lata, chartacea, nervis lateralibus gracilibus utrinsecus 3-4, petiolis usque 7 mm. longis; stipulae longe subulatae, basibus persistentibus lignosis. *Cymae* 3-5-florae, brevissime gracilissime pedunculatae, pedicellis gracilibus 3 mm. longis. *Calyx* 5-triangulari-dentatus. *Corolla* alba, alabastro 2 mm. longa. *Fructus* non visus.



Fig. 2. *Canthium Robynsianum* Bullock; A, habit; B, flower; C, pistil and calyx; D, flower laid open; E, anther; F, stigma.

KENYA COLONY. Mida, Malindi District, a tall shrub of the forest edge, or in the bush, with small white flowers, March, *Graham 2341* (type).

Named after Dr. Robyns, of Brussels, in recognition of his monograph of the *Vanguerieae*.

28. *Canthium Siebenlistii* (K. Krause) Bullock, comb. nov.—*Plectronia Siebenlistii* K. Krause in Engl. Bot. Jahrb. lvii. 35 (1920).

TANGANYIKA TERRITORY. West Usambara, 4500–6500 ft., Dec., *Siebenlist s.n.* (type, Ber.). Near Monya, 3000 ft., March, *Grote 3755* (Am., Ber.). Magambarvald, Feb., *Holtz 1846* (Ber.).

This is a small savannah tree which, like the two following species, develops a thick bark which serves as a protection against fire.

29. *Canthium lactescens* Hiern, Cat. Welw. Afr. Pl. i. 511 (1898).—*Canthium crassum* Hiern in Oliv. Fl. Trop. Afr. iii. 145 (1877), partim, quoad spec. mittuense, excl. descr. *Canthium lactescens* var. *grandifolium* S. Moore in Journ. Linn. Soc. Bot. xxxvii. 161 (1905). *Plectronia lactescens* (Hiern) K. Schum. in Just, Jahresb. 1898, 393 (1900).

UGANDA PROTECTORATE. Ankole, 4500 ft., a small tree or shrub, *Dawe 376*. Near Mulema, June, *Bagshawe 329* (B.M.).

TANGANYIKA TERRITORY. Kondoa District, in a rocky ravine in the hills opposite Kola, a small tree with cream-coloured flowers, Feb., *Burt 1305*.

Also in Mittu-land (*Schweinfurth 1695*), Rhodesia and Angola. The Uganda specimens cited above belong to Spencer Moore's var. *grandifolium*, and they differ from the Angolan type (*Welwitsch 3157*) only in the large size and cordate base of the leaves. A form intermediate between the Uganda plants and the Angolan type occurs also in Angola (*Gossweiler 2405*) suggesting that these abnormal forms are merely specimens taken from very vigorous or pollard shoots. It seems likely also that *C. umbrosum* Hiern (Cat. Welw. Afr. Pl. i. 479; 1898), described from another of Dr. Welwitsch's Angolan plants (No. 2576) is merely a pubescent form of this species. *C. Welwitschii* Hiern may also be an abnormal form of this species.

30. *Canthium crassum* (Schweinf.) Hiern in Oliv. Fl. Trop. Afr. iii. 145 (1877), partim, quoad descr. et spec. djurense.—*Vangueria crassa* Schweinf. MS. *Canthium platyphyllum* Hiern, Cat. Welw. Afr. Pl. i. 479 (1898). *Plectronia platyphylla* (Hiern) K. Schum. in Just, Jahresb. 1898, 393 (1900). *Canthium opimum* S. Moore in Journ. Linn. Soc. Bot. xxxvii. 308 (1906); K. Krause in R. E. Fries, Wiss. Ergebn. Schwed. Rhod.-Kongo Exped. 1911–12, i. (Nachtr.) 15 (1921). *Canthium amplum* S. Moore in Journ. Bot. lvii. 87 (1919). *Canthium dictyophlebium* S. Moore l.c. *Plectronia*

III.—FASCICULATE SERIES.

buarica. Mildbr. in Notizblatt Bot. Gart. Berlin, ix. 203 (1924).
Plectronia opima (S. Moore) Mildbr. l.c. 204, in obs. *Plectronia opima*
 var. *sudanica* Mildbr. MS. in Herb. Kew.

TANGANYIKA TERRITORY. Kyimbila District, a shrub with
 greenish-yellow flowers and yellow edible fruits, Jan. (fl.), July (fr.),
Stolz 569; 1463. Urundi, Meyer 1806 (Ber., not seen).

Also in Djur-land, Eastern Sudan, Cameroons, Belgian Congo,
 Rhodesia, Shire Highlands (*Buchanan* 196; 223; s.n.) and Angola.
 According to Mr. Taylor, of the British Museum Herbarium, this
 species occurs also in Kenya Colony, but the writer has seen no
 specimen from this area. The numerous descriptions of this plant
 cited in synonymy above are perhaps due to its having been collected
 in different stages or in different habitats. The shortly tomentose
 lower surface of the leaves in *Canthium amplum* and *Plectronia*
buarica render this form strikingly distinct, but it seems certain that
 the indumentum soon falls off, leaving the typical form of *C. crassum*.
 The distribution of this form is interesting: *C. amplum*, N.-W.
 Rhodesia (*Rogers* 8446); *Plectronia buarica*, Cameroons; Buar,
 savannah of the Baja highlands (*Mildbraed* 9330; 9459). *C.*
platyphyllum is a further form with a lanate tomentum on the inflores-
 cence and young branchlets; this falls away and the plant develops
 a rusty red-coloured bark. It is an Angolan form (*Welwitsch* 2583).
 Of the remaining synonyms, *C. dictyophlebium* was collected by the
 Rev. F. A. Rogers (No. 10085) at Elisabethville in Katanga and is
 identical with specimens from Northern Rhodesia. An Angolan
 specimen (*Gossweiler* 1239) is also referable to this species. *Van-*
gueria crassa (*Schweinfurth* 1707), is from Djur-land, and is the type
 of this species.

Canthium crassum is a shrub or small tree occurring in the fire-
 swept grasslands of Tropical Africa. It develops a very thick,
 light bark, which serves as an extremely efficient protection against
 the intense heat of the grass fires. Specimens have been recently
 collected by Hutchinson and Gillett in N.-E. Rhodesia, while travelling
 with General Smuts's Botanical Expedition to Lake Tanganyika
 (1930), with the following notes: "No. 3691; a shrub 15 ft. in a
 moist dell in the *Brachystegia* forest, 5 miles E. of Chiwefwe." "No.
 3813; a shrub 8 ft. with green fruits, 30 miles N. of Kasama, alt.
 4500 ft." The fruits of the latter specimen must have been at least
 3.5 cm. in diameter when fresh.

31. ***Canthium subopacum*** (*K. Schum. et K. Krause*) *Bullock*,
 comb. nov.—*Plectronia subopaca* K. Schum. et K. Krause in Engl.
 Bot. Jahrb. xxxix. 538 (1907).

TANGANYIKA TERRITORY. Dar-es-Salam, Oct., *Stuhlmann* 233
 (type, Ber.).

A species remarkable for its inflorescence, first described as
 "fasciculate" but actually a sessile branched cyme which marks a
 close approach to the members of the following series.

*Flowers several in each fascicle:

Pedicels about 2.5 cm. long; leaves glabrous, broadly elliptic,
 3–5 cm. long, 2–3.5 cm. broad, rounded at the apex, decurrent
 to the base, venose reticulate above and below; calyx limb
 very small, denticulate; corolla about 7 mm. long in bud;
 style long-exserted.....32. *C. micans*

Pedicels 1–1.5 cm. long:

Corolla 10–12 mm. long in bud, anthers exserted; leaves
 ovate to obovate, 3–7 cm. long, 2–4.5 cm. broad, subacute
 to rounded at the apex, decurrent to the base, glabrous,
 shining above; calyx very small, subtruncate or denticu-
 late.....33. *C. Kaessneri*

Corolla 5–8 mm. long in bud:

†Pedicels glabrous:

Branchlets ascending; a small tree; leaves elliptic or
 oblong-elliptic, about 10 cm. long and 5 cm. broad,
 abruptly acuminate.....34. *C. clityophyllum*

Branchlets inserted at right-angles; scandent shrubs:

Drupe large, 1 or 2 maturing in each fascicle, often
 1-celled by abortion, each cell about 1 cm. diam.
 (when dry); leaves ovate, 6–10 cm. long, 3–6 cm.
 broad, shortly and abruptly acuminate, with about
 3 pairs of indistinct lateral nerves; stems becoming
 terete.....35. *C. egregium*

Drupe smaller, more numerous in each fascicle, each
 cell 4–5 mm. diam.:

Leaves shining above, oblong-ovate, up to 12 cm.
 long and 5.5 cm. broad, rather gradually acum-
 inate, rounded to acute at the base, with about
 5 pairs of lateral nerves; stems becoming
 terete.....36. *C. malacocarpum*

Leaves dull above, elliptic, 6–8 cm. long, 3–4.5 cm.
 broad, very abruptly acuminate (acumen about
 1 cm. long), acute or cuneate at the base, with
 3–4 pairs of lateral nerves; stems 4-angled,
 deeply furrowed.....37. *C. lacus-Victoriae*

††Pedicels densely puberulous; trees or erect shrubs:

Corolla acute in bud; leaves ovate or ovate-lanceolate,
 gradually and acutely acuminate, acute at the base,
 about 6 cm. long and 3 cm. broad; pedicels up to
 1.5 cm. long; calyx-lobes broadly ovate; corolla 6 mm.
 long in bud; bark pale greyish brown...38. *C. euryoides*
 Corolla rounded in bud; leaves very much as in *C.*
euryoides, but scarcely acute; pedicels about 1 cm.
 long; calyx subtruncate or undulately lobed; corolla
 6 mm. long in bud; bark dark-coloured.....

39. *C. Schimperianum*

**Flowers 2-4 in each fascicle, or solitary :

Leaf margins not recurved; erect shrubs or trees with ascending branches; leaves pubescent above and below, ovate to ovate-lanceolate, apex subacute, rounded at the base, about 2-4 cm. long and 1-2 cm. broad; flowers solitary; calyx deeply dentate; ovary and young fruit clothed with a golden pubescence; internodes about 5 mm. long (see also in the *Pedunculate Series* above)....2. *C. telidosma*

Leaf margins recurved; usually a scandent shrub with the branchlets inserted at right-angles; leaves elliptic to ovate, apex obtuse to rounded, rounded to subcordate at the base, 2.5-4 cm. long, 1.5-2 cm. broad, glabrous, shining above, margins recurved; flowers in fascicles of 2-4; calyx obtusely 5-denticulate; corolla 7 mm. long.....40. *C. recurvifolium*

32. **Canthium micans** Bullock, nom. nov. — *Plectronia lamprophylla* K. Schum. in Engl. Bot. Jahrb. xxiv. 335 (1904); K. Krause in R. E. Fries, Wiss. Ergebn. Schwed. Rhod.-Kongo Exped. 1911-12, i. (Nachtr.) 14 (1931); non *Canthium lamprophyllum* F. Muell. Fragm. ii. 133 (1860-61); *Plectronia nitens* K. Schum. in Engl. Pflanzenw. Ost-Afr. C. 385 (1895).

TANGANYIKA TERRITORY. Dar-es-Salam, a shrub 6-10 ft. high, Nov., Engler 2127 (type, Ber.).

Also in Northern Rhodesia (Fries 1852, fide K. Krause, l.c. not seen). The very long pedicels render this species strikingly distinct. K. Schumann first considered this species to be identical with *Canthium nitens* Hiern (not of DC.), but later corrected this mistake when he described *Plectronia lamprophylla*. *Canthium nitens* appears here under the new name *C. euryoides*.

33. **Canthium Kaessneri** S. Moore in Journ. Bot. xliii. 351 (1905). [Figure 3].—*Plectronia longistaminea* K. Schum. et K. Krause in Engl. Bot. Jahrb. xxxix. 542 (1907).

KENYA COLONY. Near Gadu, 300 ft., March, Kässner 418 (type).

TANGANYIKA TERRITORY. Without exact locality, Busse 556 (Am.).

Also in Portuguese East Africa (Msalu River-mouth, Lake Nyasa, a small bush 6 ft. high, on river banks, Feb., Allen 119). Schumann and Krause described *Plectronia longistaminea* from Kässner 418, the number which Spencer Moore had described two years previously. The large corolla and exserted stamens with comparatively long filaments are not closely paralleled among East African species of the genus.

34. **Canthium clityophyllum** Bullock, sp. nov.

Arbor parva, glabra. Folia elliptica vel oblongo-elliptica, apice abrupte acuminata, basi rotundata, 10-12 cm. longa, 3.5-5.5 cm. lata, nervis lateralibus utrinsecus circiter 4 supra prominentibus petiolis 5 mm. longis; stipulae deciduae, anguste oblongae, basi latae,



Fig. 3. *Canthium Kaessneri* S. Moore; A, habit; B, flower; C, pistil and calyx; D, flower laid open; E, anther.

circiter 5 mm. longae. *Fasciculi* pro rata pauciflori. *Calyx* 5-denticulatus. *Corolla* alabastro leviter apiculata, 3 mm. longa, sub anthesin 5-lobata. *Drupa* didyma vel loculo altero abortivo globosa, loculis circiter 8 mm. diametro.

TANGANYIKA TERRITORY. Tana, Uluguru, 2000 ft., in clearings on mountain slopes, a small tree, Oct., *Stuhlmann* 8928 (type, Ber.).

35. ***Canthium egregium* Bullock**, sp. nov.

Frutex vel arbor parva, glabra, usque 4 m. alta, ramulis gracilibus adscendentibus vel patentibus. *Folia* elliptica, apice abrupte acuminata, basi subacuta usque rotundata, 6-10 cm. longa, 3-6 cm. lata, supra nitida, nervis lateralibus inconspicuis utrinsecus 4. *Fasciculi* pro rata pauciflori. *Calyx* 5-lobatus, lobis triangularibus. *Corolla* non visa. *Drupa* didyma vel loculo altero abortivo globosa loculis usque 2 cm. diametro.

TANGANYIKA TERRITORY. Kymbila District, 3500 ft., a climbing shrub 12 ft. high, without flowers, fruit glossy, glaucous green, leaves pale green on both surfaces, stem greenish brown but not shining, March, *Stolz* 1914 (type, Ber.).

A species remarkable for the large size of its fruits, some of the two-celled examples being nearly 5 cm. across.

36. ***Canthium malacocarpum* (K. Schum. et K. Krause) Bullock**, comb. nov.—*Plectronia malacocarpa* K. Schum. et K. Krause in Engl. Bot. Jahrb. xxxix. 540 (1907).

TANGANYIKA TERRITORY. Ischana, Nov., *Stolz* 92 (type, Ber.). Kymbila District, Dec., *Stolz* 1764.

Also in N.E. Rhodesia ("a climber in patches of forest by the river E. of Chiwele, 15 July, 1930, *Hutchinson & Gillett* 3693") and in N. W. Rhodesia ("Solwezi Distr., evergreen vegetation by Mbulungu Stream near Mutanda Bridge, shrub 18 ft. high, with unripe fruit, June, 1930, *Milne-Redhead* 629").

37. ***Canthium lacus-Victoriae* Bullock**, sp. nov.

Frutex scandens glaber, ramulis acute 4-angularibus. *Folia* elliptica, apice abrupte longe acuminata (acumine 1-1.5 cm. longo), basi acuta vel subrotundata, 7-8 cm. longa, 3.5-4.5 cm. lata, nervis lateralibus indistinctis utrinsecus 4, petiolis circiter 7 mm. longis. *Fasciculi* multiflori. *Flores* non visi. *Drupa* bilocularis vel abortu unilocularis, loculis globosis circiter 7 mm. diametro.

UGANDA PROTECTORATE. Victoria Nyanza; Sese Is., Sozi Is., 3700 ft., on the edge of the forest, Dec., *Maitland* 399; 424 (type). Entebbe, 3900 ft., common in the lakeshore forest, a bush up to 12 ft. high, with black fruits, Oct., *Eggeling ex Brasnett* 205.

38. ***Canthium euryoides* Bullock ex Hutch. et J. M. Dalz.** Fl. W. Trop. Afr. ii. 113 (1931)*.—*Canthium nitens* Hiern in Oliv. Fl. Trop. Afr. iii. 135 (1877), non DC. Prodr. iv. 474 (1830), nec *Plectronia*

* This name was published as follows: ***C. euryoides* Bullock** in Kew Bull. 1931, ined.

nitens K. Schum. in Engl. Pflanzenw. Ost-Afr. C. 385 (1895). *Plectronia lucida* De Wild. et Th. Dur. in Ann. Mus. Congo, Ser. 2, i. II. 33 (1900), non K. Schum. et K. Krause in Engl. Bot. Jahrb. xxxix. 537 (1907), nec *Canthium lucidum* R. Br. (1814). *Canthium Schimperianum* S. Moore in Journ. Linn. Soc. Bot. xxxvii. 161 (1905), non A. Rich. (1847).

UGANDA PROTECTORATE. Kagera Valley, May, *Bagshawe* 282 (B.M.).

*KENYA COLONY. Without exact locality, 6000-7500 ft., in dry country, *Battiscombe* 84.

TANGANYIKA TERRITORY. Maschana, Usambara, March, *Holst* 8868.

Also in Southern Nigeria (*Barter* 2114), the *locus classicus* of Hiern's species, and in the Lake Kivu and Lake Albert areas of the Congo (*Kässner* 3152; 3261). I have not seen *Dewèvre* 657, the type of *P. lucida*, from the Congo, but from the description I believe it should be placed here.

39. ***Canthium Schimperianum* A. Rich.** Fl. Abyss. i. 350 (1847); Hiern in Oliv. Fl. Trop. Afr. iii. 135 (1877); Robyns in Notizblatt Bot. Gart. Berlin, x. 617 (1929).—*Canthium lucidum* R. Br. in Salt, Abyss. p. lxvii. (1814), nomen, non Schlecht. ex Hook. f. Fl. Brit. Ind. iii. 132 (1880), nec Hook. et Arn. Bot. Beech. Voy. 65 (1830), et non *Plectronia lucida* De Wild et Th. Dur. (1900). *Phallaria Schimperiana* (A. Rich.) Vatke in Linnaea, xl. 195 (1876); Engl. Hochgebirgsfl. Trop. Afr. 399 (1892); K. Schum in Engl. et Prantl, Nat. Pflanzenfam. iv. Abt. 4, 92, fig. 33, E-F (1897); Battiscombe, Trees and Woody Pl. of Kenya Col. 106 (1926). *Canthium myrtifolium* S. Moore in Journ. Bot. 266 (1907).

UGANDA PROTECTORATE. Forest near the mouth of the R. Mpanga, Toro, 3800 ft., Aug., *Bagshawe* 1152 (B.M.).

KENYA COLONY. Arabuko, a fairly tall forest tree, attaining a diameter of 2 ft., with numerous white flowers, dark-coloured rough bark with many longitudinal slits, and yielding a whitish hardwood said to be almost as good as *Brachychlaena*, June, *Graham* 1995. Without exact locality, a small tree, Jan., *Fries* 1055. Nairobi, Nyeri, 5500 ft., a medium sized tree in the *Brachychlaena* forest, *Gardner* 115 (Oxf.). (Also *Fries* 247; 883 fide Robyns, l.c.—not seen.)

TANGANYIKA TERRITORY. Iringa, 6400 ft., a common small tree, March, *Lynes l.h.* 255.

Also in Abyssinia. According to Battiscombe (l.c.) this tree produces hard, easily-worked timber, and is common near Nairobi and in the Nandi Cedar forests.

40. ***Canthium recurvifolium* Bullock**, sp. nov.

Frutex scandens vel erectus, glaber, 3-5 m. altus, ramis teretibus angulo recto patentibus vel adscendentibus, ramulis primum

puberulis. *Folia* elliptica vel ovata, apice rotundata, basi rotundata vel subcordata, 2.5–6 cm. longa, 1.5–3.5 cm. lata, supra nitida, marginibus recurvis, petiolis brevissimis; stipulae anguste oblongae, 5 mm. longae, glabrae, mox deciduae. *Fasciculi* 2–4-flori, pedicellis 1 cm. longis parce puberulis. *Calyx* 3 mm. longus, limbo 5-lobato, lobis parce puberulis. *Corolla* alabastro apice acuta, 7–8 mm. longa, 5 lobata, lobis 3.5 mm. longis. *Drupa* 2-locularis vel abortu 1-locularis, compressa, ambitu obovata, 7 mm. longa, pedicello usque 2 cm. elongato parte superiore incrassato.

KENYA COLONY. Mowesa, a scandent shrub growing near the edge of the swamp, the twigs inserted at right-angles, with white or cream flowers, *Graham* 1751.

PEMBA IS. Bank of Chake-Chake Creek, a scandent shrub with white flowers growing over bushes and small trees on the cliff face in yellow sand, not common, Dec., *Greenway* 2781 (type). Ras Mkumbuu, a much branched shrub with stiff erect branches growing in sand near the sea shore above high water mark, fairly common, Dec., *Greenway* 2775.

This is the only species occurring in East Africa which shows a definitely recurved leaf-margin, though a tendency in this direction is sometimes seen in small, ill-nourished examples of *C. Schimperianum*. Like many other species, its habit is erect with ascending branchlets when there is no other vegetation near by suitable for it to show its more usual scrambling habit. In the latter case, the branchlets are inserted at right-angles.

IV.—ANOMALOUS SERIES.

Internodes very short; leaves rather small, narrowly oblong-elliptic to elliptic, usually about 2–2.5 cm. long and up to 1 cm. broad, but sometimes attaining 3–4.5 cm. long and 2 cm. broad, apex obtuse, base subacute; fascicles 3–6-flowered; corolla 2–2.5 mm. long.....41. *C. Greenwayi*

Internodes rarely less than 1 cm. long, usually much longer; leaves larger than above:

Flowers several:

Branchlets and stipules rusty-pubescent; leaves glabrescent, but petioles persistently pubescent; otherwise very much as in *C. pallidum* (below).....42. *C. Diplodiscus*

Branchlets, etc., quite glabrous; leaves oblong-elliptic to ovate or obovate, apex rounded to acute, rounded or abruptly acute at the base, usually up to about 7 cm. long and 4 cm. broad.....43. *C. pallidum*

Flowers solitary:

Pedicels up to 2 cm. long; leaves oblong or somewhat obovate-oblong, rounded at the apex, subtruncate at the base, up to 8 cm. long and 3 cm. broad; calyx-lobes glabrous, lanceolate, about 4 mm. long...44. *C. mombazense*

Pedicels 1 cm. long or less; leaves ovate, obovate or elliptic, apex very obtuse or rounded, rounded to somewhat subcordate at the base, 2.5–4.5 cm. long, 1.5–2.5 cm. broad; calyx-lobes glabrous, lanceolate, about 1.5 mm. long.....45. *C. inopinatum*

41. *Canthium Greenwayi* Bullock, sp. nov.

Frutex parvus, glaber, ramosissimus. *Folia* elliptica vel ovata, 1.3–3.5 cm. longa, 0.5–1.5 cm. lata (raro usque 4.5 cm. longa et 2 cm. lata), coriacea, petiolis 1.5 mm. longis; stipulae lanceolatae, usque 5 mm. longae, membranaceae, mox deciduae. *Flores* 3–6, in axillis fasciculatis, pedicellis 5–7 mm. longis. *Calyx* profunde dentatus, dentis triangularibus 1 mm. longis. *Corolla* caduca, alabastro 2 mm. longa, apice minutissime apiculata. *Drupa* non visa.

TANGANYIKA TERRITORY. Kisuani, S.E. Pares, 3000 ft., a small much branched shrub with greenish flowers, growing in shade in sandy soil on a rocky mountain slope, not common, Feb., *Greenway* 2179.

42. *Canthium Diplodiscus* (K. Schum.) Bullock, comb. nov.—*Plectronia Diplodiscus* K. Schum. in Engl. Pflanzenw. Ost-Afr. C. 385 (1895).

TANGANYIKA TERRITORY. Mlalo, Usambara, April, *Holst* 583 (type, Ber.).

43. *Canthium pallidum* (K. Schum.) Bullock, comb. nov. [Figure 4].—*Plectronia pallida* K. Schum. in Engl. Bot. Jahrb. xxviii. 77 (1899).

KENYA COLONY. Arabuko, a shrub 10 ft. high forming undergrowth in the forest, with greenish-white flowers which fall to pieces very soon after opening, or a small tree up to 20 ft. high in the bushland, *Graham* 1968; 2340. Mwachi, a small tree up to 12 ft. high with white flowers, growing as undergrowth in the forest or in the bush, *Graham* 1762. Mida, a shrub or small tree of the undergrowth, with white flowers, *Elliot* 1544. Without locality, a shrub of the coast forests, *Battiscombe* 170.

ZANZIBAR IS. Mangapwani, a small shrub with greenish inconspicuous flowers growing on the cliff top in coral rock, Jan., *Greenway* 1151. Without locality, Jan., *Stuhlmann* 487 (type, Ber.). Without notes, *Vaughan* 1780.

44. *Canthium mombazense* Baill. in Baill. Adans. xii. 188 (1878).

KENYA COLONY. Mombasa, *Boivin s.n.* (type, Paris).

PEMBA IS. Ras Mkumbuu, a much-branched shrub up to 15 ft. high, with lax branches and small greenish white flowers, growing near the seashore above high-water mark, Dec., *Greenway* 2774. Pemba Is., Oct., *Burt Davy* 22460 (Oxf.). Pansa Is. (S.W. of Pemba Is.). A shrub growing in the shade of taller trees, not common, Feb., *Greenway* 1410.

The type of this species was collected during Boivin's journey of 1847–52.



Fig. 4. *Canthium pallidum* (K. Schum.) Bullock; A, habit; B, flower; C, pistil and calyx; D, flower laid open; E, anther.

45. *Canthium inopinatum* Bullock, sp. nov.

Frutex erectus (vel arbor parva?), glaber, ramis subpatentibus leviter striatis, internodiis circiter 1-2 cm. longis. *Folia* ovata vel obovata vel elliptica, apice valde obtusa vel rotundata, basi rotundata usque subcordata, 2.5-4.5 cm. longa, 1.5-2.5 cm. lata, petiolis 1-2 mm. longis; stipulae oblongo-lanceolatae, acutae, membranaceae, 5 mm. longae. *Flores* in axillis solitarii, pedicellis 5-8 mm. longis. *Calyx* campanulatus, 3 mm. longus, profunde 5-lobatus, lobis glabris lanceolatis 1.5 mm. longis. *Corolla* apiculata. *Drupa* non visa.

TANGANYIKA TERRITORY. Ukambane, Nov., *Sc. Elliot* 6380. Closely allied to the preceding, on account of its solitary flowers, though differing in leaf-shape, the shorter pedicels and smaller flowers, this species shows evident affinity with both *C. pallidum* and *C. Diplodiscus*, both of which, however, have several flowers in axillary fascicles.

EXCLUDED SPECIES.

1. *Plectronia xanthotricha* K. Schum. in Engl. Bot. Jahrb. xxxiv. 335 (1904), is perhaps better referred to *Hutchinsonia* Robyns, under the name ***H. xanthotricha*** (K. Schum.) Bullock, comb. nov.

2. *Plectronia bugoyensis* K. Krause in Mildbr. Wiss. Ergebn. Deutsch. Zentr.-Afr. Exped., 1907-8, ii. 327 (1911), is congeneric with the preceding, and a new combination, ***Hutchinsonia bugoyensis*** (K. Krause) Bullock, is therefore made for it.

The two species above have much shorter corolla-tubes than the two West African plants on which Dr. Robyns founded the genus. Some slight modification of the generic characters is therefore necessary.

3. *Plectronia kidaria* K. Schum. et K. Krause in Engl. Bot. Jahrb. xxxix. 537 (1907), is ***Rytigynia kidaria*** (K. Schum. et K. Krause) Bullock, comb. nov.

4. *Plectronia amaniensis* K. Krause in Engl. Bot. Jahrb. xliii. 142 (1909), is ***Rytigynia amaniensis*** (K. Krause) Bullock, comb. nov.

5. *Plectronia Eickii* K. Schum. et K. Krause in Engl. Bot. Jahrb. xxxix. 538 (1907), is ***Rytigynia Eickii*** (K. Schum. et K. Krause) Bullock, comb. nov.

6. *Canthium phyllanthoideum* Baill. in Baill. Adans. xii. 220 (1878), is ***Rytigynia phyllanthoidea*** (Baill.) Bullock, comb. nov.

7. *Canthium didymocarpum* Peters MS. in Herb. Amani. is better placed in *Rytigynia* (Zimmermann G. 6107, from Longuza).

8. *Canthium pubipes* S. Moore in Journ. Bot. xliii. 352 (1905), is a Rubiaceae plant which I exclude from *Canthium* on account of its terminal inflorescence. It may be a species of *Psychotria*, but the material is scarcely sufficient to decide the point.

LII.—RESEARCHES ON *SILENE MARITIMA* AND *S. VULGARIS: X. INVESTIGATION OF THE VASCULAR ANATOMY OF THE FLOWERS OF *SILENE MARITIMA*. C. A. PRATT (Imperial College of Science and Technology).**

The material on which this investigation is based was collected at Potterne from numbered plants of *Silene maritima*. Flowers of these plants were examined anatomically in order to substantiate, if possible, the suggestion put forward by R. O. Whyte (Nature, cxxiii. 113: 1929 and Journ. Genetics, xxiii. 109: 1930) that the sexual and petal differences exhibited might be due to, or at least correlated with, variations in the vascular anatomy ("vascular bundle supply") of the flowers.

Some of the flowers investigated showed poor petal development, others deficient anther development (functionally female), and some were defective in both respects.

This material was derived from the following plants:—

N 16 (=A 13 selfed) Plant 1—Poor petals and anthers deficient.

N 16 (=A 13 selfed) Plant 3—Poor petals and normal anthers.

A 13—Poor petals.

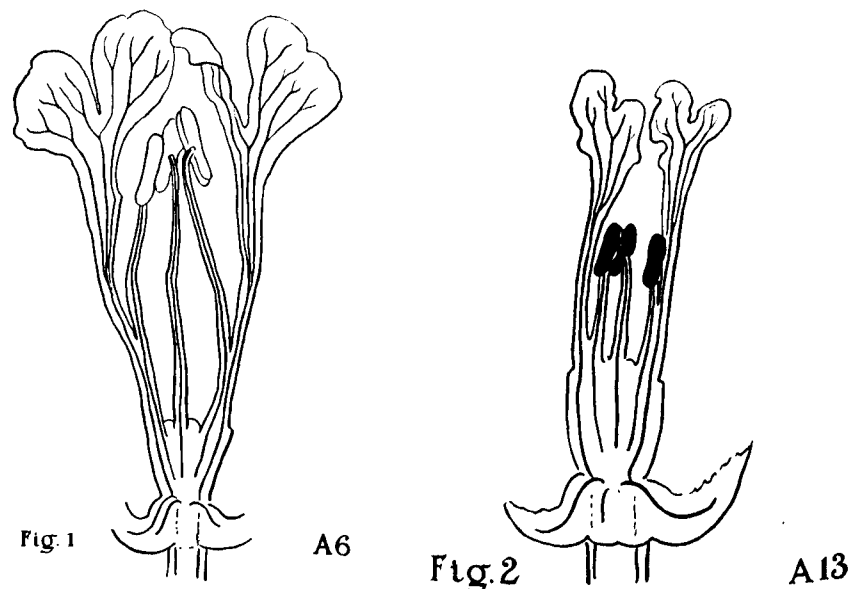
A 2—Anthers deficient.

A 11—Normal hermaphrodite.

A 6—Normal hermaphrodite.

Methods.

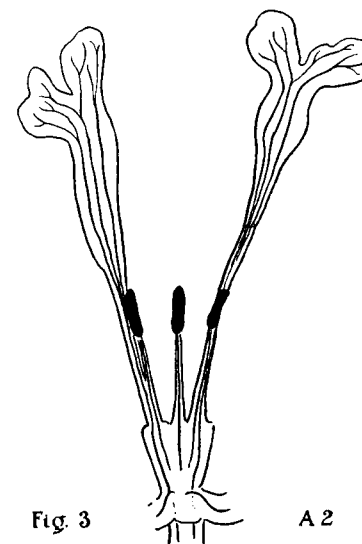
(i) Flowers of each of these were cleared in Eau de Javelle, stained in ammoniacal fuchsin and mounted entire.



(ii) Flowers were cut approximately in half and the ovary removed. The half flower was cleared in Eau de Javelle, stained in ammoniacal fuchsin and then mounted.

(iii) Longitudinal sections were cut through the flowers. All of the sections of any one flower were stained and mounted together. These sections were stained either with safranin and haematoxylin, or with ammoniacal fuchsin. The latter stain proved the more satisfactory.

(iv) Series of transverse sections were cut through the base of the flower from the level of the calyx attachment to that where the petals and stamens become free from the receptacle. All of the sections from any one flower were stained and mounted together.



Results.

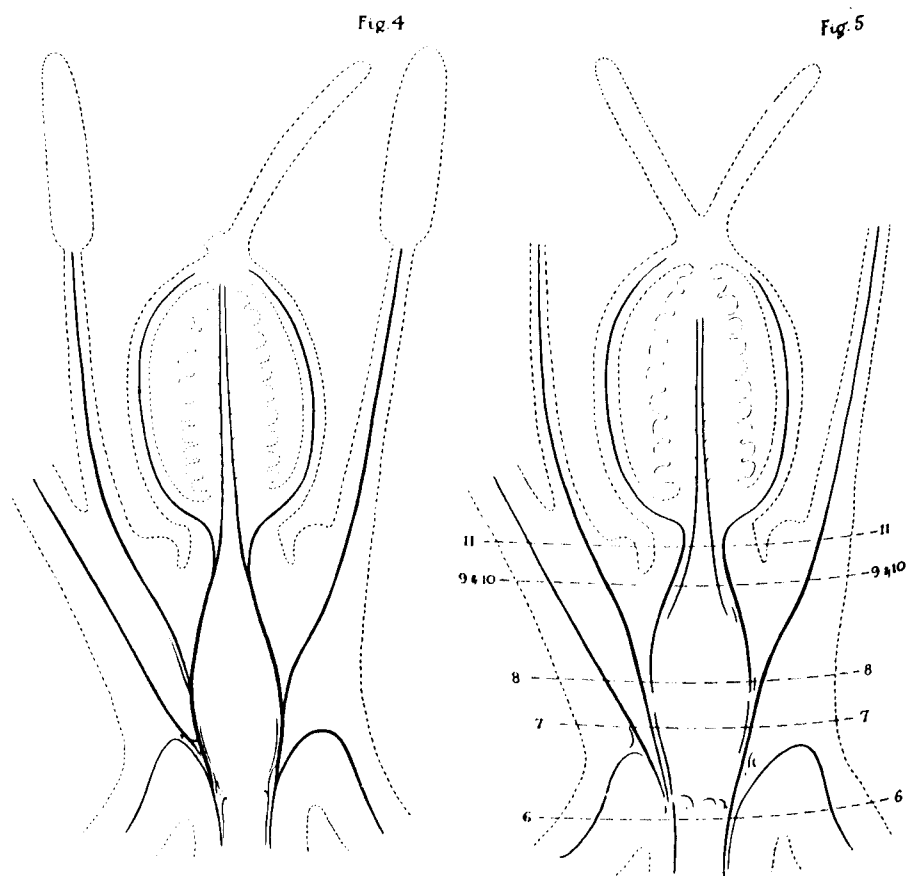
The entire flowers in method (i) did not show the vascular system sufficiently clearly though it was evident that in every flower examined the vascular supplies were abundantly developed. Cutting the flowers, as in (ii), and removing the ovaries made it possible to follow the vascular strands with some degree of certainty. Typical results are shown in the diagrams, Figs. (1), (2), and (3), which are drawn as nearly as possible on the same scale. Fig. (1) was drawn from A 6 with normal petals and anthers, Fig. (2) from N 16 with poor petals and deficient anthers, Fig. (3) from A 2 with normal petals and deficient anthers.

These diagrams serve for comparison of the relative sizes of the stamens and petals in the different flower types, as well as to show vascular supplies to petals and stamens.

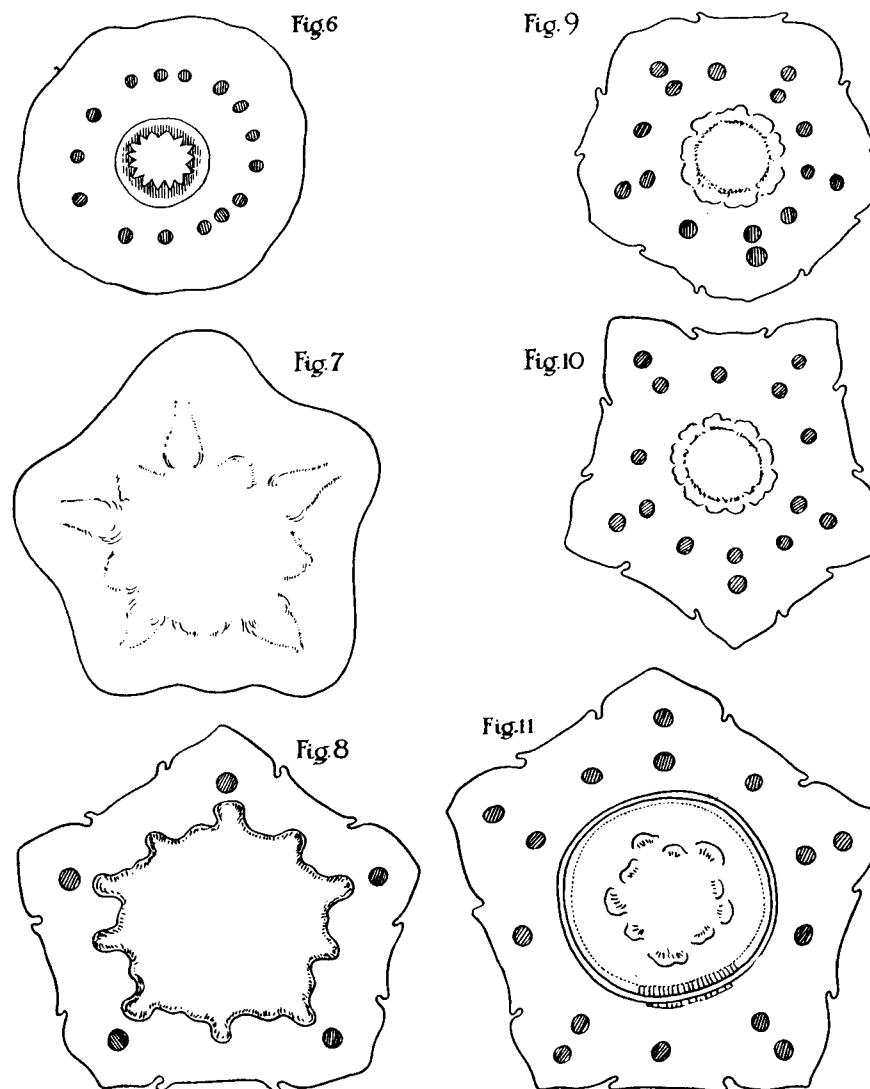
Figs. (4) and (5) have been drawn from a large number of longitudinal sections obtained by method (iv).

*Continued from K.B. 1932, 276.

Fig. (4) represents the vascular system as seen in flowers of plants A 6 and A 11 (both normal), and A 13 (poor petal). The vascular strands were well developed in every flower to stamens, to normal petals, and to poor petals. The same was found to be true of flowers of A 2 (anthers deficient) and of N 16 (poor petals and anthers deficient).



The results obtained by method (iv) are shown in Figs. (6) (11). Fig. (5) shows the approximate levels of the sections from which the drawings were made. The investigation made it clear that the vascular systems are alike and equally developed in all of the flowers, whether normal, or with poor petals, or with deficient anthers, or if deficient in both petals and anthers. A similar series was obtained for every flower. The drawings have intentionally been made from sections selected from different series in order to emphasise this point. The source of the section is indicated below. It will be noticed that these sections provide an essentially continuous series.



Diagrams of sections through base of flower of *Silene maritima*, passing upwards.

- Fig. (6) Vascular supply of axis and small strands passing down and out to calyx (from N 16).
- Fig. (7) Petal strands leaving central cylinder, which has by now widened out considerably (from A 11).
- Fig. (8) Five petal strands isolated: origin of outer and inner stamen strands by fluting of central cylinder (from A 13 and A 2).
- Fig. (9) Five petal and ten stamen strands clearly and strongly developed: drawn from N 16 (poor petals and anthers deficient): ridges at bases of petals not pronounced.
- Fig. (10) Five petals and ten stamen strands as seen in normal hermaphrodite flower (A 11): pronounced ridges at bases of petals.
- Fig. (11) Petals and stamens free from receptacle: vascular supply to ovary wall separating out.

Conclusion.

All the evidence obtained by each of the four methods described above points to the conclusion that the failure in certain of the flowers of plants of *Silene maritima* to complete the development of anthers and of petals cannot be ascribed to any anatomical defects of the vascular bundles. Early cessation of growth of the parts is not, then, due to failure of nutrition resulting from an inadequate vascular supply. The stamens and petals cease to grow in spite of the fact that the vascular strands are as well formed as in normal plants. Indeed, as will be seen by comparing Figs. (9) and (10) the difference between the poor and normal petals is already evident at such a low level as, obviously, to be quite independent of the vascular supply. The petal strands are equally well developed in the two flowers, but only the normal petals have a strongly ridged base.

Imperfect flower development does not, then, seem to be conditioned by the vascular supply, for in this respect all the flowers of *Silene maritima*, perfect and imperfect, are indistinguishable.

Literature.

- (i) Marsden-Jones, E. M. and Turrill, W. B. "Researches on *Silene maritima* and *Silene vulgaris*." Kew Bulletin, 1928, 1; 1929, 33, 145; 1931, 118, 345.
- (ii) Whyte, R. O. "Dioecism in *Ranunculus acris*," Nature, cxxiii, 13 (1929).
- (iii) Whyte, R. O. "Researches on *Silene maritima* and *Silene vulgaris*." Kew Bulletin, 1929, 197.
- (iv) Whyte, R. O. "Studies in *Ranunculus*: II, The cytological basis of sex in *R. acris* L." Journ. Gen. xxi, 183-193 (1929).
- (v) Whyte, R. O. "Sterility and Floral Abnormality in the tetraploid *Saxifraga potternensis*." Journ. Gen. xxiii, 93-121 (1930).

LIII.—CONTRIBUTIONS TO THE FLORA OF TROPICAL AMERICA. XIV.* N. Y. SANDWITH.

MORA AND DIMORPHANDRA IN BRITISH GUIANA.

These two genera, like *Eperua* (Wallaba), are of considerable economic and ecological importance, and the time has come for a taxonomic treatment of the species occurring in British Guiana. The small genus *Mora*, which has sometimes been merged in *Dimorphandra*, includes the famous Mora of the Arawaks, which is one of the largest and best-known trees in the Colony and has been repeatedly mentioned by such writers as the Schomburgks, and the less well-known Morabukea, a large tree of equal ecological significance, which has only recently been described as a distinct species, while the flowers are described for the first time in this paper. A full account of the ecology of the Mora and Morabukea consociations or forest-types in British Guiana will appear shortly in the Journal of Ecology, in a paper by Messrs. P. W. Richards and T. A. W. Davis.

Dimorphandra is a very interesting genus of about 18 species occurring in Guiana and Brazil, and in Amazonian Venezuela. This number will probably be increased by further exploration in the interior of Guiana and adjacent Brazil, since of the six species known in British Guiana four are described here for the first time. In British Guiana, at any rate, the species of *Dimorphandra*, unlike those of *Mora*, are always found in the "white sand" patches of the coastal region or in the wide sandstone areas of the interior where more species will almost certainly be discovered. They may be small trees of the savannah type of vegetation (*D. conjugata* and *D. cuprea*), or very large trees with an immense girth (*D. Davisii*). One of them, *D. macrostachya*, is a conspicuous feature of the flora of the slopes of Roraima, but has not yet been met with on Duida, at the western extremity of the Pacaraima Range.

A most useful recension of *Dimorphandra* and *Mora* was given by Dr. Ducke in Arch. Jard. Bot. Rio de Janeiro, iv, 39-45 (1925). Sufficiently convincing arguments were given there for the retention of *Mora* as a good genus, but Dr. Ducke might have stressed two floral characters of *Mora*, the woolly deciduous hairs at the apex of the anthers, and the long style, which appear to be constant in the South American species and in *M. megistosperma* (Pittier) Britton et Rose (*M. oleifera* Ducke) of Panama although, to judge from descriptions, they are not present in the two isolated species of Hispaniola, *M. Ekmanii* (Urb.) Britton et Rose and *M. Abbottii* Rose et Leonard.

In his review of *Dimorphandra*, Ducke has shown that the staminal characters, which were originally used by Tulasne to distinguish the two sections *Eudimorphandra* and *Pocillum*, are by no means so clear-cut as had been supposed. This is still further borne out by

*Continued from K.B. 1932, 317.

examination of the British Guiana species, and one is led to the conclusion that there is no correlation whatever between such characters and the others, such as inflorescence and fruit, which certainly distinguish the species forming the two sections. Thus the staminodes of *D. Davisii* (§ *Pocillum*) and of *D. conjugata* (§ *Eudimorphandra*) are free and anantherous; those of *D. congestiflora* and *D. Hohenkerkii* (both § *Pocillum*) are free and antheriferous; while those of *D. cuprea* (§ *Pocillum*) are coherent and antheriferous. The staminodes of *D. macrostachya* (§ *Pocillum*) are unfortunately unknown. The presence or absence of rudimentary anthers on the staminodes is presumably of no great taxonomic value, since of two closely allied species, *D. cuprea* and *D. velutina* Ducke, they are present in the former and absent in the latter. There remains the actual shape of the lamina of the staminode; the value of this has been greatly exaggerated, and it does not appear to be capable of employment as a sectional character.

Mention must be made of Ducke's misleading interpretation of *D. polyandra* Benoist and *D. macrostachya* Benth. Relying on portions of the original descriptions, he has placed these species in a part of his key comprising plants with truly spicate (sessile) flowers. Both species, however, have very distinctly pedicellate flowers, and the Brazilian *D. macrostachya* Ducke is obviously a misidentification and bears no resemblance to the Roraima species; it seems, on the other hand, to be closely allied to *D. congestiflora* of the present paper.

Dr. Ducke made no reference in his account to *D. megacarpa* Rolfe, which was described from leaves and fruit only, but he had already reduced it to *Parkia multijuga* Benth. —see Arch. Jard. Bot. Rio de Janeiro, iii. 79 (1922).

KEY TO MORA AND DIMORPHANDRA.

Leaves simply pinnate, wholly glabrous; anthers (in S. American species) with conspicuous deciduous white hairs; style longer than the glabrous (in British Guiana species) ovary; seeds large, reniform, soft, with membranous testa, exalbuminous.....

Mora Benth.

Leaves bipinnate, never wholly glabrous; anthers always glabrous; style much shorter than the villous (in British Guiana species) ovary; seeds (*vide* Ducke) small, nearly cylindric or oval and flattened, very hard, with coriaceous testa, albuminous.....

Dimorphandra Schott

KEY TO THE BRITISH GUIANA SPECIES OF MORA.

Bark greyish-brown; leaflets 3-4-jugate, finely and intricately reticulate beneath; ovary distinctly stipitate.....1. *excelsa*

Bark rich brown; leaflets 2-jugate, laxly reticulate beneath; ovary sessile or barely stipitate.....2. *Gonggrijpui*

1. *Mora excelsa* Benth. in Trans. Linn. Soc. xviii. 210, tt. xvi, xvii (1839); Griseb. Fl. Brit. W. Ind. 216 (1860); R. O. Williams in

Flora of Trinidad and Tobago, i. 285 (1931).—*M. guianensis* Schomb. ex Benth. et Hook. f. Gen. Pl. i. 588 (1865), pro syn.; Baill. Hist. Pl. ii. 149 (1870), in adnot.; Ducke in Arch. Jard. Bot. Rio de Janeiro, iv. 45 (1925). *Dimorphandra Mora* Benth. et Hook. f. Gen. Pl. i. 588 (1865); Record, Timbers of Tropical America, 225 (1924). *D. excelsa* Baill. Hist. Pl. ii. 167 (1870), in obs.; Pulle, Enum. Pl. Surinam, 209 (1906); Pittier in Trab. Mus. Com. Venezuela, iii. 133 (1928). *D. guianensis* Baill. l.c. 149, in adnot.

Arbor excelsa, cortice cinereo usque cinereo-brunneo. *Folia* omnino glabra, internodiis rhacheos usque 5.5 cm. longis; foliola 3-4-juga, matura oblonga, elliptica vel elliptico-oblonga, apice rotundata saepissime leviter emarginata vel brevissime obtuse cuspidata, basi saepius rotundata vel obtusa sed nonnunquam cuneata, 6-19 cm. longa, 2.5-7.5 cm. lata (in plantis incipientibus cuneata, forma valde diversa, anguste elliptica, apice attenuata, longe acuminata, basi attenuata acuta), coriacea, utrinque praesertim supra nitida, costa utrinque elevata, nervis ceteris utrinque obviis, reticulatione densa valde intricata praesertim subtus prominente. *Inflorescentiae* spicatae, spicis apice ramulorum paniculatis dense breviter albo-pilosulis 8-25 cm. longis genitalibus exclusis ad 1.7 cm. diam. *Calyx* cylindrico-campanulatus usque campanulatus, lobis inclusis circiter 4 mm. longus atque latus, extra glaber vel pilosulus, tubo intus pubescente; lobi rotundato-semicirculares, 1-1.25 mm. longi, 1.5-2 mm. lati, valde albo-ciliati. *Petala* spathulata, 5.5-6 mm. longa, vix 2.5 mm. lata, glabra sed dimidio superiore valde ciliata. *Stamina* filamentis 7 mm. longis; antherae ellipticae, 1.5 mm. longae, 1 mm. latae, pilis albis longis mox deciduis dense lanato-barbatae. *Staminodia* glabra, filamentis 6-7 mm. longis; lamina anguste clavata, 1.5 mm. longa, vix 0.5 mm. lata. *Ovarium* distincte (0.7 mm. vel saepius longius) stipitatum, ellipsoideum, glabrum, stylo multo longiore. *Legumen* glabrum, 13-21 cm. longum, 5-7.5 cm. latum, seminibus 1-2 reniformibus usque 12.5 cm. longis, usque 7 cm. latis.

Without locality, *Robert Schomburgh* 496 (type), 148; *Parker*. Demerara River, fl. June, 1889, *Jenman* 5096. Pomeroon River, fl. March 1884, *Jenman* 2006. Flat ground near Pomeroon River, fl. Jan. 1931, *Chapelle* in *Forestry Department* record no. 1013. Baboon Island, Kurupukari, Essequibo River, fl. July 1920, *Hohenkerk* in *F.D.* no. 844. Near Tinamu Fall, Cuyuni River, fl. March 1931, *Martyn* 267. Stop-off Fall, Cuyuni River, fl. Feb. 1931, *Brinsley* in *F.D.* no. 2051. On right bank below the Akaio Falls, Cuyuni River, seedling leaves only, Nov. 1929, *Sandwith* 701.

Vernacular name (Arawak), "Mora."

Distr. Guiana; Trinidad; Eastern Venezuela, in the Orinoco Delta.

The Trinidad material has the calyx pilosulous on the outer surface; that of British Guiana specimens is usually, but not always —see *Martyn* 267—glabrous outside except for the ciliate lobes.

The leaflets of seedlings are remarkably different in shape and size from those of the mature tree.

2. **Mora Gonggrijpii** (Kleinh.) Sandwith, comb. nov. — *Dimorphandra Gonggrijpii* Kleinh. in Rec. Trav. Bot. Néerl. xxii. 410 (1925); Sandwith in Kew Bull. 1931, p. 367 8.

Arbor excelsa, cortice lacte brunneo. *Folia* omnino glabra, petiolo 1-6 cm. longo, internodio rhacheos 1.5-5 cm. longo, petioululis 4-8 mm. longis; foliola bijuga, elliptica, obovato-elliptica vel ovata (semper eis *M. excelsae* multo minus oblonga), apice breviter late obtuse acuminata vel cuspidata, basi cuneata acuta usque obtusa fere rotundata, 5-15 cm. longa, 2.5-7.5 cm. lata (in plantis incipientibus majora), tenuiter coriacea, utrinque praesertim supra nitida, costa utrinque elevata, nervis ceteris supra obviis sed venulis inconspicuis, subtus laxe prominenter reticulatis. *Inflorescentiae* spicatae, spicis apice ramulorum paniculatis; spicae ut in *M. excelsa* breviter albo-pilosulae, usque 9 cm. longae, genitalibus exclusis 1-1.5 cm. diametro. *Flores* sessiles, cremeo-albi. *Calyx* maturus campanulatus, lobis inclusis 3.5-4.5 mm. longus, 4-5 mm. latus, extra glaber, tubo intus pubescente; lobi late rotundato-ovati, 1.5-1.75 mm. longi, 1.75-2 mm. lati, albo-ciliati. *Petala* spathulata, vix 6 mm. longa, 2-2.5 mm. lata, dimidio superiore ciliata, ceterum glabra. *Stamina* filamentis glabris, maturis ad 8 mm. longis; antherae elliptico-oblongae, 1.75-2 mm. longae, 1 mm. latae, ut in *M. excelsa* pilis albis longis mox deciduis dense lanato-barbatae. *Staminodia* libera, glabra, filamentis 4-5 mm. longis; lamina ovata usque clavato-elliptica, 1-1.2 mm. longa, 0.5 mm. lata. *Ovarium* sessile vel subsessile, ellipsoideum, sub anthesi 3 mm. longum, 1.5 mm. diametro, glabrum; stylus glaber, 5-7 mm. longus; ovula 4-5. *Fructus* maturus ignotus; semen teste Kleinhoonte medio connatum, rotundatum, applanatum.

Matope Line, Cuyuni River, fl. Feb. 1931, Davis in Forestry Department record no. 1033: "moderately large tree, about 130 ft. high, 14 in. diam., in morabukea forest on ochreous-brown clay soil on hill slope; slightly buttressed; flowers creamy-white." Moraballi Creek, Essequibo River, Nov. 1929 (leaves only), Sandwith 570. Mazaruni River, Aug. 1926 (leaves only, from seedlings?), Forestry Department record no. 888.

Vernacular name (Arawak), "Morabukea."

Distr. Surinam.

The flowering material collected by Mr. T. A. W. Davis removes all doubt as to the position of this species in the genus *Mora*, and enables the above description to be drawn up. The characters of the inflorescence prove to be strikingly similar to those of *M. excelsa* in every detail, the only differences detected being in the calyx-lobes, which appear to be rather longer, and in the ovary, which is sessile or very nearly so, instead of very distinctly stipitate. The flowering spikes are uniformly short, but further collections may show that they can be longer; those of *M. excelsa* are known

to vary greatly in length. The flowers of the two species appear to be of the same colour.

Mr. Davis has kindly sent the following note on Morabukea:

"Morabukea is normally not quite so large a tree as Mora, the average height of mature trees being 127 ft. against 135 ft. in Mora, and the difference in girth is still more marked, very large specimens of Morabukea being far less common than they are of Mora. Apart from the leaves the colour of the bark is a good distinguishing character, for though the difference may not be very marked in a few cases, it is very distinctive in typical individuals. *M. Gonggrijpii* has brick red bark (where it is clean and newly exposed by the shedding of old bark) whilst that of Mora is ashy brown, or light ochreous brown in colour. Mora boles appear ashy grey whilst those of Morabukea are decidedly reddish. The blaze is not distinctive."

"Ecologically the two species are alike in being gregarious. Morabukea is characteristic of localities always free from inundation, whilst Mora typically grows in swampy localities, or on low-lying ground subject to periodical floods. *M. excelsa* is, however, quite commonly found growing on hill slopes, when the general composition of the forest is very similar to that of Mixed Forest. In typical Mora Forest the canopy is less dense than in Mixed Forest. Morabukea Forest is characterised by a very dense canopy—it gives heavier shade than any other common forest type in British Guiana—and heavy undergrowth due to a dense mass of seedlings which form a thicket. Its associates are the species characteristic of Mixed Forest, but it is normally far more strongly dominant than is Mora occupying a similar habitat. In typical Mora Forest seedlings are abundant, but they do not form thickets comparable in density with those of Morabukea regeneration. Neither Mora nor Morabukea Forest can be definitely associated with any particular type of soil."

KEY TO THE BRITISH GUIANA SPECIES OF DIMORPHANDRA.

Leaflets not stellate-pubescent; flowers in solitary or few, long (usually much exceeding 10 cm.) simple racemes or spikes; calyx campanulate or cup-shaped; petals longer than the calyx (species of Section *Pocillum*);

Leaflets 3-5-jugate, large, not less than 5.8 cm. long or 2.5 cm. wide, usually much larger: petals conspicuously sericeous-pilose within 1. *Davisii*

Leaflets multijugate, not reaching the lowest dimensions of *D. Davisii*, usually much smaller; petals glabrous or nearly glabrous within:

Flowers sessile; petals less than 4 mm. long..... 2. *congestiflora*

Flowers pedicellate; petals more than 4 mm. long:

Lower surface of leaflets, rhachis, branchlets and inflorescence, densely cupreous-pilose..... 3. *cuprea*

Lower surface of leaflets glabrous or glabrescent; rhachis, branchlets and inflorescence not cupreous-pilose:

Leaflets up to 10 pairs, rather large, 2.5-5.5 cm. long,
0.6-2.4 cm. wide.....4. *Hohenkerkii*
Leaflets numerous, more than 10 pairs, small, hardly up to
1.5 cm. long, very rarely exceeding 4 mm. in width.....
5. *macrostachya*

Leaflets large, stellate-pubescent beneath; flowers in numerous,
short (usually less than 10 cm.), paniculate spikes; calyx cylin-
dric; petals small, shorter than the calyx (species of Section
Endimorphandra).....6. *conjugata* (*latifolia*)

1. ***Dimorphandra Davisii*** *Sprague et Sandwith*, sp. nov.; distinct-
issima, specierum adhuc cognitarum prope *D. verrucosam* Spruce ex
Benth. tantum ponenda, ab illa forma foliolorum magnorum,
petalis intus dense sericeo-pilosis longe abhorrens.

Arbor excelsa, in terra albo-arenosa crescens; ramuli summi
nigrescentes, glabrescentes, costati, lenticellati. *Folia* usque 33 cm.
longa; petiolus sparse pubescens, 5.5-6.5 cm. longus; internodium
rhacheos simile, 3-4.2 cm. longum; pinnae 2-jugae, altera jugi
superioris nonnunquam suppressa, petiolis 2-4 cm. longis, internodiis
rhacheos 1-4 cm. longis, omnibus cinereo-pubescentibus; petioluli
3.5-6 mm. longi, similiter induti; foliola 3-5-juga, opposita vel fere
opposita, ovata usque oblonga, apice abrupte breviter (3-7 mm.)
acute acuminata, basi rotundata et leviter cordata vel obtusa
ecordata vel etiam acuta cuneata, 5.8-15 cm. longa, 2.5-5.5 cm. lata,
subcoriacea, supra nitidula glabra vel glabrescentia, subtus satis
dense minute cinereo-pubescentia, utrinque subtiliter inconspicue
reticulata, nervis primariis utroque costae latere circiter 12.
Inflorescentiae densissime racemosae, racemis solitariis vel binis
ubique praesertim superne ferrugineo-tomentosis vel pedunculo
inferne tantum pubescente; pedunculus 3.5-10 cm. longus,
3.5-4.5 mm. diametro; pars florifera densissima, 10.5-17 cm. longa,
circiter 2.5 cm. diametro; pedicelli tomentosi ad 3 mm. longi.
Calyx turbinato-campanulatus, extra sericeo-pubescentis, lobis
inclusis 4-5 mm. longus, apice ad 4 mm. latus; lobi deltoideo-
triangulares, obtusi, circiter 1 mm. longi, ad 1.75 mm. lati. *Petala*
anguste obovato-spathulata, 7-7.5 mm. longa, ad 2.6 mm. lata, extra
glabra, intus inferne glabra ceterum conspicue dense sericeo-pilosa.
Stamina uniseriata, glabra, matura filamentis 6.5-7.5 mm. longis
juventute apicem versus conspicue angustatis; antherae oblongae,
vix 2 mm. longae, 1 mm. latae. *Staminodia* libera, decidua, glabra,
filamentis in alabastro 1-1.5 mm. longis, lamina foliacea crassa plus
minusve triquetra elliptico-lanceolata, 2.75-3 mm. longa, vix 1 mm.
lata, apice ananthera. *Ovarium* stipite styloque incluso anguste
fusiforme, saepe leviter falcatum, saepe leviter falcatum, 7-7.5 mm.
longum, ad 1 mm. latum, dense flavescens-sericeo-pilosum, stipite
indumento ovarii circiter 2.5 mm. longo, stylo brevi glabro vix 2 mm.
longo; ovula 5. *Legumen* rectum vel leviter falcatum, planum,
coriaceum, marginibus incrassatis, glabrum, oblongum, 16-20 cm.

longum, 3.3-3.6 cm. latum, apice in acumen ad 1 cm. longum con-
tractum, indehiscens, stipite 2-4.5 cm. longo.

BRITISH GUIANA. Mazaruni-Kuribrong Divide, between Camps
9 and 10, fl. and fr., Nov. 1926, *Davis* in *Forestry Department* record
no. 895 (type); a large tree on white sand hill. *Ibid.*, Camp 8,
fr. and old fl., Oct. 1926, *Mackay* in *F.D.* no. 891.

A magnificent species, with no obvious affinities. Its discoverer,
Mr. T. A. W. Davis, writes as follows: "The specimen was not
measured, but was a large tree about 30 in. diameter and probably
120 ft. or more in height. The bark is grey with regular longitudinal
fissures. The crown is light, and the leaves are rather pale green,
those on young trees or epicormic shoots being very much larger
than those from the crowns of mature trees. No. 891 is undoubtedly
the same species as No. 895. Flowers white."

"The trees are very large, unbuttressed, with long somewhat
tapering boles. The normal girth attained undoubtedly exceeds
that of *Mora excelsa*, and the average height is at least 120 ft.
They grow gregariously in association with *Eperua* and *Dicymbe*
corymbosa. Arawak Indians asserted that where it was found the
undergrowth consisted of species which commonly grow in Muri
(*Houmivi*) scrub. It was found growing on white quartz sand only,
and the dead leaf-layer was always thick, but not excessively so as in
Dakama Forest (*D. conjugata*)."

2. ***Dimorphandra congestiflora*** *Sprague et Sandwith* sp. nov.;
D. campinarum Ducke affinis, indumento foliolorum calycisque e
descriptione distinguenda.

Arbor, sat excelsa, cortice laevi. *Folia* usque 35 cm. longa,
petiolo, rhachi, pinnisque ubique breviter molliter ferrugineo-
tomentosis; petiolus 4.5-9.5 cm. longus, 3-4.5 mm. diametro;
internodia rhacheos 1.5-3.5 cm. longa; pinnae 3-8-jugae, 11-22 cm.
longae, petiolis vulgo 7-8 mm. longis, internodiis rhacheos 6-9 mm.
longis; foliola sessilia vel minutissime petiolulata, multijuga,
28-29-juga, opposita, anguste obovato-oblonga (vel oblonga), apice
obtusae rotundata (vel levissime emarginata), basi truncata levissime
cordata, 1.5-3.3 cm. longa, 4.5-7.5 mm. lata, inferiora nonnunquam
minora, coriacea, margine revoluta, supra nitida prope basin atque
secus costam sericeo-pubescentia ceterum glabrescentia costa
canaliculato-impressa excepta evenia rugulosa, subtus ubique
flavescens-sericeo-pubescentia costa ferruginea valde prominente
ceterum fere evenia vel nervis lateralibus obscuris vix elevatis.
Inflorescentiae apicem ramulorum versus complures (saepius 4),
spicatae; spicae longissimae, aurantiaco-rubrae, ubique velut
ramuli molliter ferrugineo-tomentosae, pedunculo 2.5-4 cm. longo,
4-5 mm. diametro, parte florifera usque 32 cm. longa et 1.2 cm.
diametro, floribus sessilibus densissime congestis; bractae subu-
latae, circiter 1.5 mm. longae. *Calyx* perfecte cupularis, statu vivo
flavus, siccitate extra ferrugineo-tomentosus, intus pubescens, lobis
inclusis 2.5 mm. longus atque latus; lobi late rotundato-ovati vel

subsemicirculares, vix 0.7 mm. longi, ad 1.5 mm. lati. *Petala* aurantiaca, obovato-oblonga, ad 3.75 mm. longa, 2-2.5 mm. lata, extra dimidio inferiore sparse flavescenti-pubescentia ceterum glabra, intus fere glabra sed prope medium sparsissime pubescentia. *Stamina* 5 glabra; filamenta rubra, matura 3-3.5 mm. longa, 0.6 mm. lata, apice angustata; antherae aurantiacae, ovato-oblongae, vix 1.5 mm. longae, circiter 0.8 mm. (vix 1 mm.) latae. *Staminodia* libera, glabra, laminis deciduis; filamenta in alabastro circiter 1 mm. longa, flore maturo elongata tenuia ad 4 mm. longa; lamina rubra, petaloidea, plana, membranacea, obovata, 1.5 mm. longa, 0.5 mm. lata, apice anthera rudimentaria circiter 0.4 mm. longa 0.3 mm. lata coronata. *Ovarium* sessile, anguste ovoideo-ellipsoideum, densissime longe flavescenti-villosum, stylo incluso 3.25 mm. longum, 1 mm. latum; stylus brevis, glaber, vix 1 mm. longus; ovula 8. *Fructus* ignotus.

BRITISH GUIANA. Mazaruni River: Macreba Falls, Kurupung River, August 1925, *Altson* 348 (type). "A large tree, 80 ft. high, by waterside on sandy soil. Bark smooth, exudes translucent-brown watery secretion. Flowering spikes borne in terminal clusters at the summit, usually 4 in a cluster; calyx yellow; corolla orange; filaments red; anthers orange; dilated staminodes red; whole spike appears orange-red. The bark is said to be used in the construction of 'woodskins'."

Potaro River: Waratuk Path, Oct. 1898, *Jenman* 7429.

Vernacular name (Acawai), "Hawakaiyek" (*vide* *Altson*).

A very close ally of this species is *D. macrostachya* Ducke, non Benth., see note under *D. macrostachya* Benth. *D. congestiflora* and its allies are characterised not only by their sessile flowers, but also by their cupular, rather than campanulate, calyx, and unusually short petals.

3. ***Dimorphandra cuprea*** *Sprague et Sandwith* sp. nov.; *D. velutinae* Ducke manifeste affinis, pinnis foliorum paucioribus, foliolis infra cupreo-pilosis nec pallide sericeo-pubescentibus, racemis angustioribus, rhachi pedicellis calycibusque indumento cupreo multo densius atque longius tomentosus, lamina staminodiorum breviori apice anthera rudimentaria coronata differt.

Arbor parva, patula, 6 m. alta, partibus novellis inflorescentiisque ubique insigniter dense cupreo-tomentosis; ramuli summi costato-sulcati, ad 5 mm. diametro. *Folia* usque 30 cm. longa; petiolus ut ramuli indumento supra descripto praeditus, 4.7 cm. longus; internodia rhacheos similiter induta, 1.5-2 cm. longa; pinnae 9-12-jugae, 5-11 cm. longae, petiolis 3-4 mm. longis rhachique indumento cupreo denso indutis, internodiis rhacheos circiter 3 mm. tantum longis; foliola sessilia, multijuga, 20-40-juga, opposita, anguste lineari-oblonga sed apicem versus paulum dilatata, apice rotundata, basi truncata rhachi adpressa, 0.5 (ima et summa)-1.2 cm. longa, 1-2 mm. lata, coriacea margine revoluta, supra nitida plumbea costa pilosa demum glabrescente excepta glabra costa

canaliculato-impressa ceterum evenia, subtus dense praesertim costa valde prominente cupreo-pilosa ceterum evenia. *Inflorescentiae* axillares, solitariae, racemosae, passim cupreo-tomentosae; pedunculus circiter 10-12 cm. longus, ad 2.5 mm. diametro; pars florifera 18-26 cm. longa, 1.5 cm. diametro, floribus in verticillis congestis dispositis; pedicelli 2-3 mm. longi; bractae subulatae, circiter 2 mm. longae. *Calyx* campanulatus, lobis inclusis 3 mm. longus, 4 mm. latus, utrinque cupreo-tomentosus; lobi late ovato-triangularès, obtusi, ad 0.75 mm. longi, 1.5-2 mm. lati. *Petala* glabra, obovato-spathulata, 6-7 mm. longa, 3 mm. lata. *Stamina* 5, glabra, filamentis 4 mm. longis apice angustatis; antherae oblongo-ellipticae, ad 2.25 mm. longae, vix 1 mm. latae. *Staminodia* glabra, filamentis in alabastro circiter 1 mm. longis (in flore maturo elongatis); laminae deciduae, in alabastro insigniter cohaerentes, foliaceae, crassae, carnosae, ellipsoideae, ad 3.5 mm. longae, circiter 1.5 mm. latae, apice antheris rudimentariis minutis coronatae. *Ovarium* sessile, ovoideo-ellipsoideum, cum stylo ad 4.5 mm. longum, 1.5 mm. diametro, dense cupreo-villosum; stylus glaber, vix 1 mm. longus; ovula 9. *Fructus* ignotus.

BRITISH GUIANA. Kaieteur Savannah, Potaro River, Sept.-Oct. 1881, *Jenman* 1030. "A spreading tree, 20 ft. high."

4. ***Dimorphandra Hohenkerkii*** *Sprague et Sandwith*, sp. nov.; *D. vernicosae* Spruce ex Benth. affinis, pinnis foliorum 4-5-jugis, inflorescentiis longissimis differt; *D. polyandra* R. Benoist valde affinis, staminibus fertilibus 8-10 statim distinguitur.

Arbor mediocris, in terra arenosa crescens; ramuli summi circiter 8-9 mm. diametro, obtuse angulati, late sulcati, minute ferrugineo-pubescentes. *Folia* usque 18 cm. longa; petiolus minute cinereo- et ferrugineo-pubescent, 2.5-4.5 cm. longus, 2-3.5 mm. diametro; internodia rhacheos similiter induta, 1.5-4 cm. longa; pinnae 4-5-jugae, similiter indutae, ad 11 cm. longae, petiolis ad 1.3 cm. longis, internodiis rhacheos 0.7-1.2 cm. longis; foliola subsessilia, 7-10-juga, obovato-oblonga vel oblonga, apice truncata levissime emarginata vel obtusa rotundata, basi obliqua obtusa, brevissime petiolulata, 2.5-5.5 cm. longa, 0.6-2.4 cm. lata, coriacea, supra nitida siccitate plumbeo-purpurascens semivernicosa, subtus opaca brunneo-rubra, supra glabra costa nervisque impressis obscuris, subtus costa saepius pubescente excepta glabra costa nervisque lateralibus prominentibus venulis inconspicuis mesophyllo dense minutissime punctulato. *Inflorescentiae* axillares, solitariae, racemosae, dense cinereo- et ferrugineo-pubescentes vel subtomentellae; pedunculus 3-5 cm. longus, 4-5.5 mm. diametro; pars florifera usque 38 cm. longa, 1.7-2 cm. diametro; pedicelli circiter 2 mm. longi, ferrugineo-pubescentes; bractae subulatae, circiter 2 mm. longae. *Calyx* statu vivo aurantiacus, campanulatus, lobis inclusis 3 mm. longus, 3.25 mm. latus, extra sparse ferrugineo-pubescent, intus tubo satis dense flavo-sericeo-pubescente ceterum glabrescent; lobi rotundato-ovati, ad 1.25 mm. longi, ad 1.5 mm.

lati. *Petala* rubra, glabra, obovato-spathulata, ad 6 mm. longa, 2.5 mm. lata. *Stamina* 5, glabra, filamentis circiter ad 2.5 mm. longis; antherae oblongae, ad 2.5 mm. longae, 1 mm. latae. *Staminodia* glabra, laminis inter se liberis sed cum petalis plus minusve cohaerentibus, filamentis 2.5 mm. longis; lamina clavato-spathulata, foliacea, carnosae, 1.5-2 mm. longa, 0.5 mm. lata, apice anthera rudimentaria coronata. *Ovarium* subsessile, ellipsoideum, ad 4.5 mm. longum, vix 1 mm. diametro, dense villosum; stylus glaber, brevissimus, haud 1 mm. longus. *Legumen* planum, crassum, 14 cm. longum, 6 cm. latum, glabrum, nigrum.

BRITISH GUIANA. He Creek, Kurubaru River, Demerara River, Sept. 1919, *Hohenkerk* in *Forestry Department* record no. 823 (type): "tree, 60 ft. high, on white sand on the edge of 'Muri' bush; flowers cherry to brick-red, with orange calyx." Ridge between Ewaropa and Mauri Creeks, Demerara River, Nov. 1919, *Hohenkerk* in *F.D.* no. 823A: "on white sand, in 'Muri' bush; flowers cherry to brick-red, with orange calyx."

The description of *D. polyandra* was based on material collected from a single tree. The species owed its name to a very remarkable character which distinguished it from all other members of the genus, the presence of a second whorl of fertile stamens in addition to the normal whorls of stamens and staminodes. Thus M. Benoist described the androecium as composed of 5 staminodes and 10 fertile stamens. The British Guiana material cited above had been provisionally identified as a new species, when it was discovered that it agreed well with the description of *D. polyandra* except for its androecium, which was normal. One of the type sheets of *D. polyandra* was accordingly borrowed from the Paris Herbarium, and this was found to agree well with the British Guiana sheets in most important respects, from foliage to the small details of floral dissection, except for its abnormal androecium. Two flowers of Benoist 138 were dissected, and in each instance the calyx and corolla were pentamerous, whereas the androecium whorls were tetramerous. Thus there were 4 staminodes and 2 whorls of 4 fertile stamens, the outer whorl being the shorter. On present evidence, the best course is to describe the British Guiana material as a distinct species; on the other hand, it seems quite possible that M. Benoist's tree bore unusual, abnormal, flowers with an additional whorl of fertile stamens, but it is to be hoped that further collections in French Guiana will throw light on the matter. It may be added that, under the International Rules of Nomenclature, should *D. polyandra* prove to represent a teratological state and to be indistinguishable as a species from the British Guiana tree, that name must be rejected in favour of *D. Hohenkerkii*.

5. *Dimorphandra macrostachya* Benth. in Hook. Journ. Bot. ii. 101 (1840), non Ducke in Arch. Jard. Bot. Rio de Janeiro, iv. 39, 40, 42 (1925).

Ramuli summi crassi, minute ferrugineo-pubescentes. *Folia* usque 24 cm. longa; petiolus 1.2-2.2 cm. longus, velut internodia rhacheos pinnaeque minute ferrugineo-pubescentes; internodia rhacheos 0.8-2 cm. longa; pinnae 6-12-jugae, 7-12 cm. longae, petiolis ad 5 mm. longis, internodiis rhacheos 4-5 mm. longis; foliola sessilia, ut videtur 17-25-juga, oblonga, apice rotundata saepius subtruncata, basi obliqua truncata rhachi adpressa, 0.5 (summa vel ima)-1.5 cm. longa, 2.5-4 mm. lata, coriacea, supra nitida marginibus nonnunquam pilosulis exceptis glabra costa impressa excepta evenia, subtus opaca secus margines costamque pilosula (costa nonnunquam glabra) ceterum glabra costa prominente ceterum evenia vel nervis lateralibus inconspicue elevatis. *Inflorescentiae* racemosae, apice ramulorum 2-6, dense minute ferrugineo-pubescentes vel subtomentellae; pedunculus ad 3 cm. longus, 4-6 mm. diametro; pars florifera usque 25 cm. longa, 1.5-2 cm. diametro; pedicelli 2-3 mm. longi. *Calyx* campanulatus, lobis inclusis ad 3.5 mm. longus, 4 mm. latus, extra sparse ferrugineo-pubescent, intus tubo ferrugineo-pubescente lobis fere glabris; lobi rotundato-ovati, 0.75-1.25 mm. longi, ad 1.75 mm. lati, ciliati. *Petala* glabra, obovata, ad 5.7 mm. longa, 3 mm. lata. *Stamina* 5, glabra, filamentis 4-4.5 mm. longis; antherae oblongae, 2 mm. longae, vix 1 mm. latae. *Staminodia* filamentis in flore maturo tenuibus glabris ad 4.5 mm. longis; laminae delapsae, non visae. *Ovarium* sessile, ellipsoideum, stylo incluso ad 5 mm. longum, 1.5 mm. diametro, dense villosum; stylus glaber, brevis, vix 1 mm. longus; ovula 9. *Fructus* jam valde immaturus dense minute ferrugineo-tomentellus, pilis longis sparsis praesertim secus margines hic illic interspersis, stipite circiter ad 1 cm. longo.

BRITISH GUIANA. Sandstone district of Roraima, Robert Schomburgk 1045 (type). Roraima district, fl. Nov., Dec., Schomburgk 635 (962B); Richard Schomburgk refers to this species in his Travels as one of the chief floral constituents of the slopes of Roraima, where it grows to a height of 5000 ft. on the edges of forest. Arapoo Valley, Roraima, Dec. 1884, in Thurn Set A no. 39.

D. macrostachya Benth. of Ducke in Arch. Jard. Bot. Rio de Janeiro, iv. 39, 40, 42 (1925) is represented at Kew by Ducke 20203, and is a totally different plant. Ducke was presumably misled by Bentham's original description, which describes the inflorescence as spicate, although mention is made of the very distinct pedicels. Ducke's plant differs from Bentham's, *inter alia*, in the thinner inflorescence with sessile flowers, the much smaller petals (only 3 mm. long), and the persistent lamina of the staminodes. *D. macrostachya* Ducke is, in fact, very closely allied to *D. congestiflora* Sprague et Sandwith described above both in foliage and floral characters, and examination of further material may prove it to be conspecific. It is apparently distinguished chiefly by the glabrescence of the lower surface of the leaflets.

6. **Dimorphandra conjugata** (Splitg.) Sandwith, comb. nov.—*Mora conjugata* Splitg. in Hœv. et De Vriese, Tijdschr. ix. 109 (1842). *Dimorphandra latifolia* Tul. in Arch. Mus. Par. iv. 189 (1844); Walp. Rep. v. 575 (1845 6); Benth. et Hook. fil. Gen. Plant. i. 587 8 (1865); Pulle, Enum. Pl. Surinam, 209 (1906); Ducke, l.c. 44.

Arbor parva, in locis arenosis crescens. *Folia* petiolo 3-10 cm. longo, rhachi, pinnis, omnibus stellato-pubescentibus; pinnae 1-2-jugae, petiolo 2-6 cm. longo, internodiis rhacheos 4-10 (vel ultra) cm. longis; foliola 1-3-juga, apice truncata vel rotundata vel brevissime cuspidata, basi cuneata vel obtusa vel rotundata et levissime cordata, 5-24 cm. longa, 4-2-15 cm. lata, supra glabra nitida, subtus sparse regulariter stellato-pubescentia, utrinque praesertim subtus peraxe reticulata, nervis primariis lateralibus 8-11. *Inflorescentiae* spicatae in paniculis densis dispositae, ubique ferrugineo-pubescentes vel subtomentosae; spicae 4-10 cm. longae, circiter 1 cm. diametro, floribus sessilibus. *Calyx* cylindricus, 3-25 mm. longus, vix 2-5 mm. latus, extra ferrugineo-pubescent. *Petala* inclusa, satis anguste spathulata, 3 mm. longa, ad 1 mm. lata, extra sparse pilosa intus praesertim superne marginibusque flavescenti-villosa. *Stamina* 5, glabra, filamentis 3-5 mm. longis; antherae oblongae, 1-75 mm. longae, 0-8 mm. latae. *Staminodia* libera, glabra, filamentis 4 mm. longis; lamina obovato-elliptica, in filamentum abrupte transiens, carnosae, 1-5 mm. longa, 0-75 mm. lata, apice ananthera. *Ovarium* sessile, stylo inclusio 4-5 mm. longum, vix 1-5 mm. diametro, dense villosum; stylus glaber, vix 1-5 mm. longus; ovula circiter 8. *Fructus* desideratur.

BRITISH GUIANA. In sandy places by the railway near Rockstone, June 1910, *Stockdale* in Bot. Gard. Herb. 8778: tree, 7-8 ft. high, with white flowers. Dry sandhills east of Rockstone, July 1921, *Gleason* 748: spreading tree, 40 ft. high. Demerara River, May 1887, *Jenman* 3932.

SURINAM. Without locality, *Splitgerber*, *Hostmann* 1007. *Splitgerber* (l.c.) notes that *Mora conjugata* grew "plentifully in sandy places near Joode Savanne, with *Licania crassifolia* Benth."

Vernacular name (Arawak), "Dakama" (*vide* *Jenman* and *Davis*).

LIV.—OITICICA (*LICANIA RIGIDA*).

J. H. HOLLAND.

For some years past kernels under the name of "Oiticica" have been coming on to the markets of London and Liverpool, mostly in sample quantities, but occasionally in consignments of several tons imported from Brazil. For want of material it was never possible to name the tree with any certainty. Requests for herbarium specimens to importing firms who had submitted samples for identification always met with a courteous response, but usually resulted in failure to obtain proper specimens, or the sending of other

trees bearing the same or a similar common name. At the outset the oilseed in question was believed at Kew, and by various authors, to be a species of *Couepia* (Rosaceae), and *C. grandiflora* Benth. was suggested. The botanical source has also been attributed provisionally to *Pleragina umbrosissima* Arruda (Rosaceae), *Moquilea tomentosa* Benth (Rosaceae), and *Licania rigida* Benth. (Rosaceae). *Pleragina* in the Index Kewensis has been treated as a synonym of *Couepia*, whether correctly or not it is impossible to say, but the names quoted referred without doubt to kernels which to all outward appearances belonged to the same species.

Fruits of two distinct species sent in response to a circular letter for Oiticica issued by the Foreign Office on behalf of Kew proved to be (1) *Moquilea tomentosa* Benth. and (2) probably *Clarisia racemosa* Ruiz et Pav. (Urticaceae), both large trees of Brazil. The Brazilian name of the first is "Oytycera" and the fruit is called "Oyty" or "Oity." The latter tree is called "Oiti manso" and has an edible fruit called "Oiticuro." The kernels of *Moquilea tomentosa* do not contain oil and those of *Clarisia racemosa*, on a sample of the fruits received from Bahia submitted by the Director to the Imperial Institute for analysis, were found to yield only 1-7 per cent. of oil, in comparison with about 60 per cent. found in the true "Oiticica" kernels. Accordingly neither is held to be of commercial value as a source of oil.

Usually the name "Oiticica" has been that under which the seeds in question have been sent to Kew for identification, but samples have also been received at the Museum (in 1915) as "Brazilian" or "Hazel Nuts." The Ceara name is sometimes given in publications as "Oticia."

The specimens recently received from Ceara through the kind offices of H. M. Consul-General at Pernambuco have been found ample to admit of determining the tree as *Licania rigida* Benth. They agree with the type specimens in the herbarium, described under this name by Benth in 1840 (see *Hooker's Journal of Botany*, ii. 220: 1840), and collected by Gardner (No. 1592) in Ceara, whence the present material was also obtained. Benth apparently did not see the fruits, since he does not describe them.

The tree is reported to grow to a height of 15 metres, native of the States of Rio Grande do Norte, Ceara and Piahy in north-east Brazil, flowering towards September, and fruiting from December to March. The fruits, in shape mostly ovoid to ellipsoid, are single-seeded, with comparatively thin shells about 45 mm. long, 15 to 20 mm. in diameter at the middle, and reddish brown or somewhat green in colour. A kilogram contains approximately 240 fruits, of which about 70 per cent. is seed—which is easily separated—and 30 per cent. hull. The kernels have been found on various analyses (see the works referred to below) to contain from 60 to 65 per cent., or an average of 63 per cent. of oil. The habit of the tree as illustrated (1) resembles that of the Mango.

The industrial value of the oil has been thoroughly investigated, but the production at the present time appears to be of importance only in the States above mentioned, where the tree is indigenous and abundant. According to Dr. Henrique Paulo da Cunha Bahiana (1) the factory preparation of the oil was taken up in 1876 at Fortaleza (Ceara) but was discontinued after a short time on account of the disagreeable odour. During the Great War (1914-1918) the extraction was again started by a Company in Rio Grande do Norte; again in 1927 the firm of H. H. Sardinha at Rio de Janeiro, and later (1929) the firm of C. N. Pamplona & Co. in Fortaleza commenced the extraction of Oiticica oil on a large scale.

The native method of preparing the oil is simple. The seeds are taken out of the shells, crushed in a mortar and boiled in a pot of water for some hours. The top oily layer is then skimmed off and purified by treatment for some time with clean water. This oil is used locally for rheumatism and other medicinal purposes.

On a commercial scale the extraction of the oil in Rio de Janeiro and Fortaleza is described (1) and the following facts have been abstracted from this account.

In the factory of J. A. Sardinha the seeds (or kernels) are conveyed by means of elevators to rotating sieves in order to separate impurities, and from these to roller presses where the seeds are broken but not crushed. They are then heated in a heater to about 70°C., crushed, and the oil is finally refined and rendered odourless.

The yield of oil is from 35 per cent. to 40 per cent. of the kernels. With this equipment it is possible to produce about 500 kg. of oil daily, though the actual production may be less. The price is lower than that of Linseed oil. The Sardinha factory aims at treatment that will considerably or completely remove the unpleasant odour of the oil. Experiments are in progress to make the oil permanently liquid.

The Myrian Factory in Fortaleza (Ceara) was established in 1928 by Carlito N. Pamplona and Franklin Monteiro Gondim. As Oiticica seeds were not available in sufficient quantity when the factory was erected (April 1929), castor oil was produced during the latter part of that year. Oiticica oil was first produced in January 1930, nuts having begun to come in from the new harvest in December 1929.

The procedure is the same as in Sardinha's factory, but the capacity of the machines is greater. The oil is despatched in tin plate receptacles of 15 kg. or more, often in iron drums. The factory is concerned entirely with the production of oil at present, but the production of paints and varnish has been under consideration. The entire production is exported from the ports of Sao Paulo and Rio de Janeiro. The new industry in Ceara is being assisted by the State in that it is to be exempt from taxes and duties for the first ten years. Felling of Oiticica trees has been prohibited and they are included in the State estimates of trees.

The kernels have been examined by Bolton and Revis (2), and at the Imperial Institute in 1929 (4). The former analysis was made according to the authors in the early part of 1917, when they stated that the oilseed had been sent apparently for the first time from Brazil, bearing the native name "Oiticica" or "Oilizika."

The description given by them mentions the characteristic odour, which, as above stated, was sufficiently powerful to stop the extraction on a large scale in Ceara. "They have a peculiar and very distinctive smell, which might be described as a heavy and overpowering odour, rather recalling the smell of tung oil, a very interesting property, seeing that the oil, as subsequently described, bears a distinct resemblance to tung oil."

The outstanding features of the oil were given as follows:—
"Melting-point.—As the oil consists of a mixture of oils varying from liquids to hard solids no definite figures can be given to represent the melting-point of the oil, and the points of incipient and complete fusion must both be considered—incipient fusion, 21.5°C., complete fusion 65.09°C. Iodine Value, 179.5; Saponification Value, 188.6; Free Fatty Acids as oleic, 5.7 per cent.; Unsaponifiable matter, 0.91 per cent.; Sp. Gr. at 15.5/15.5°C., 0.9694; Refractive Index at 40°C. Zeiss, beyond the scale of the Zeiss butyro-refractometer."

A series of chemical experiments is recorded by these authors, who state that "all tended to show that this oil has very remarkable properties, which place it in a distinctly unique position and there seems every reason to suppose that the oil is worthy of the attention of the varnish-maker and possibly also of those interested in the manufacture of linoleum, but for these purposes it will be necessary to obtain the oil on a commercial scale."

The above analysis is recorded (4) with others made at the Imperial Institute. One of these analyses of the oil, extracted from imported kernels, showed the constants to be Specific Gravity at 15/15°C. = 0.9673; Refractive Index at 40°C., 1.507; Acid value 5.6; Saponification Value 186.1; Iodine Value (Wijs, 3 hrs.) per cent. 144.8; Unsaponifiable matter per cent. 0.9; and Solidifying point of fatty acids 45.4°C. In general the examination showed that "the kernels examined contained a normal percentage of oil of the usual appearance. . . . A comparison of the figures with those recorded by Bolton and Revis shows that the solidifying point of the fatty acids of the oils examined at the Imperial Institute was from 2 to 4.6 degrees above that previously recorded whilst the Iodine Value of the oils is about 35-40 per cent. below the recorded figure." The oil in this analysis was also found to resemble Tung oil.

Similar characteristics of the oil are recorded (7) in a recent paper by Dr. Jordan, who summarises the results of investigations, which have been made as follows:—"From the tabulated records it will be seen that the physical as well as the chemical properties of the oil samples vary widely. This variation is undoubtedly due to the high

acidity and rapid oxygen absorption to which reference has already been made—for example . . . a drop of 15 points in iodine value between cold pressed and hot pressed oil from the same seed is quite outstanding. There is also no doubt about the fact that the variations reported as to the capacity of the oil to gelate are really due to variations in acidity, which in some samples must have been sufficient practically to inhibit gelation altogether.

Making allowances for these variations it is concluded that oiticica oil is characteristic in respect of :

- (a) smell, which is very persistent ;
- (b) density, which is higher than that of tung oil ;
- (c) refractive index, which is lower than that of tung oil ;
- (d) melting point range, which shows a great difference between incipient and complete fusion ;
- (e) heat polymerisation and gelation, rather slower than tung oil ;
- (f) high oxygen absorption, relative to linseed oil."

Other analyses could be given—Van Loon and Steger (Delft, Holland), Grimme (German), Gardner (United States), etc.—but that first recorded (1918) and the most recent (1929) of imported kernels will perhaps be sufficient to give an idea of the general characters of the oil.

Whether it will ever prove an effective substitute for Tung oil (*Aleurites Fordii*) seems open to question. There are no export figures available either of kernels or of oil from the country of origin to show that the trade has become of any commercial importance outside Brazil.*

There is no information available on the rate of development of *Licania rigida* under cultivation, but when mature it is said to yield fruits abundantly and it would no doubt prove to be a good shade tree in parks or avenues.

From the experience at Kew the germination of the seeds seems to be very uncertain. Out of 60 sown on April 25th only one showed signs of germination on July 6th, or about three months from the time of sowing. They were selected from the fruits received from Ceara with the herbarium material mentioned above and all appeared to be comparatively fresh when sown. Some seeds (kernels of the trade) were sent to Kew for identification in March 1924 by Messrs. Kleinwort, Sons & Co., of Liverpool, and of two seeds selected for growing at the propagating pits one germinated in less than a month

*In a paper on "Le Commerce des graines oléagineuses au Brésil... L'Oiticica..." in Bulletin des Matières grasses de l'Institut Colonial de Marseille, no. 2, 63 (1931), it is stated that the export of this oil dated only from that year; it had been, up to May, approximately 25,500 kg. in all.

In a monograph on Tung Oil, by C. Concannon (U.S. Dept. of Commerce), Trade Prom. Ser. No. 133, 59 (1932), it is estimated that "only small quantities have been shipped to foreign countries, but the development of an export trade in Oiticica Oil is hoped for, and trial shipments have recently been made to Germany, England, Belgium and the United States."

after sowing. On the other hand the seeds of *Moquilea tomentosa* germinate readily. In a small consignment of fruits received from the British Consul at Para in 1929, the seeds germinated freely and there are now several well-established plants about 3 ft. high.

LITERATURE.

- (1) "O Oleo de Oiticica e as vantagens de sua industria no Brasil." Dr. Henrique Paulo da Cunha Bahiana in Boletim do Ministeres da Agricultura, Industria e Commercio, Rio de Janeiro, Sept. 1930, 443-460. (Under the name of "*Licania rigida*".)
- (2) "Oiticica Oil—a New Drying Oil," E. Richards Bolton and Cecil Revis in "The Analyst," July 1918, 251-253. Reprint in American Journal of Pharmacy, October 1918, 727-730.
- (3) "Oticica or Oiticica Oil." Bull. Imp. Inst. 1923, 641.
- (4) "Oiticica Nuts (*Licania rigida*)." Bull. Imp. Inst. 1929, 279.
- (5) "Oticica Oil: A possible Adjunct to Tung Oil." Henry A. Gardner, Circular 177, Educational Bureau, Paint Manufacturers Association U.S.A. 1923.
- (6) "Das Oiticica-Öl und die Oiticica-Ölindustrie in Brasilien." Der Tropenpflanzer, Berlin, May 1931, 206-210.
- (7) "Oiticica Oil," Dr. Jordan in Technical Paper of the Research Association of British Paint, Colour and Varnish Manufacturers, No. 34, 155-158 (1932).

LV.—MISCELLANEOUS NOTES.

Hooker's Icones Plantarum.*—Part iii. of vol. ii. of the Fifth Series, which has now appeared, includes descriptions and plates of sixteen new or recently described species of special interest, four of them belonging to genera not previously or adequately figured. The remaining nine plates illustrate little-known species or varieties.

Delphinium (Consolida) acutilobum Turrill (t. 3151) is a native of northern Persia, discovered by Mr. Gilliat-Smith in 1927. *D. macedonicum* Halácsy et Charrel (t. 3152) is a very beautiful species of larkspur inhabiting Thrace, Anatolia and Armenia. Its rather complicated history and synonymy have now been elucidated. *Tamarix Hampeana* var. *aegaea* Turrill (t. 3153) is a new variety, from W. Thrace. It is remarkable for the long acuminate bracts and might have been treated as a distinct species but for the existence of specimens intermediate in character. *Genista tinctoria* var. *virgata* Koch (t. 3154), which is distributed in Central and South-Eastern Europe, differs from *G. tinctoria*, as represented in Western

*Hooker's Icones Plantarum; or, figures, with descriptive characters and remarks, of new and rare plants, selected from the Kew Herbarium. Fifth Series. Edited for the Bentham Trustees by Sir A. W. Hill, K.C.M.G., Sc.D., F.R.S., Director, Royal Botanic Gardens, Kew. Vol. ii. part iii. (London, Dulau & Co., 1932). Price 10s.

Europe, by its tall erect habit (up to 2 m. high) and numerous slender twigs, as well as by its persistent stipules. *Cotyledon lassithiensis* Hayek (t. 3155) is a native of Crete and Thrace, described by the late Dr. Hayek in 1925. It differs from *C. pendulinus* Batt. chiefly in its coarsely serrate bracts. *Onopordon tauricum* Willd. (t. 3156) is a handsome thistle figured from material grown at Kew from Bulgarian seed. It has a wide distribution in South-Eastern Europe and N. Asia Minor, but its occurrence in the western Mediterranean as a native plant is doubtful. *Sideritis scardica* Griseb. (t. 3157) is collected in considerable quantity in Bulgarian Macedonia, and is used for making an infusion which is drunk as "tea."

Neocheiropteris Waltoni Ching (t. 3158) is a second species of a genus of Polypodiaceae hitherto supposed to be monotypic. It is a native of Tibet, and differs from the Yunnanese *N. palmatopedata* (Baker) Christ chiefly in its hastately trilobed fronds. *Sloanea elegans* Chun (t. 3159) and *Acer sycopseoides* Chun (t. 3160) are new species from South China. The latter is remarkable, in the genus *Acer*, for its undivided or slightly trilobed leaves. *Pterostyrax Lencillei* (Fedde) Chun (t. 3161) is clearly allied to *P. hispidus* Sieb. et Zucc., from which it may be distinguished by the tricuspidate leaves and floral characters. *Gentiana setulifolia* Marquand (t. 3162), from S.E. Tibet, is unique in the genus in having ciliate leaves and calyx-lobes. *Kingdon-Wardia* is a recently described monotypic genus, intermediate between *Gentiana* and *Saccolia*. *K. codonopsidoides* Marquand (t. 3163) has been found only in S.E. Tibet. *Buddleja gynandra* Marquand (t. 3164), which is a native of Tonkin, differs from all previously known species of *Buddleja* in the position of the stamens, which are semi-epigynous instead of being attached to the corolla-tube. *Leycesteria crocothyrsos* Airy-Shaw (t. 3165), from Assam, is a beautiful new species with foliaceous stipules and orange flowers. *L. gracilis* (Kurz) Airy-Shaw (t. 3166) has a wide distribution in Sikkim, Bhutan, and Yunnan. It was long known erroneously under the name *L. glaucophylla* (Hook. f. et Thoms.) Hook. f. That species is now assigned to subgen. *Euleycesteria* Sect. *Pentapyxis*, whereas *L. gracilis* is the type of a new subgenus, *Paralestera*, distinguished by the 8-locular glabrous ovary and very small subulate bracts. *Taraktogenos calophylla* Ridley (t. 3167) is a new species from Sarawak.

Paraphyadanthé suffruticosa Milne-Redhead (t. 3168), a new species from Northern Rhodesia, is an undershrub, well adapted to withstand savannah conditions and especially the annual grass fires which sweep the country at the end of the dry season. *Paraphyadanthé* belongs to the Flacourtiaceae-Oncobaceae. *Dalbergiella nyasae* E. G. Baker (t. 3169), a tree originally described from Nyasaland, is by no means uncommon in Northern Rhodesia, though it was not collected there before 1929. The fruits possess a remarkable fringe of plumose hairs along the dorsal suture. The genus, which was described for the first time in 1928, belongs to the Leguminosae-

Dalbergieae. *Canthium Gueinzii* Sond. (t. 3170) has a wide distribution from Uganda and Kenya Colony in the north to the Transvaal, Natal and Zululand in the south. It is readily distinguished from all other species of *Canthium* by the reddish tomentum of the young branchlets and by the lateral nerves being impressed in the glabrous upper surfaces of the mature leaves. Perhaps the most remarkable plant in the Part is *Rhopalota aphylla* N. E. Brown (t. 3171), a diminutive aquatic member of the Crassulaceae, which has been segregated generically from *Crassula* chiefly on account of its leafless stems and truncate-convex uniovulate carpels. The flowers are sunk in the upper surface of the club-shaped segments of the stem, so that the limits of calyx and stem-segments are difficult to distinguish.

Barnhartia floribunda Gleason (t. 3172), from British Guiana and the Amazonas, was described in 1926 as a new genus and species related to the Styracaceae. It is shown that both *Barnhartia* and the related genus *Diclidanthera* (on which a new family, Diclidantheraceae, was based in 1924) should be referred to the Polygalaceae. The Part ends with three species of *Strychnos* from British Guiana. *S. (§ Longiflorae) diabolii* Sandwith (t. 3173) is a new species known by the Arawak Indians of British Guiana as "Black Devil-Doer" on account of its poisonous properties. *S. (§ Intermediae) Melinoniana* Baill. (t. 3174) is known, for a similar reason, by the vernacular name "White Devil-Doer." *S. (§ Longiflorae) tomentosa* Benth. (t. 3175) is related to *S. toxifera* Rob. Schomb., from which it differs in the indumentum of the branchlets and leaves and the shape of the calyx segments.

Principles of Soil Microbiology.* The investigation of the activities of micro-organisms occurring in the soil is to-day one of the most important and far-reaching problems of agricultural science. Since the publication of the first edition of Waksman's Principles of Soil Microbiology (see K.B. 1927, 424) there has appeared a considerable volume of new literature on the subject. In this second edition the author has incorporated much additional recent information. Certain chapters, as for instance that on mycorrhiza, have been entirely rewritten, and some new chapters have been added dealing with the decomposition of organic matter in natural and artificial manures, with the transformation of organic matter in peat and forest soils, and with the relation between plant growth and the activities of soil micro-organisms. To counterbalance the increase in size of the work which would have resulted, there has been some condensation by the omission of not strictly relevant matter and by the combination of certain chapters. The resulting volume actually has three pages less than the first edition, and 15

*Principles of Soil Microbiology, by Selman A. Waksman. Second Edition. Baillière, Tindall & Cox, 8, Henrietta Street, Covent Garden, London, W.C.2, 1931, pp. xxviii + 894, 15 plates, 83 figures in text, price 52s. 6d.

instead of 19 plates. Allowing for a few more text-figures and an additional number of words, it is still difficult to see why it was necessary to raise the price from 45/- to 52/6. The work is of the first importance, not only to investigators in soil science, but also to advanced students of general biology. It is unfortunate therefore that its price could not have been brought more within the means of the average research worker.

E.M.W.

The Curious Gardener.* Mr. Jason Hill has rendered a conspicuous service to Horticulture in this book, since he reminds us of many interesting and valuable old garden plants, which are tending to vanish or have vanished from our gardens owing to the desire for new forms.

Many of the old-fashioned flowers charmed us by their scent or some other pleasant qualities, such as beauty of form, now often ousted by doubling and so on. The author reminds us of the old-fashioned roses, now so largely neglected, which it is hoped will again receive attention thanks to his welcome volume. If Mr. Hill would look through the early numbers of the *Botanical Magazine* and try to reintroduce the numerous plants of interest now lost to cultivation he would perform a signal service to horticulture and good gardening.

His chapter "The Invisible Garden" is one to be commended, since he dilates there on those plants which yield their fragrance to us either from their leaves or flowers. How much pleasure can be derived from scented plants is not fully appreciated by those whose main delight is to cultivate plants only for the size or brilliance of their flowers.

A number of plants are mentioned all of which are worthy of a place in any garden, and which could well be grown apart in a separate plot.

The book is illustrated with some interesting drawings by John Nash, and in all the chapters there are references to plants well worthy of attention by the "Curious" amateur gardener, who should take the interest of a connoisseur in his garden.

Insects and Diseases of Ornamental Trees and Shrubs.†—

Although primarily a book for the guidance of those interested in American Arboriculture, this important work is also applicable to this and other European countries, for many of the fungus diseases

*By Jason Hill, London, Faber & Faber, Ltd., 24, Russell Square, pp. 173, ill. 7. Price 7s. 6d.

†By Ephraim Porter Felt, Director and Chief Entomologist, Bartlett Tree Research Laboratories; and W. Howard Rankin, Associate in Research in Plant Pathology, New York State Agricultural Experiment Station, Cornell University. Published by the Macmillan Company, New York and London, 1932, pp. xix + 507, 243 text figures. Price 25s. net. Obtainable in this country from Messrs. Macmillan & Co., Ltd., London.

and insect pests considered are troublesome alike to North American and European cultivators, whilst similar means of control are necessary wherever they are found. The book, which is divided into two parts, commences with a general description of insects, their life history, and depredations. This covers pp. 3-38 and includes notes on the anatomy of insects, the transformation stages of various kinds, food preferences, methods of attack, natural checks to injurious insects, climatic effects on insects, the more important groups injurious to shade trees, and other subjects. Lists are then given of borers and wood-gnawers, leaf-feeders, sucking and other insects.

Chapter 2 deals in like manner with fungi and extends from p. 39 to p. 99. General remarks on fungi are followed by sections on their methods of causing disease, descriptions of specific types of disease, and the treatment of wounds and cavities. The next eleven pages deal with the composition and methods of use of a considerable number of insecticides and fungicides, and a chapter follows on injuries other than those caused by organisms.

Of particular interest to persons residing in or about industrial towns are the pages on gas and smoke injuries. Lists are given of some of the most easily affected and of some of the most resistant trees. From the former list the horse chestnut is missing. That tree is one of the first deciduous trees to suffer from impure atmospheric conditions in this country. The ash heads the list of resistant trees, a decision that is corroborated by experience in the British Isles. This concludes Part I of the book.

Part II is devoted to an alphabetical arrangement of trees and shrubs with accounts of the associated insects and fungi. In this the various groups of trees and shrubs are taken in alphabetical sequence under their common names. The various pests and diseases peculiar to each genus are dealt with at varying lengths according to their bearing upon the health of their hosts, one that occasions little harm being dismissed in a few lines whereas one or more pages may be devoted to those that are of greater virulence and endanger health and life. In the latter cases methods of control are described. The book is concluded by a good index. W. D.

A Handbook of Empire Timbers.*—In the preface we are informed that the object of this book is to direct the attention of architects, engineers, builders, the designers and makers of furniture, and other people interested in the use of timber, to a number of the more important woods of the British Empire, and ways are indicated whereby they may be used instead of those of foreign origin. The Imperial Institute, the Forest Products Research Laboratory at Princes Risborough, the Royal Botanic Gardens, Kew, and the

*A Handbook of Empire Timbers. Issued by the Empire Marketing Board, 2, Queen Anne's Gate Buildings, London, S.W.1, pp. 102. Particulars from the Secretary.

Empire Marketing Board have collaborated in the production of the book and the Empire Marketing Board has undertaken the important work of publication.

The timbers described are limited to sixty, and include only those of proved worth of which a regular supply can be maintained. They are geographically arranged, and under the general heading of the trade name each timber is described under several subheads. The first paragraph in each description deals with the scientific name of the tree, its average size and general distribution. Then are given descriptions of the physical properties of the timber, mechanical properties, seasoning, durability, working and finishing qualities, sizes as generally available, and its principal uses, in fact, all the particulars that are required by a person who is asked to use a particular wood of which he has no previous knowledge.

The various woods described have been well tested, and lists of their special uses are given on pp. 94-96. Specimens of all of them are to be seen in the museums in the Royal Botanic Gardens, Kew. The use of the book is facilitated by a good index of scientific and common names, and it should be included in the library of every person interested in the marketing and use of timber. W. D.

The Birds of Tropical West Africa.* The first volume of this valuable work, including an introductory essay on the relationship of the vegetation belts to the distribution of bird life in tropical Africa, was reviewed in *Kew Bull.* 1930, 334. The second volume, which appeared late in 1931, continues the systematic description of genera and species and includes the Orders Ralliformes (Rails and Finfoots), Gruiformes (Cranes, Bustards, Stone Curlews, and Lily Trotters), Charadriiformes (Waders), Columbiformes (Sandgrouse, Button-Quails, Pigeons and Doves), and Psittaciformes (Parrots).

Under each species or variety are paragraphs dealing with its synonymy, technical description, field identification, range and local distribution, and habits, the last section being attractively written and containing many facts of interest to the general reader. No support is given to the popular belief that the Egyptian Plover or Crocodile Bird enters the mouth of the Crocodile in order to pick its teeth. The coloured illustrations of the commoner birds are particularly good. The volume also contains a useful map of the Gold Coast on which the railways, roads of various classes, and principal paths are clearly marked.

*By D. A. Bannerman. The Crown Agents for the Colonies, 4, Millbank, Westminster, 1931, pp. xxx + 428, full page plates 15, coloured map, text figs. 114. Price 22s. 6d.

BULLETIN OF MISCELLANEOUS INFORMATION No. 9 1932 ROYAL BOTANIC GARDENS, KEW

LVI.—THE GRASSLAND VEGETATION OF THE CAMEROONS MOUNTAIN. T. D. MAITLAND.

INTRODUCTION.

The following remarks on the grass flora of the Cameroons Mountain have been drawn up from observations by the writer during several botanical trips along its eastern slopes, and from a fairly comprehensive collection of its grasses.

The region is of considerable interest botanically, as many of its species are endemic, and there is still much to be known regarding it.

It is hoped that these notes will add to our knowledge of the area and provide a comparison with the other mountain regions in the African Tropics and with those in other Continents.

The Mountain lies on the edge of the Bay of Biafra in the Gulf of Guinea on the west coast of Africa, between 3°57'–4°27'N. and 8°58'–9°24'E. It is a huge, volcanic mass, its lower peak rising abruptly from the sea to 13,336 ft. (4100 m.) in its main peak, which is about 14 miles away. It is roughly oblong in shape, and extends inland to about 28 miles, forming a land mass of about 600 sq. miles. It is considered to be of the same basaltic origin as Fernando Po, Prince's Is., St. Thomas Is., and Ascension in the Atlantic.

It will be observed from its position that it lies within the tropical rain-belt, and some local records compare with those of Assam, which holds the world's record for rainfall. There are records for Debuncha, a plantation at sea-level, showing as much as 316.64 in. for one year, and for Buea at 3200 ft. (984 m.), the highest station on the Mountain, as much as 121.96 ins.

These excessive precipitations do not hold for the whole mountain area, and, although there are no records for the higher altitudes, the Buea meteorological records would indicate that above the rain-forest belt, mist and drizzle during the rainy period, as opposed to the torrential downpours of the lower levels, are the rule. In addition, the porosity of the great lava folds of the upper regions precludes the accumulation of moisture supplies.

The seasons are very well defined. There is a period of heavy rains, occurring between the months of June and October, with July, August and September the excessively wet months; and a dry period, extending from November to May, with December, January, and February very hot. The latter season leaves the mountain grass-land dry and parched, and causes many of the forest trees to

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cast and renew their leaves. The periodic dessication, the rarified air, and the edaphic conditions in the upper reaches all combine to give rise to a flora with marked xerophytic characters.

ZONATION.

The vegetational zones of the Mountain are also well-defined and can be classified as follows :

THE MANGROVE ZONE. This is confined to the southern end of the Mountain, and to the estuaries of the Rio del Rey and Mungu rivers. It is a mere fringe, interrupted in parts where the rugged rocks form the fore-shore.

THE RAIN-FOREST ZONE. This succeeds the Mangrove zone and covers the slopes up to 6500 ft. (2000 m.). It contains a sub-zone with its higher limit at 3200 ft. (984 m.), where the coastal components of the rain-forest cease.

THE MOUNTAIN FOREST ZONE. This immediately follows the Rain-Forest zone, and is characterized by a formation consisting of *Hypericum lanceolatum* Lam., *Lasiosiphon glaucus* Pres., *Rapanea neurophylla* Mez, *Lachnophyllis Mannii* Hutch. et M. B. Moss, *Schefflera Hookeriana* Harms, *Myrica arborca* Hutch., *Pittosporum Mannii* Hook. f., etc., with its higher limit at 8500 ft. (2616 m.).

THE MOUNTAIN GRASS-LAND ZONE, with its higher limit at 11,000 ft. (3384 m.).

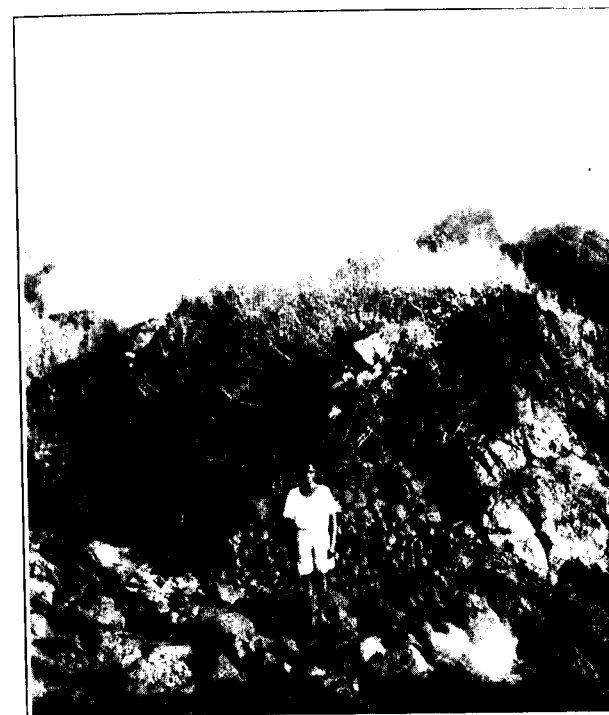
THE ALPINE DESERT ZONE. This succeeds the grassland at 11,000 ft. (3384 m.) and continues to the summit.

Apart from the extensive community described as a sub-zone within the rain-forest, no mention is made here of other smaller communities within the respective zones. These will be remarked on later where necessary. It may be added that the various zones indicated are exemplified in the grass flora.

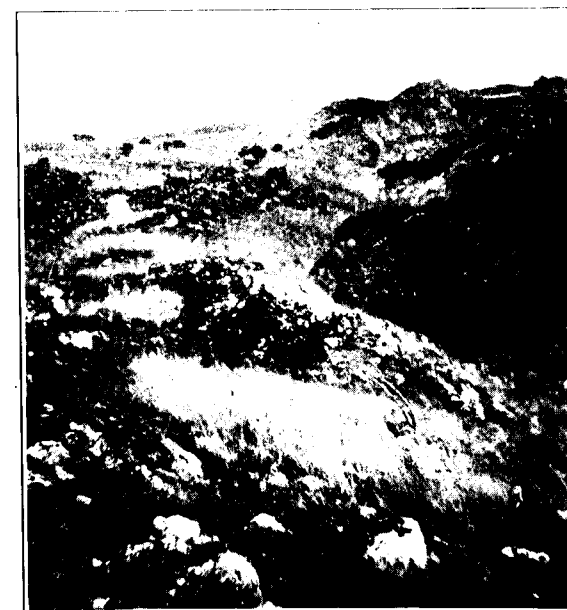
TYPES OF VEGETATION.

MANGROVE ZONE. The maritime grasses are the first encountered at low levels. One of the most interesting of these is *Paspalum vaginatum* Swartz, which is found in certain places in the *Avicennia nitida* Jacq. mangrove association, where it inhabits the salt mud-flats, the rocky and sandy fore-shore, and the periodically flooded tidal level. In the salt water conditions it forms cushion-like domes with masses of finely developed roots which hold up fine particles of sand. Over the rocks above the tide it is of a clambering nature, and on the sandy shore, although it does not extend beyond a very narrow strip, it exhibits a pasture-like habit. At its landward limits it is found in the *Avicennia* association linked up with *Stenotaphrum secundatum* (Walt.) O. Kuntze, the St. Augustine grass of America, a species widely distributed on the sea-shores of West Africa.

Both these grasses, it is interesting to note, exhibit the thick, fleshy structure characteristic of halophytes and xerophytes, in contrast to the normal structure of neighbouring grasses which approach, but do not enter, the salt-marsh area.



Sporobolus robustus Kunth, clambering over rocky foreshore.



Trichopteryx camerunensis Stapf, growing over old lava flow, 8,000 ft. (2,460 m.).

[To face page 418.

Sporobolus robustus Kunth and *Andropogon tectorum* Schum. are also found in rather unusual conditions on the sea-front, the former clambering over the rocks, and the latter on the edge of afforested cliffs almost within the tidal spray. These two grasses, however, will be discussed later with other species of the genus from the higher levels.

RAIN-FOREST ZONE. On some parts of the gentle slopes to the sea-shore *Paspalum vaginatum* Swartz is joined by a closely allied species, *Paspalum conjugatum* Berg., which extends to the higher limits of the sub-zone at 3200 ft. (984 m.). At this altitude it enters largely into the composition of the pasture land about the Government station of Buea. It is a vigorous, matted grass, forming natural pastures wherever the shrubby and arboreal plants are kept down. It invades old cultivations, open spaces, and, about the villages where it is grazed by goats and sheep, it forms lawn-like stretches. In the damper positions at the coast *P. conjugatum* Berg. is often mixed with *Axonopus compressus* Beauv., known as the "carpet grass," but the latter may in places be found almost pure. It is of similar habit and behaves in much the same way as *P. conjugatum* Berg., but it is, however, very restricted in its distribution, as it does not extend much higher than a few hundred feet.

P. conjugatum Berg. and *Axonopus compressus* Beauv. are also found at these low levels in association with *Oplismenus hirtellus* Beauv. and *O. Burmannii* Beauv., but mostly about afforested areas or near shade. The two former being typical forest species, give place to the latter in the more shady places. The *Oplismenus* spp. have, however, been observed to persist for a time in the *P. conjugatum* Berg. and *Axonopus compressus* Beauv. communities in open land which had, until some years previously, been under forest.

It may be worthy of note that the inflorescences of *O. hirtellus* Beauv. are glandular and viscid, and, in places where it forms thick patches in open glades and during hot, moist weather, have been observed to give off the strange smell so peculiar to the "stink grass," *Melinis minutiflora* Beauv.

Both the species of *Oplismenus* are widely distributed and extend some way beyond the sub-zone. At a higher altitude their place is taken by a hairy form, the variety *simplex*, and the *forma robusta* Stapf of *O. hirtellus* Beauv., all of which are found along forest paths in glades at about 4500 ft. (1384 m.). The last form has larger spikes and stronger bristles than the type.

Ruderals are very well represented within the sub-zone and the well-known "guinea grass," *Panicum maximum* Jacq., is prominent among them. It behaves here in its normal way, invading old clearings, cultivations and roadsides, and may be found in pure stands of strong, luscious growth. Other ruderals occurring are *Digitaria horizontalis* Willd., *Chloris breviseta* Benth., *C. pycnothrix* Trin., *Eragrostis ovina* Hochst., *Eleusine indica* Gaertn., *Sporobolus Molleri* Hack., all of which inhabit gravelly places such as roadsides,

Paspalum scrobiculatum var. *Commersonii* Stapf, and *P. paniculatum* L., both invading old pastures, and *Pennisetum polystachyon* Schult., *Arthraxon Quartinianus* Nash., and *Rottboellia exaltata* L., which, like the "guinea grass," invade old clearings and cultivated lands.

The occurrence here of *P. paniculatum* L. is of interest, being a species widely known in Mexico, tropical America, and the West Indies, while its distribution on the west coast of Africa is rather local. Although a few stragglers have been observed as high as 3200 ft. (984 m.), it finds the conditions about sea-level more favourable, where in parts it is fairly common.

Of the ruderals enumerated only one, or perhaps two, would appear to be restricted to the higher limits of the sub-zone. These are *Arthraxon Quartinianus* Nash, and *Rhynchelytrum roseum* Stapf et Hubbard (*Tricholaena rosea* Nees), which, so far as observations go, occur only at about 3200 ft. (984 m.). Here the *Arthraxon* is a rambling grass forming pure patches about the sides of roads and in abandoned garden plots, or mixed with other grasses. During the height of the dry season it shows a heavy infestation of rust, which turns the patches brown and destroys the leaves, but not before the flowers are well advanced. This point is remarked on as the grasses of the Mountain are singularly free from fungal attack.

The *Rhynchelytrum* is not at all frequent and the gatherings so far made have been from around boulders in large clearings. The excessively moist conditions do not seem to favour it. In East Africa, where it is quite common and where the rainfall and humidity are very much less, it frequents dry, gravelly slopes, or is a ruderal in old cultivated areas.

Besides *Echinochloa pyramidalis* Hitch. et Chase, which has been observed only at low levels in swamp communities, mention may be made of *Brachiaria mutica* Stapf as one other grass confined to the sub-zone. It has been gathered on the edge of swamp along with the former; also on some adjoining elevated land near the sea, and in an elephant grass community at 3200 ft. (984 m.), occurring in dense patches some three or more feet deep. Those at the lower level are glabrous, whilst those of the higher possess hairy joints. It is a vigorous, spreading grass with tough stems.

With the exception of *B. plantaginea* Hitch., which was found on a stock farm, but considered to be an alien, this is the only *Brachiaria* so far recorded. This fact is significant, since the genus is represented by numerous species over a great part of Central Africa, and especially the Uganda Plateau.

There are two other grasses of the sub-zone which have so far not been discussed, the "elephant grass," *Pennisetum purpureum* Schum. and the "buffalo grass," *Setaria caudula* Stapf; they are not confined to the sub-zone, occurring as high as 4500 ft. (1384 m.). In the sub-zone the "elephant grass" occurs only sporadically along the mountain streams, about the edge of forests, bordering clearings, and almost to the sea-level, but at 3200 ft. (984 m.) it covers some

fairly extensive areas and evidently finds the conditions at this altitude very favourable, as it forms strong, dense growth. This grass having invaded deforested land, these areas are not stable and some of the older parts are now becoming overgrown by shrubs, such as species of *Maesa*, *Triumfetta*, *Millettia*, *Combretum*, *Tephrosia*, etc.—a transitional stage in re-afforestation. This altitude would appear to be the most favourable for it, for on the great Uganda Plateau it covers miles of country at 3700 ft. (1140 m.) and extends over the greater part of the western slopes of the Ruwenzori Mountain up to 5000 ft. (1540 m.).

Within the "elephant grass" areas there are found other grass communities which are of interest, as, for instance, colonies of *Melinis minutiflora* x *M. tenuissima*, *Brachiaria mutica* Stapf, *Panicum brevifolium* L., and *Imperata cylindrica* var. *Thunbergii* Durand et Schinz. *Melinis minutiflora* Beauv. and *M. minutiflora* var. *inermis* Rendle have been observed at about 4500 ft. (1384 m.), but the other parent, *M. tenuissima* Stapf, has not so far been observed on the mountain by the writer.

Setaria caudula Stapf follows its normal behaviour here, growing about the edge of forests and in glades associated with herbs and bushes. At lower levels in some of the banana plantations which have been planted over deforested land, it is becoming a serious pest. The genus is further represented by the species *S. Chevalieri* Stapf and *S. barbata* Kunth, the former being similar to *S. caudula* Stapf, occupying much the same habitats, but having a spreading, lax inflorescence, with stiff, piercing hairs on the leaf-sheath. The latter is a rambling grass, rooting at the nodes, and frequenting damp places and the shade of trees.

There are two grasses which take up roughly a middle position in the rain-forest zone, both representative of the genus *Panicum*, *P. calvum* Stapf, and *Panicum* cf. *P. sublaetum* Stapf. *P. brevifolium* L. might well be included here too, although its limits appear to be somewhat narrower. The two former occur from 1000 ft. (308 m.) or 2000 ft. (616 m.) to about 4000 ft. (1232 m.) and frequent the edges of the forest, clearings and paths. They are trailing or clambering grasses and occur in pure patches when they have no neighbours over which to clamber. They form a link with the *Panicum monticolum* Hook. f. group, including *P. acrotrichum* Hook. f., and *P. Hochstetteri* Steud., which make their appearance at high altitudes. Here also is found another interesting forest grass, *Chloachne secunda* Stapf, which exhibits much the same characters as the *Panicums*.

The foregoing account gives some impression of the grasses of the rain-forest zone, but it should be noted that most of the species dealt with occur within the region of human habitation, and it is by reason of this that they appear as prominently as they do. Their existence is made easier by man having deforested large areas for cultivation and habitation, whereby competition with the larger components of the flora is for the time being restrained.

Cultivation by the native ceases about 4500 ft. (1384 m.) and with it the grasses. Closed forest mostly obtains, and grasses do not again appear until the limits of the rain-forest are reached at 6500 ft. (2000 m.).

MOUNTAIN FOREST ZONE. The rain-forest, with its fringe of mountain forest, forms an irregular band along the mountain slopes, extending from 6500 ft. (2000 m.) to 8500 ft. (2616 m.). In some places the mountain grassland pierces the mountain forest to the limits of the rain-forest zone, and here, fringing the forest, *Panicum Hochstetteri* Steud. is usually found with *P. acrotrichum* Hook. f. in glades and shady places. The former is found fringing the forest and the mountain grass-land as high as 8000 ft. (2460 m.), forming matted masses and clambering over bushes. It possesses extensive, thin, hard, wiry stems and narrow leaves.

The following observations on the genus *Panicum* as represented by the species recorded for this region may be of interest. With the exception of *Panicum maximum* Jacq., which is a strong-growing, erect plant with thick stems and large leaves, usually inhabiting open places, the species are of a trailing and clambering habit with extensive, thin, wiry stem development and small, narrow leaves. In the species *P. calvum* Stapf, *Panicum* cf. *P. sublaetum* Stapf and *P. brevifolium* L., which occur well within the rain-forest, the leaves are somewhat larger than those of *P. Hochstetteri* Steud. They become very reduced in the diminutive species *P. pusillum* Hook. f. which occurs sparingly in the mountain grass-land at 8000 ft. (2460 m.).

It is evident that the trailing and clambering habit assumed by these species of *Panicum* is a method of growth suited to forest or semi-forest conditions, as it enables them to grow more easily in search of light and advantage of position. The reduction in the leaf system of the species *P. Hochstetteri* Steud. and *P. pusillum* Hook. f. at the higher levels is compatible with the rarified air conditions and the extreme drought to which they are subject during the dry season.

In addition to the last two *Panicums* associated with the mountain forest zone there are two other grasses found in glades, with various herbs or in small colonies; namely, *Streblochaete longiaristum* Pilger and *Acritochaete Volkensii* Pilger. Like the *Panicums* they are trailing grasses with fairly extensive stem development. Their long, slender, barbed awns are peculiar in that they form a rope-like twist so that numbers of the spikelets are linked up and when ripe become detached from the spike in a bunch-like fashion. Both these grasses have been recorded from East Africa, the latter from Mts. Kilimanjaro, Elgon and Kenya.

In the more open parts and about the fringe of the mountain forest zone two species of *Bromus*, *B. scabridus* Hook. f. and *B. giganteus* L. occur, as well as several species of *Avenastrum*. The latter also appear sparingly in the neighbouring grass-land, and in

general appearance resemble the British *Arrhenatherum elatius* Mert. et Koch. The *Bromus* species have not so great a range, although *B. scabridus* Hook. f. has been gathered among bushes at 9200 ft. (2832 m.).

MOUNTAIN GRASS-LAND ZONE. There is little or no transitional bush stage from the forest limits to the mountain grass-land so that one passes as through a door-way from the forest. Very soon, especially on the main Eastern slopes, having passed through a narrow strip of *Panicum Hochstetteri* Steud., *Pennisetum monostigma* Pilger, and certain herbaceous plants, a belt of *Trichopteryx camerunensis* Stapf is encountered. It is a tussock grass subsisting on the thin soil of the windswept slopes, and during the dry season its browned culms and panicles of chestnut hue give them a characteristic colouring. In full leaf it appears as a continuous sward, but the grass fires during the dry season reveal its tussocky nature.

The approximate range of *T. camerunensis* Stapf is between 7000 ft. (2152 m.) and 8000 ft. (2460 m.), thus forming a narrow belt round the mountain. It is superseded by *Andropogon Mannii* Hook. f., *A. lima* Stapf, *A. distachyus* L., and *Andropogon* cf. *A. Dummeri* Stapf, which are a feature of the grass-land up to 10,000 ft. (3080 m.), with scattered tufts extending higher. As they occupy a higher level they are subject to more poverty-stricken conditions, occurring over great stretches of the old weathered lava fields. They have been gathered from ledges and holes in the scoriaceous rocks and boulders.

The association of *Andropogon* and *Trichopteryx* here suggests a reference to a similar association in East Africa, where, on the shores of the Victoria Nyanza in Uganda, *Trichopteryx kagerensis* K. Schum. and *Andropogon canaliculatus* Schum. are found. *A. Dummeri* Stapf is found also about the same region. The sandy soil of the Lake shore and the gravelly, laterite slopes approximate in some respects to the edaphic conditions of the Cameroons Mt., where the *Trichopteryx* and *Andropogon* exist. The genus *Trichopteryx* is represented here only in the species *T. camerunensis* Stapf, whereas in East Africa there are a number, ranging from the short *T. kagerensis* K. Schum. to the tall *T. superba* Baglietto. The several species of *Andropogon* recorded from the higher levels of the Mountain are all of similar growth, being tussock grasses with thin, straight flowering stems up to two feet or so, carrying from 2 to 3 brown spikes. There is, however, an exception in *A. abyssinicus* R. Br. gathered at 11,000 ft. (3384 m.), a small, annual species with short awns and light coloured, hairy spikes, but not so common as the others. These mountain species are in striking contrast to *A. tectorum* Schum., found near the sea-shore and already referred to—a grass of more ample dimensions, growing as high as 3 to 4 ft., with a multiple branching habit and carrying numerous spikes. It is found only sparingly in the afforested sub-zone, whilst in Sierra Leone it covers extensive areas in the open.

Within the mountain grass-land there are some favoured areas which might be described as orchard, inhabited by low trees and shrubs, namely *Aguaria salicifolia* Hook. f., *Hypericum lanceolatum* Lam., and *Adenocarpus Mannii* Hook. f. Such areas exist at the southern and northern ends on flats and gentle slopes from 8000 ft. (2460 m.) to 10,500 ft. (3230 m.). In the lower orchard areas the grass covering is of a heavier nature than elsewhere and is composed of a number of species, notably *Hyparrhenia Smithiana* Stapf and *Pennisetum monostigma* Pilger, besides *Trichopteryx* and *Andropogon*. The *Hyparrhenia* does not go much beyond 8000 ft. (2460 m.), keeping to the more favoured areas, but the *Pennisetum* is less fastidious, occurring not only on the edge of the forest around bushes in the orchard land, but even among scoriaceous rocks in the old lava flows, and is found as high as 9000 ft. (2768 m.). It is an interesting *Pennisetum* not only in this respect, but in the fact that it is a species almost confined to the Cameroons Mountain.

In places the mountain grass-land is intersected by more recent lava flows overlying the old and in various stages of deterioration, resulting in peculiar communities of plants within them. They are invaded by some of the grasses from the neighbouring grass-land, and although some of the species merely tolerate the conditions others would appear to be adapted to them. Besides *Pennisetum monostigma* Pilger, already referred to as occurring in the lava flows, one species of *Tripsacum*, *T. major* Hook. f., also occurs frequently. Indeed it has been gathered from pure ashbeds on the slopes of some of the small craters. It is found only sparingly in the grass-land, about boulders and stones, and is of a xerophytic structure, with narrow, rolled leaves, thin, wiry flower stalks, carrying scaly *Lolium*-like spikes, of an unusual ashen colour. It is found between 8000 ft. (2460 m.) and 9000 ft. (2800 m.).

Another interesting grass found under identical conditions, but extending much higher, even up to 11,000 ft. (3384 m.), is *Sporobolus montanus* (Hook. f.) Engl. Its vegetative characters are also similar, being tufted, with thin flower stalks, carrying a loose panicle of dark-coloured spikes. It differs markedly in these respects from the species *S. robustus* Kunth and *S. indicus* R. Br. The former is a diffuse plant, thick-stemmed, and bearing robust, tail-like panicles. The plants of this species from the rocky fore-shore, it should be remarked, are of a clambering habit and short-jointed in contrast to the long-jointed, strong, erect habit of those from the Uganda plains, which appear to be its more natural habitat. The latter is found usually in favoured places and at lower levels—a leafy grass with an erect, open, graceful panicle. There is a form, however, which occurs scattered in the grass-land at about 7000 ft. (2152 m.), with a stiff, spike-like panicle.

At 8000 ft. (2460 m.) or even lower, some of the outposts of the upper grass-land are encountered, as, for example, *Aira caryophyllaea* L., the well-known European species—here it is very light-



Arboreal limits at 10,700 ft. (3,292 m.) with *Adenocarpus Mannii* Hook. f. in foreground leading to pure grass land.



A community of *Deschampsia* cf. *D. Mildbraedii* Pilger and *Festuca abyssinica* Hochst.

coloured in all its parts, delicate in structure, scattered but widely distributed, and frequent in pockets in the grass-land and old lava flows—*Koeleria convoluta* Hochst., allied to *K. cristata* Pers. of the northern and southern hemispheres, *Deschampsia* cf. *D. Mildbraedii* Pilger, *Agrostis*, *Festuca*, *Pentaschistis*, *Poa annua* L. and *P. leptoclada* Hochst.

The bush *Adenocarpus Mannii* Hook. f. finally ceases at 10,700 ft. (3292 m.). This is preceded on certain parts of the barren mountain slopes at 9000 ft. (2800 m.) to 10,000 ft. (3080 m.) by a community of *Aguaria salicifolia* Hook. f., *Hypericum lanceolatum* Lam., together with *Adenocarpus Mannii* Hook. f.; the grasses here are *Andropogon Mannii* Hook. f., *Agrostis Mannii* Stapf MS. (*Deyeuxia Mannii* Hook. f.), *Festuca abyssinica* Hochst., and *Deschampsia* cf. *D. Mildbraedii* Pilger. The last, with its ripened silvery panicles, is a striking feature over the boulder-strewn landscape.

Above 10,700 ft. (3292 m.) the vegetation becomes pure grass-land with certain herbaceous components, and *Deschampsia* and *Festuca abyssinica* Hochst. are prominent. This community continues along the sloping approaches to the peak, which become more and more thinly-clad and tussocky as the conditions become more and more desert, and finally ceases at about 12,500 ft. (3846 m.).

ALPINE DESERT ZONE. On the steep rise to the main crater and the barren ash-covered cones which make up the peak the conditions become bleak and desert in the extreme, and it would be difficult to find a place more unfavourable to plant life. Nevertheless on the smooth, ashy slopes and on the very summit itself stunted and dried up plants of *Festuca Schimperiana* Nees and *Pentaschistis Mannii* Stapf MS. grow either in clumps or from low domes of moss. These, with *Senecio clarenceanus* Hook. f. and *Helichrysum Mannii* Hook. f., form the final plant community at 13,336 ft. (4100 m.) on this mountain mass.

For identifications of many of the grasses I am indebted to the Director of the Royal Botanic Gardens, Kew, with whom many of the specimens have been deposited; and to Dr. Turrill and Mr. C. E. Hubbard for suggestions regarding the preparation of this paper.

LVII.—CONTRIBUTIONS TO THE FLORA OF SIAM.*— ADDITAMENTUM XXXVI.

Ixora betongensis Craib [Rubiaceae-Ixoreae]; ab affini *I. merguense* Hook. f. foliis subtus haud glabris, nervis lateralibus magis numerosis inter alia recedit.

Frutex circa 1 m. altus (ex Kerr); ramuli validi, ad 8 mm. diametro, parum complanati, puberuli, brunneo-corticati, lenticellis parvis inconspicuis. *Folia* elliptica vel obovato-elliptica, apice acuminata, basi cuneata, 27–33 cm. longa, 12–14.3 cm. lata, subcoriacea, sicca viridia vel parum brunnescentia, supra glabra, subtus breviter hirsuta, costa supra impressa subtus prominente, nervis

*Continued from K.B. 1932, 338.

lateralibus utrinque circa 16 supra impressis subtus prominentibus intra marginem anastomosantibus, nervis transversis supra impressis subtus prominulis, margine recurva, petiolo 1.5 cm. longo valido supra late canaliculato suffulta; stipulae deciduae. *Inflorescentia* terminalis, 7 cm. diametro, pedunculo communi brevi incluso 6 cm. longa, ramulis longius puberulis; bracteae ad 4 mm. longae, cum bracteolis 2 mm. longis puberulae; flores albi (ex *Kerr*), sessiles vel pedicello ad 1.5 mm. longo suffulti. *Receptaculum* 1 mm. longum, sicco fuscum, puberulum. *Calycis* segmenta 4, inter se subaequalia, oblongo-ovata, acuta vel acute acuminata, ad 2 mm. longa et 1.25 mm. lata, dorso puberula, ciliata. *Corollae* tubus extra puberulus, 2.8 cm. longus, lobi 8 mm. longi. *Antherae* 6 mm. longae, acuminatae, loculis basi inter se liberis, filamentis 1 mm. longis. *Stylus* gracilis, ad 3.3 cm. longus, stigmatibus 4 mm. longis. Betong, 200 m., scrub jungle, *Kerr* 7639.

***Ixora bracteolata* Craib** [Rubiaceae-Ixoreae]; ab *I. lucida* R. Br. ex Hook. f. bracteolis receptaculo longioribus, corollae tubo extra glabro, ab *I. eugenioide* Pierre ex Pitard stipulis et calycis segmentis angustioribus, corollae tubo conspicue longiore distinguenda.

Ramuli graciles, primo compressi, puberuli, demum teretes, glabri, cortice brunneo obtecti, lenticellis haud conspicuis. *Folia* oblongo-oblancoolata, rarius elliptica vel ovata, apice subacuminata, summo apice apiculata, basi cuneata, late cuneata, vel rarius rotundata, 4.6-5 cm. longa, 1.8-3.2 cm. lata, chartacea, sicca supra subfusca, subtus brunnea, pagina utraque glabra, costa supra prominula subtus prominente, nervis lateralibus utrinque 8-10 tenuibus rectis supra conspicuis subtus prominulis intra marginem anastomosantibus, nervulis paucis pagina utraque plus minusve conspicuis, petiolo usque ad 5 mm. longo primo puberulo supra canaliculato suffulta; stipulae subulatae, ad 5 mm. longae, puberulae. *Inflorescentia* terminalis, corymbosa, circa 3 cm. longa, et rhachi et ramulis puberulis, articulata; bracteae angustae, ad 3 mm. longae; pedicelli usque ad 2.5 mm. longi, apice bracteolis duabus angustis receptaculo paulo longioribus instructi; alabastra acuminata, apice demum paulo stellulata. *Receptaculum* 1 mm. longum, glabrum. *Calycis* tubus brevis, segmenta 2 mm. longa, 0.75 mm. lata, glabra. *Corollae* tubus 1 cm. longus, extra glaber, lobi 4, circa 4 mm. longi. Krat, Ta Kum, *Put* 2887.

***Ixora brevidens* Craib** [Rubiaceae-Ixoreae]; ab affini *I. Brunonis* Wall. ex G. Don foliis subtus indumento brevi instructis, calycis segmentis multo brevioribus inter alia recedit.

Ramuli annotini compressi, crassi, breviter hirsuti. *Folia* elongato-obovato-elliptica, apice acuminata, basi cuneata, obtusa, 18-32 cm. longa, 9.5-11.5 cm. lata, chartacea, sicca parum fuscescentia, subtus pallidiora, supra ad costam et saepe etiam ad nervos laterales puberula, subtus breviter subsparse pubescentia, costa

subtus prominente, nervis lateralibus utrinque 15-17 supra conspicuis subtus prominentibus intra marginem anastomosantibus, nervis transversis supra plus minusve conspicuis subtus prominulis, petiolo 5 mm. longo breviter hirsuto supra canaliculato suffulta; stipulae e basi deltoidea subulato-acuminatae, 1 cm. longae, dorso medio carinatae, breviter hirsutae. *Infructescentia* terminalis, 2-2.5 cm. longa, e basi ramosa vel pedunculo communi ad 1 cm. longo suffulta, breviter hirsuta vel longius puberula. *Fructus* seminibus solitariis ellipsoideis vel geminis subrotundatus et parum compressus, ad 1 cm. diametro, calycis segmentis oblongo-deltoides circa 1.25 mm. longis erectis dorso breviter pubescentibus ciliatis diu coronatus.

Prachuap, Hui Yang, *Put* 3253.

***Ixora ebarbata* Craib** [Rubiaceae-Ixoreae]; ab affini *I. lucida* R. Br. ex Hook. f. corollae oculo glabro inter alia differt.

Frutex circa 4 m. altus (ex *Kerr*), inflorescentia excepta glaber; ramuli subgraciles, iuventute sicco fuscis, compressi, mox teretes, cortice cinnamomeo obtecti, lenticellis haud conspicuis. *Folia* oblonga, oblongo-obovata, vel elliptica, apice breviter obtuse acuminata, basi cuneata vel rotundato-cuneata, 4.5-11 cm. longa, 2-4 cm. lata, chartacea, sicca atra, costa supra conspicua subtus prominente, nervis lateralibus utrinque circa 10 supra saepissime impressis subtus prominulis intra marginem anastomosantibus, nervulis pagina utraque subprominulis, petiolo usque ad 1 cm. longo supra anguste canaliculato suffulta; stipulae subulato-acuminatae, circa 4 mm. longae. *Inflorescentia* terminalis, corymbiformis, pedunculo communi ad 1.5 cm. longo et floribus inclusis ad 4.5 cm. longa, laxiflora, ramulis lateralibus utrinque 2 inferioribus circa 7 mm. longis, partibus omnibus puberula; flores albi (ex *Kerr*), terminalibus saepissime sessilibus, lateralibus pedicello circa 3 mm. longo suffultis; bracteae angustae, inferioribus ad 3 mm. longis; bracteolae binae, ad pedicelli apicem positae, circa 0.5 mm. longae. *Receptaculum* puberulum, 1 mm. longum. *Calycis* lobi tubo paululo longiores, deltoidei vel suboblati, circa 0.5 mm. longi et 0.75 mm. lati, fere glabri. *Corollae* tubus gracilis, extra puberulus, 2.5 cm. longus, lobi 4, mox arcte reflexi, vix 6 mm. longi. *Antherae* 3.25 mm. longae, apice acute acuminatae, loculis basi productis, filamentis 1 mm. longis.

Ranawng, Kao Talu, 50 m., evergreen forest, *Kerr* 11,829.

***Ixora kratensis* Craib** [Rubiaceae-Ixoreae]; ab affini *I. Brunonis* Wall. ex G. Don foliis petiolatis, et calycis segmentis et corollae lobis brevioribus inter alia recedit.

Frutex circa 2 m. altus (ex *Kerr*); ramuli primo densius hirsuti, mox parum glabrescentes. *Folia* saepissime oblonga vel suboblonga, apice acute acuminata, basi truncata vel rotundato-truncata, 15-21 cm. longa, 4.5-6.5 cm. lata, chartacea, sicco brunnea, subtus pallidiora, supra ad costam primo hirsuta, mox plus minusve

glabrescentia, aliter primo sparse hirsuta, cito glabrescentia, subtus hirsuta, pilis haud densis, costa supra conspicua subtus prominente, nervis lateralibus utrinque 12-15 intra marginem anastomosantibus supra parum impressis subtus prominentibus, nervulis rete laxum supra subconspicuum subtus subprominulum efficientibus, margine revoluta, primo ciliata, petiolo 8-12 mm. longo dense hirsuto supra canaliculato suffulta; stipulae subulatae, 1 cm. longae, hirsutae, diu persistentes. *Inflorescentia* terminalis, corymbiformis, pedunculo communi circa 1 cm. longo incluso 2.5-5.5 cm. longa, 5-9 cm. diametro, partibus omnibus hirsuta; flores albi (ex Kerr), subsessiles vel pedicellis ad 2 mm. longis suffulti; bracteolae 2, sub receptaculo, circa 1 mm. longae. *Receptaculum* circa 1 mm. longum, pilis paucis instructum. *Calycis* segmenta 4, lanceolata, subacuta, 1.75 mm. longa, hirsuto-ciliata. *Corolla* extra subsparse pilosa, ante anthesin apice fusiformis; tubus 3 cm. longus, intra glaber; lobi 4, spatulato-elliptici, 7 mm. longi, 3 mm. lati. *Stamina* 4, filamentis 2.5 mm. longis ad corollae tubi apicem adfixis, antheris circa 3.5 mm. longis, connectivo excurrente acuminatis. *Stylus* filiformis, 3 cm. longus, glaber, stigmatibus binis circa 2 mm. longis. *Fructus* ellipsoideus vel late ellipsoideus, ad 11 mm. longus et 8 mm. diametro, pilis paucis instructus, calyce persistente coronatus.

Krat, Baw Rai, 600 m., common in evergreen forest, Kerr 9473.

***Ixora Lakshnakarae* Craib** [Rubiaceae-Ixoreae]; ab *I. betongense* Craib calycis segmentis conspicue longioribus distinguenda.

Frutex, ramulis inventute compressis subhirsutis magis minusve fuscis demum cinereo-corticatis. *Folia* elliptica vel anguste elliptica, apice acutius subacuminata, basi cuneata vel late cuneata, ad 30 cm. longa et 11.5 cm. lata, coriaceo-chartacea, sicco supra viridia vel subviridia, subtus pallidiora, supra glabra, subtus hirsuta, costa supra medio sulcata subtus prominente, nervis lateralibus utrinque circa 20 supra impressis subtus prominentibus intra marginem anastomosantibus, nervis transversis supra impressis subtus prominulis, petiolo usque ad 1.5 cm. longo hirsuto suffulta; stipulae e basi lata subulato-acuminatae, ad 1.5 cm. longae, basi connatae, dorso hirsutae. *Corymbi* terminales, e basi ramosi, floribus inclusis ad 15 cm. longi et lati, ramulis lateralibus utrinque 3-4 cum pedunculis hirsutis; bracteae inferiores foliaceae, ad 13 mm. longae, superiores gradatim minores, supremae 8 mm. longae; pedicelli ad 4 mm. longi, apice bracteolis duabus late oblanceolatis 7 mm. longis 2.5 mm. latis instructi, hirsuti; flores albi (ex *Lakshnakara*). *Receptaculum* 2 mm. longum, pubescens. *Calycis* segmenta 4, inter se aequalia, oblango-oblanceolata, 7 mm. longa, 2.75 mm. lata, foliacea, ciliata. *Corollae* tubus 3.7 cm. longus, extra parce subulosus, lobi 1 cm. longi, fere 4 mm. lati. *Antherae* 6 mm. longae.

Tomo, Ban Wo, 180 m., by stream, *Lakshnakara* 688.

***Ixora Parkinsoniana* Craib** [Rubiaceae-Ixoreae]; ab *I. opaca* R. Br. ex G. Don foliis latioribus, pedunculo elongato, et receptaculo et corolla extra conspicue puberulis recedit.

Frutex circa 2 m. altus (ex Kerr); ramuli glabri, primo compressi, mox cortice cinereo vel brunneo-cinereo tecti, lenticellis haud conspicuis. *Folia* suboblunga, elliptica, late elliptica, vel rarissime rotundata, apice obtusa, basi cuneata, late cuneata, vel rotundata, 7-15 cm. longa, 3.8-8.5 cm. lata, coriacea vel subcoriacea, sicco subviridia, subtus parum pallidiora, pagina utraque glabra, costa supra conspicua vel parum impressa subtus prominentibus lateralibus utrinque 7-10 supra subprominulis subtus prominentibus intra marginem anastomosantibus, nervulis rete gracile pagina utraque conspicuum efficientibus, margine revoluta, petiolo 1-2 cm. longo supra canaliculato suffulta; stipulae subulatae, ad 5 mm. longae, diutius persistentes. *Inflorescentia* pendula (ex Kerr), floribus inclusis circa 3 cm. longa et 6 cm. diametro, pedunculo communi ad 17 cm. longo sparse puberulo paululo supra basem bracteato suffulta, articulata, puberula, bracteis ad 2.5 mm. longis, floribus albis (ex Kerr), terminalibus sessilibus, lateralibus pedicellis ad 2 mm. longis apice bracteolis duabus circa 0.75 mm. longis instructis suffultis; alabastra obtusa. *Receptaculum* vix 1 mm. longum, dense puberulum. *Calycis* segmenta subquadrata, 0.5 mm. longa, ciliolata, dorso puberula. *Corollae* tubus 1.8 cm. longus, extra densius longius puberulus, lobi 4, oblango-obovati, 4 mm. longi, 2.5 mm. lati, dorso puberuli, ciliolati. *Antherae* dorsifixae, 3 mm. longae, apiculatae, filamentis ad corollae tubi apicem positae circa 1.25 mm. longis.

Yanyao, 50 m., evergreen forest, Kerr 18,170.

***Ixora straminea* Craib** [Rubiaceae-Ixoreae]; ab *I. lucida* R. Br. ex Hook. f. inflorescentia glabra, alabastris haud longe acuminatis inter alia recedens.

Frutex circa 4 m. altus (ex Kerr); ramuli graciles, glabri, sicco primo fuscis, compressi, mox straminei, teretes, lenticellis parvis haud conspicuis. *Folia* oblanceolata vel lanceolata, apice acute acuminata, basi cuneata vel obtuse cuneata, 6.5-10.5 cm. longa, 1.7-2.8 cm. lata, chartacea, sicco atra, pagina utraque glabra, costa supra conspicua subtus prominulis, nervulis rete gracile pagina utraque 12 pagina utraque prominulis, nervulis rete gracile pagina utraque efficientibus, margine anguste cartilaginea saepe parum recurva, petiolo ad 5 mm. longo glabro supra canaliculato suffulta; stipulae basi inter se breviter connatae, e basi lata subulato-acuminatae, 2.5-4.5 mm. longae, glabrae, primo fuscae, mox stramineae, diutius persistentes. *Inflorescentia* terminalis, corymbosa, pedunculo communi circa 3 mm. longo et corollis inclusis ad 3.5 cm. longa et 5.5 cm. lata, glabra, articulata; ramuli laterales utrinque 3, circa 4 mm. longi, basi bracteis angustis 2 mm. longis instructi, partiales ad 3 mm. longi; flores albi (ex Kerr), terminalibus sessilibus, lateralibus pedicellis ad 2 mm. longis apice bracteolis duabus 0.75 mm. longis instructis suffultis; alabastra primo acuta, subacuminata. *Receptaculum* 1 mm. longum. *Calycis* segmenta 0.75 mm. longa, 0.5 mm. lata. *Corollae* tubus gracilis, 2 cm. longus, lobi 4,

elliptici vel oblongo-elliptici, subacuminati, subacuti, 4 mm. longi, 1.75 mm. lati. *Antherae* dorsifixae, 3 mm. longae, acutae, loculis basi productis, filamentis ad corollae tubi apicem positis 1 mm. longis. *Stylus* gracilis, paulo exsertus.

Trang, Kao Sung, 800 m., evergreen forest, *Kerr* 15,233.

Duperrea scabrida Craib [Rubiaceae-Ixoreae]; a *D. pavettifolia* (Kurz) foliis subtus scabridulis haud molliter pubescentibus cognoscenda.

Ramuli graciles, primo subadpresse hirsuti, mox glabri, cinnamomeo-corticati, lenticellis inconspicuis. *Folia* opposita, paribus haud rarius inter se inaequalibus, saepissime oblanceolata vel oblongo-oblanceolata, apice acute acuminata, basi cuneata, ad 15 cm. longa et 5 cm. lata, sicca fusco brunnea, chartacea, pagina superiore setulis adpressis hic et illic instructa, inferiore ad costam nervosque laterales setis brevibus adpressis scabridula, costa supra conspicua subtus prominente, nervis lateralibus utrinque ad 10 supra conspicuis subtus prominulis, nervulis rete laxum pagina utraque subconspicuum efficientibus, setuloso-ciliata, petiolo 4-10 mm. longo adpresse setuloso supra canaliculato suffulta; stipulae subulato-acuminatae, ad 6 mm. longae, scariosae, dorso parce adpresse setulosae, diutius persistentes. *Inflorescentia* corymbiformis, pedunculo communi 2 cm. longo et floribus inclusis ad 7 cm. longa et 6 cm. lata, pedunculo ramulis et pedicellis subadpresse hirsutis; bracteae angustae, ad 4 mm. longae; pedicelli ad 5 mm. longi. *Receptaculum* 1.5 mm. longum, subsparse adpresse hirsutum. *Calycis* tubus 0.5 mm. longus, segmenta subulata, 5 mm. longa, hirsuta. *Corollae* tubus extra adpresse hirsutus, 2 cm. longus, lobi 5, subrotundati, breviter acuminati, circa 4 mm. diametro, primo hirsuto-ciliati, dorso apice pilis paucis rigidis instructi. *Antherae* 3.25 mm. longae, filamentis brevibus ad corollae tubi apicem insertis. *Stylus* 3 cm. longus, parce breviter pubescens, stigmatibus fusiformi carnosos.

Krat, Ta Kum, *Put* 2889.

Pavetta aspera Craib [Rubiaceae-Ixoreae]; ab affini *P. nervosa* Craib calycis lobis deltoideis inter alia distinguenda.

Ramuli annotini scaberuli, teretes, circa 3 mm. diametro. *Folia* saepissime oblongo-oblanceolata, apice obtuse acuminata vel subacuminata, basi attenuato-cuneata, 11-18 cm. longa, 2.7-6 cm. lata, chartacea, sicco subviridia, subtus parum pallidiora, matura supra ad costam scaberula, subtus scaberula, costa supra conspicua subtus prominente, nervis lateralibus utrinque 10 supra plus minusve conspicuis subtus prominentibus, nervulis rete gracile subtus subconspicuum efficientibus, petiolo 1-2 cm. longo scaberulo suffulta; stipulae ad 8 mm. longae, subulato-acuminatae. *Corymbi* terminales, foliati, iis *P. indicae* Linn. similes, floribus inclusis usque ad 20 cm. lati, densius crispatis puberuli; pedicelli circa 5 mm. longi; flores albi (ex *Put*). *Receptaculum* 1 mm. longum, densius subadpresse longe puberulum. *Calyx* receptaculo paululo longior, fere

ad medium lobatus, extra longe puberulus, lobis deltoideis ciliolatis. *Corollae* tubus 2.7 cm. longus, extra glaber, lobi 4, oblongo-elliptici, 6 mm. longi, 2.75 mm. lati. *Antherae* 6 mm. longae, filamentis brevibus. *Stylus* 5 cm. longus.

Krat, Ta Kum, *Put* 2881.

Pavetta brevifolia Craib [Rubiaceae-Ixoreae]; a *P. indica* Linn. foliis subtus breviter hispidulis, corollae tubo brevioribus distinguenda.

Frutex circa 1 m. altus (ex *Kerr*); ramuli primo fusci, breviter sparse scaberuli, mox pallidi, glabri, lenticellis haud conspicuis. *Folia* lanceolata, oblanceolata, vel oblongo-oblanceolata, apice acute acuminata, basi cuneata, 3.5-7.5 cm. longa, 1.2-2.9 cm. lata, chartacea, sicco subviridia, subtus parum pallidiora, pagina superiore primo sparse breviter setulosa, inferiore breviter hispidula et saepissime in nervorum axillis pilosa, costa supra conspicua subtus prominente, nervis lateralibus utrinque circa 6 subtus prominulis, nervulis vix conspicuis, petiolo 4-10 mm. longo breviter hispidulo suffulta; stipulae ad 4 mm. longae. *Inflorescentia* corymbiformis, terminalis, pedunculo communi brevi et floribus inclusis circa 2 cm. longa et 3.5 cm. lata, rhachi ramulis et pedicellis sicco atris breviter albo-hirsutis; pedicelli ad 4 mm. longi, floribus albis (ex *Kerr*). *Receptaculum* 0.75 mm. longum, sparse hispidulo-puberulum. *Calycis* tubus receptaculo subaequilongus, dorso extra subglaber, lobi 4, deltoidei, obtusi, 0.5 mm. longi, dorso subglabri vel hispidulo-puberuli, ciliati. *Corollae* tubus 7 mm. longus, extra glaber, lobi 4, oblongi vel late elliptici, ad 4 mm. longi et 2.5 mm. lati, glabri. *Antherae* 4.25 mm. longae, filamentis brevibus ad corollae tubi os adfixis. *Stylus* 1.8 cm. longus.

Prachuap, Ban Nawng Kang, under 50 m., evergreen forest, *Kerr* 10,908.

Pavetta fruticosa Craib [Rubiaceae-Ixoreae]; a *P. tomentosa* Roxb. ex Sm. statura minore, foliis subtus haud tomentosis inter alia recedens.

Frutex ad 1 m. altus (ex *Kerr*); ramuli nisi ad nodos glabri, obtuse quadrangulares, ad 6 mm. diametro, rubro-corticati, lenticellis parvis inconspicuis. *Folia* obovata, anguste obovata, vel suboblonga, apice rotundata, saepe parum retusa et apiculata, basi cuneata, sub anthesi ad 6 cm. longa et 2.5 cm. lata, rigide chartacea, sicca brunnescentia, pagina superiore pilis brevibus adpressis sparse instructa, inferiore ad costam nervos nervulosque similiter instructa, costa supra conspicua subtus prominente, nervis lateralibus utrinque usque ad 12 supra conspicuis subtus prominulis, nervis transversis supra subconspicuis subtus subprominulis, margine ciliolata, petiolo ad 7 mm. longo pilis brevibus adpressis primo sparse instructo supra canaliculato suffulta; stipulae variabiles, scariosae, late deltoideae, oblongae, vel transverse oblongae, cuspidato-acuminatae, ad 7 mm. longae. *Corymbi* terminales, sessiles, floribus inclusis 6-8 cm. longi, 9-11 cm. lati, foliati, rhachi et ramulis primo pilis paucis instructis

glabrescentibus sicco fuscis; pedicelli ad 6 mm. longi, bracteis parvis; flores albi (ex *Kerr*). *Receptaculum* circa 1 mm. longum, puberulum, sicco fuscum. *Calycis* tubus receptaculo subaequilongus, dorso puberulus, lobi breves, pallide marginati, ciliolati. *Corollae* tubus 1.1 cm. longus, extra glaber, intra superne pilosus, lobi 4, oblongi, 6.5 mm. longi, 2.25 mm. lati, pallide marginati, supra basi pilis paucis instructi. *Antherae* 5 mm. longae, filamentis brevibus. *Stylus* 2.5 cm. longus, medio sparse pubescens.

Doi Sutep, 300-600 m., deciduous forest, *Kerr* 1149.

***Pavetta nervosa* Craib** [Rubiaceae-Ixoreae]; a *P. indica* Linn. eiusque affiniorebus ramulis scaberulis, a *P. siphonantha* Dalz., cui habitu subsimilis, calycis lobis multo brevioribus inter alia recedit.

Ramuli scaberuli, sicco primo compressi, subfusci, mox teretes, cortice cinnamomeo obtecti, lenticellis haud conspicuis. *Folia* saepissime oblongo-ovata, oblongo-obovata, vel late oblanceolata, apice obtuse acuminata vel subacuminata, basi cuneata vel late cuneata, interdum acuminata, usque ad 16 cm. longa et 6 cm. lata, rigide chartacea, sicco brunnescentia et plus minusve fusciscentia, pagina utraque praecipue ad costam sparse subscaberulo-puberula, costa supra conspicua subtus prominente, nervis lateralibus utrinque 9-12 supra conspicuis subtus prominentibus, nervulis pagina utraque conspicuis vel paucis inferiore prominulis, petiolo 1-2.5 cm. longo scaberulo suffulta; stipulae basi connatae, 8 mm. longae. *Inflorescentia* ei *P. indicae* Linn. similis sed parcius puberula; flores albi (ex *Put*), pedicellis circa 5 mm. longis suffulti. *Receptaculum* 1 mm. longum, fere glabrum. *Calycis* tubus 0.5 mm. longus, dentes breves. *Corollae* tubus 1.7 cm. longus, extra glaber, intra, basi excepta, subpilosus, lobi 4, circa 5 mm. longi et 2.5 mm. lati, supra basem versus pilis paucis instructi. *Antherae* 5 mm. longae, filamentis brevibus. *Stylus* 3.7 cm. longus.

Kaw Pangan, *Put* 807.

***Pavetta petiolaris* Wall. mss.** [Rubiaceae-Ixoreae]; *P. indicae* Linn. valde affinis a qua foliis pro rata saepissime longioribus apice distincte acuminatis supra ad nervos pilis crispatis praetereaue aliter setis sparsis instructis distinguenda.

Arbuscula vel *frutex* (ex *Garrett*); ramuli glabri, primo fusci, angulati, annotini cinereo-corticati. *Folia* anguste elliptica vel oblanceolata, apice acute acuminata, basi attenuato-cuneata, 11-18 cm. longa, 2.7-5.8 cm. lata, chartacea, sicco parum brunnescentia, subtus pallidiora, supra ad nervos sed praesertim ad costam pilis saepissime crispatis subsparse instructa praetereaue aliter setis hic et illic instructa, subtus ad costam nervosque breviter crispatis pubescentia, costa supra conspicua subtus prominente, nervis lateralibus utrinque circa 9 supra conspicuis subtus prominulis, reticulatione gracili pagina utraque plus minusve subconspicua, petiolo 10-15 mm. longo suffulta. *Inflorescentia* corymbosa, sessilis, floribus inclusis 5 cm. longa et 10 cm. lata, ramulos laterales

circa 7 cm. longos apice bifolios aliter nudos terminans, rhachi ramulis et pedicellis breviter crispatis pubescentibus; pedicelli ad 5 mm. longi. *Receptaculum* circa 1 mm. longum, breviter crispatis pubescens. *Calycis* tubus receptaculo paulo brevior, extra subglaber, dentes 4, breves. *Corollae* tubus 1 cm. longus, extra glaber, intra apicem versus pilosus, lobi 4, circa 5 mm. longi, glabri. *Antherae* 5 mm. longae, filamentis brevibus ad corollae tubi apicem insertis. *Stylus* 2.5 cm. longus.

Doi Angka, E. slope, Mè Ka Pak drainage, 1450 m., *Garrett* 504.

***Pavetta pilosa* Craib** [Rubiaceae-Ixoreae]; a *P. naucleiflora* R. Br. ex G. Don foliis latioribus brevius petiolatis, calycis segmentis conspicue longioribus, corolla extra pilis albis longiusculis divaricatis sat dense instructa recedens.

Ramuli sat dense hirsuti, circa 3 mm. diametro. *Folia* oblonga, oblongo-lanceolata, vel elliptica, apice acute acuminata, basi saepe parum inaequilateralia, rotundata vel cuneata, 11.5-21 cm. longa, 4.3-7.7 cm. lata, sicca supra fusco-brunnea vel fusco-viridia, subtus fusco-grisea, chartacea, supra sparse hirsuta, subtus longius et mollius hirsuta pilis ad costam nervos nervulosque patulis, costa supra impressa subtus prominente, nervis lateralibus utrinque 12 supra impressis subtus prominulis, nervulis supra plus minusve impressis subtus subprominulis, ciliata, petiolo ad 1 cm. longo hirsuto suffulta; stipulae subulatae, ad 1.5 cm. longae, breviter hirsutae. *Inflorescentia* terminalis, pedunculo communi 1.5-2.5 cm. longo, corymbiformis, 3-4 cm. longa, 5-6 cm. diametro, densiflora, pedunculo et ramulis hirsutis; bractae inferiores lineari-lanceolatae vel lineares, ad 1.3 cm. longae; pedicelli ad 5 mm. longi, medio bracteolis duabus angustis 2 mm. longis hirsutis instructi. *Receptaculum* late ellipsoideum, 1.5 mm. longum, dense hirsutum. *Calycis* tubus 0.75 mm. longus, dorso hirsutus, lobis angustis subaequilongus. *Corollae* tubus 1 cm. longus, extra pilis divaricatis longius hirsutus, intra parte dimidia inferiore glaber, superiore subpilosus, lobi 5, oblongi, 5.5 mm. longi, 2 mm. lati, infra longius hirsuti, supra glabri. *Antherae* 7 mm. longae, apiculatae, subsessiles. *Stylus* cum stigmatibus 1.8 cm. longus, medio breviter pilosus.

Krat, Kao Saming, *Put* 534.

***Morinda cinnamomea* Craib** [Rubiaceae-Morindeae]; a *M. villosa* Hook. f. foliis minoribus, nervis lateralibus intra marginem haud anastomosantibus, nervis transversis obscuris, a *M. Scortechinii* (King et Gamble) et *M. cochinchinense* DC. ramulorum indumento multo densiore recedit.

Frutex volubilis (ex *Kerr*); ramuli dense molliter cinnamomeo-subpilosii. *Folia* oblonga, anguste oblonga vel oblanceolato-oblonga, apice subacute acuminata, basi cuneata vel rotundata, usque ad 9 cm. longa et 3.2 cm. lata, chartacea, sicca supra fusca, subtus pallidiora, supra ad costam densius subadpresse ferrugineo-pubescentia, aliter plus minusve glabrescentia, primo sparse subhirsuta,

subtus ad costam nervosque laterales adpresse pallide fulvo-sericea, aliter subpilosa, costa supra conspicua subtus prominente, nervis lateralibus utrinque 10-12 supra vix conspicuis subtus prominentibus, nervis transversis paucis subtus conspicuis, margine ciliata, petiolo 5-10 mm. longo indumento ei ramulorum simili tecto suffulta; stipulae diu persistentes, connatae, ad 9 mm. longae. *Pedunculi* terminales, ad 8, umbellatim dispositi, circa 5 mm. longi, dense subfulvo-pubescentes, 5-flori; alabastra sicco fusca, extra longius pubescentia. *Receptacula* inter se connata. *Calyx* 0.75 mm. longus, 4-lobulatus. *Corolla* 5 mm. longa, tubo brevi, lobis 4 oblongo-oblancheolatis intra pilis erectis dense barbatis. *Antherae* 0.75 mm. longae, filamentis 1 mm. longis. *Stylus* glaber, stigmatibus duobus inclusis 4.5 mm. longus; ovarium biloculare, ovulis solitariis. Satul, Kao Keo Range, 700 m., evergreen forest, *Kerr* 14551.

***Morinda longifolia* Craib** [Rubiaceae-Morindeae]; a *M. aspera* Wight et Arn. foliis angustioribus, stipulis haud alte bifidis recedit.

Frutex circa 1.75 m. altus (ex *Kerr*); ramuli compressi, primo asperuli, fusci, mox cortice stramineo obtekti. *Folia* sublancheolata, apice obtusa, basi cuneata, ad 17 cm. longa et 3 cm. lata, chartacea, sicca supra fusca, subtus pallidiora, pagina utraque pilis brevibus asperula, costa supra conspicua subtus prominente, nervis lateralibus utrinque circa 15 pagina utraque plus minusve conspicuis, nervulis paucis subtus subconspicuis, asperulo-ciliolata, petiolo ad 5 mm. longo asperulo suffulta; stipulae deltoideae vel late deltoideae, 3-5 mm. longae, brunneae, dorso asperulae. *Capitula* oppositifolia, pedunculo communi 7-10 mm. longo asperulo suffulta. *Receptacula* connata. *Calyx* brevis, truncatus. *Corolla* alba (ex *Kerr*), ante anthesin inferne subglabra, superne conspicue asperulo-puberula; tubus circa 1.1 cm. longus, intra superne pilosus; lobi 5, circa 7 mm. longi et 2 mm. lati, supra glabri. *Antherae* 4 mm. longae, ad corollae tubi apicem attingentes, filamentis brevibus. *Stylus* 1.4 cm. longus, glaber, stigmatibus duobus 3-4 mm. longis; loculi duo, ovulis solitariis.

Rahêng, 100 m., cultivated, *Kerr* 4577.

***Morinda nana* Craib** [Rubiaceae-Morindeae]; a *M. persicifolia* Ham. eiusque affiniorebus foliis minoribus, inflorescentia parva recedit.

Frutex nanus; ramuli prostrati vel erecti (ex *Kerr*), scaberuli, circa 2.5 mm. diametro. *Folia* variabilia, saepissime obovata, oblongo-ovata, elliptica, vel fere rotundata, interdum medio constricta, apice rotundata vel obtusa, basi cuneata, ad 2.8 cm. longa et 1.3 cm. lata, chartacea, sicca viridia vel subviridia, subtus pallidiora, glabra, costa supra conspicua vel prominula subtus prominente, nervis lateralibus utrinque 4-5 intra marginem anastomosantibus pagina utraque subconspicuis, nervulis vix conspicuis, petiolo ad 3 mm. longo lamina decurrente plus minusve alato suffulta; stipulae circa 1 mm. longae, apice saepissime bilobatae. *Inflorescentia*

terminalis vel pseudoterminalis, corollis exclusis 3 mm. diametro, subsessilis vel breviter pedunculata, floribus circa 5-7 albis (ex *Kerr*). *Receptacula* inter se fere libera. *Calycis* tubus brevis, apice truncatus, sat carnosus. *Corolla* extra puberula; tubus 6.5 mm. longus, intra apicem versus parce pilosus; lobi 5, oblongo-lanceolati, 4 mm. longi, 1.5 mm. lati. *Stamina* inclusa vel exserta, filamentis 1.25 mm. longis, antheris 2 mm. longis. *Stylus* 9 mm. longus, apicem versus pilis brevibus instructus, stigmatibus duobus 1.5 mm. longis; loculi duo, ovulis solitariis.

Nakawn Panom, Ta Uten, 200 m., very common along banks of streams, *Kerr* 8461.

***Morinda pumila* Craib** [Rubiaceae-Morindeae]; a speciebus aliis capitulis solitariis ob caules annuos breves distinguenda.

Caules e radice lignosa annui (ex *Kerr*), 10-30 cm. alti, erecti, simplices vel parce ramosi, subhirsuti, primo fusci, glutinosi, mox pallide virides. *Folia* saepissime elliptica vel oblongo-elliptica, apice breviter obtuse acuminata, basi cuneata vel acuminata, 4.5-8.5 cm. longa, 1.5-3.5 cm. lata, rigide chartacea, sicca supra plus minusve murina, subtus pallidiora, praesertim ad nervos supra breviter hirsuta, subtus hirsuta, costa supra conspicua subtus prominente, nervis lateralibus utrinque 7-9 supra conspicuis subtus prominulis saltem supremis intra marginem anastomosantibus, nervis transversis subtus subprominulis, densius ciliolata, petiolo ad 5 mm. longo hirsuto suffulta; stipulae circa 2 mm. longae, diutius persistentes. *Pedunculi* axillares vel oppositifolii, 0.8-3 cm. longi. *Receptacula* inter se connata. *Calyx* brevissimus, truncatus. *Corolla* haud visa.

Chaiyapum, Pak Pang, 200 m., deciduous forest, *Kerr* 19,981.

***Morinda scabrida* Craib** [Rubiaceae-Morindeae]; a *M. angustifolia* Roxb. foliis maturis sicco viridibus subtus molliter pubescentibus recedit.

Frutex ad 1 m. altus (ex *Kerr*); ramuli iuventute quadrangulares, primo hirsuti, cito pilorum basibus induratis persistentibus scabridi, brunnei, lenticellis inconspicuis. *Folia* oblongo-oblancheolata vel subelliptica, apice acuminata vel subacuminata, basi longe cuneata, 14-21 cm. longa, 3-6 cm. lata, rigide chartacea, sicca supra viridia vel parum lutescentia, subtus pallide viridia, supra scabrida, subtus molliter pubescentia, costa supra conspicua subtus prominente, nervis lateralibus utrinque 10 supra conspicuis subtus prominentibus saltem supremis intra marginem arcuatim iunctis, nervulis rete laxum subtus prominulum efficientibus, margine parum revoluta, scabrida, petiolo 1.5-2.5 cm. longo scabridulo suffulta; stipulae persistentes, 1.5 cm. longae, dorso scabridulae. *Capitula* et axillaria et terminalia, breviter pedunculata. *Receptacula* inter se connata. *Calyx* brevis, extra scabridulus. *Corolla* alba, ante anthesin punicea (ex *Kerr*), extra puberula; tubus 1.8 cm. longus; lobi 5, elliptico-lanceolati,

apice subacuti, 8 mm. longi, 4 mm. lati. *Stamina* 5, ad corollae tubi medium posita. *Stylus* filiformis.

Kanburi, Baw Noi, 700 m., open grassy forest, *Kerr* 10,260.

Gynochthodes puberula Craib [Rubiaceae-Morindeae]; a *G. macrophylla* Kurz, cui habitu similis, pedunculis et pedicellis longioribus, pedicellis et receptaculis puberulis recedens.

Ramuli recti, puberuli, sicci primo fusci, mox pallide plumbei vel plumbei, ad 6 mm. diametro. *Folia* oblongo-elliptica, elliptica; vel rarius oblongo-lanceolata, apice subobtusata, saepissime breviter acuminata, basi cuneata vel late cuneata, 7-12 cm. longa, 2.7-5 cm. lata, rigide chartacea, vel subcoriacea, sicca fusca, subtus in nervorum axillis glandulosa et saepissime breviter sparse hirsuta, aliter glabra, costa supra impressa subtus prominente, nervis lateralibus utrinque 10 supra conspicuis interdum leviter impressis subtus prominentibus, nervulis pagina utraque subconspicuis, margine recurva, petiolo 7-10 mm. longo supra canaliculato suffulta; stipulae parvae, late deltoideae, dorso puberulae. *Inflorescentia* axillaris, petiolo fere dimidio brevior, pedunculo communi ad 3 mm. longo, pedicellis ad 4 mm. longis puberulis. *Receptaculum* puberulum, circa 1.25 mm. longum. *Calyx* brevis, truncatus. *Corolla* extra glabra, tubo 0.5 mm. longo, lobis 4 oblongo-linearibus 6 mm. longis 1.5 mm. latis intra villosis. *Antherae* 2 mm. longae. *Styli* fere e basi liberi, 1 mm. longi.

Kaw Pangan, *Put* 809.

Prismatomeris filamentosa Craib [Rubiaceae-Morindeae]; a *P. malayana* Ridl. eiusque affinioribus filamentis quam antheris conspicue longioribus recedens.

Ramuli iuventute conspicue 4-angulati, glabri, stramineo-corticati, mox teretes, cortice cinereo vel cinereo-brunneo obtecti, lenticellis haud conspicuis. *Folia* oblonga vel elliptica, apice breviter acute acuminata, basi cuneata, late cuneata, vel rotundato-cuneata, interdum acuminata, saepe parum inaequilateralia, 4-7 cm. longa, 1.5-3 cm. lata, coriacea, sicca plus minusve lutescentia, pagina utraque glabra, costa supra prominula subtus prominente, nervis lateralibus utrinque 7-8 supra prominulis subtus conspicuis nervulis rete laxum pagina utraque subconspicuum formantibus, margine recurva, petiolo circa 5 mm. longo supra canaliculato suffulta; stipulae deciduae. *Flores* per 2-5 ad ramulorum apices umbellatim dispositi, pedunculo communi haud evoluto vel rarius ad 3 mm. longo; pedicelli 3-7 mm. longi, glabri. *Receptaculum* glabrum, circa 1.25 mm. longum. *Calycis* tubus receptaculo subaequilongus, apice truncatus vel parvi-denticulatus. *Corollae* tubus 1.7 cm. longus, lobi circa 10 mm. longi et 3 mm. lati. *Filamenta* 4.5 mm. longa, circa 1 mm. supra corollae tubi basem adfixa, antheris 3.5 mm. longis paululo exsertis.

Rayawng, Ban Pe, *Put* 2720.

Prismatomeris memecyloides Craib [Rubiaceae-Morindeae]; a *P. malayana* Ridl. eiusque affinioribus foliis tenuioribus, receptaculo cum calyce brevioribus recedit.

Ramuli graciles, glabri, iuventute 4-angulati, straminei, mox teretes, cortice brunneo-cinereo obtecti, lenticellis haud conspicuis. *Folia* anguste elliptica, oblongo-lanceolata, vel late lanceolata, apice obtuse acuminata, basi saepe parum inaequilateralia, cuneata vel late cuneata, 5-11 cm. longa, 2-4 cm. lata, rigide chartacea, supra saepissime plus minusve fusciscentia, subtus pallide viridia, pagina utraque glabra, costa supra prominula subtus prominente, nervis lateralibus utrinque 6-8 supra plus minusve conspicuis subtus prominulis intra marginem anastomosantibus, nervulis tantum paucis subconspicuis, petiolo circa 5 mm. longo supra canaliculato suffulta; stipulae deciduae. *Flores* albi (ex *Rabil*), ad apices ramulorum solitarii vel per 3-5, pedunculo communi haud evoluto, pedicellis 4 mm. longis glabris. *Receptaculum* glabrum, sicco fuscum, 1 mm. longum. *Calycis* tubus 0.75 mm. longus, subtruncatus. *Corollae* tubus 1.6 cm. longus, utrinque glaber, lobi 7-8 mm. longi, 1.5-2 mm. lati, glabri. *Stamina* 4, filamentis 1 mm. longis glabris supra corollae tubi medium adfixis, antheris inclusis fere 4 mm. longis. *Stylus* cum stigmatibus 18 mm. longus.

Kaw Chang, Salak Kawk, along path, *Rabil* 37.

Prismatomeris mollis Craib [Rubiaceae-Morindeae]; a speciebus aliis foliis subtus molliter pubescentibus recedens.

Frutex circa 2.5 m. altus (ex *Kerr*); ramuli iuventute sicco fusci, mox conspicue 4-angulati, straminei, glabri, demum teretes, cinerei vel stramineo-cinerei. *Folia* elliptico-oblonga vel oblongo-lanceolata, apice acuminata, obtusa, basi cuneata vel subtruncata, acuminata, haud rarius parum inaequilateralia, 12-20 cm. longa, 4-7.5 cm. lata, chartacea, sicca supra plus minusve fusciscentia, subtus pallide viridia, supra glabra, subtus molliter pubescentia, costa supra prominula subtus prominente, nervis lateralibus utrinque 8-10 rectis supremis subpatulis bene intra marginem anastomosantibus supra conspicuis subtus prominentibus, nervulis rete laxum formantibus, margine parum recurva, petiolo 8-15 mm. longo glabro suffulta; stipulae ad 4 mm. longae, bilobatae, per annum persistentes. *Flores* e ligno annotino orti, inflorescentiam 2-3-floram sessilem formantes, subsessiles; alabastra alba (ex *Kerr*), glabra, sicco fusca. *Receptaculum* 2 mm. longum. *Calycis* tubus receptaculo duplo longior, apice minute denticulatus. *Corollae* tubus 8 mm. longus, intra glaber, lobi 5, crassi, circa 1.4 cm. longi et 2 mm. lati, glabri. *Antherae* paululo exsertae, 3 mm. longae, filamentis 2 mm. longis paululo supra corollae tubi medium adfixis. *Stylus* cum stigmatibus duobus 7 mm. longus, glaber.

Krabi, Tambon Kao Panom, 100 m., evergreen forest, *Kerr* 18,825.

LVIII.—A NEW SPECIES OF ARBORESCENT *SENECIO*
FROM RUWENZORI (*SENECIO ERIONEURON*).

A. D. COTTON.

[Kew Bulletin, 1932.

In November, 1931, a large collection of plants from Mt. Ruwenzori was presented to Kew by Messrs. C. W. L. Fishlock and G. L. R. Hancock, of the Department of Agriculture, Uganda. The material had been collected by them the previous August during their expedition up the Bujuku Valley, on the western slopes of Ruwenzori, to the Bujuku Lake and to Mount Stanley. Amongst this material was an exceedingly fine series of arborescent *Senecios*. It was intended to prepare a special paper on the Ruwenzori species of this group. Since, however, several points with regard to certain specimens are still obscure this has not been possible, and the general systematic account must be deferred until the whole matter can be dealt with in a monograph which it is hoped to publish shortly. One hitherto undescribed species stands out markedly and, as this has been previously collected by Prof. H. Humbert and is likely to be found by other botanists who visit Ruwenzori, it appears advisable to describe it forthwith rather than wait until all the species can be clearly defined.

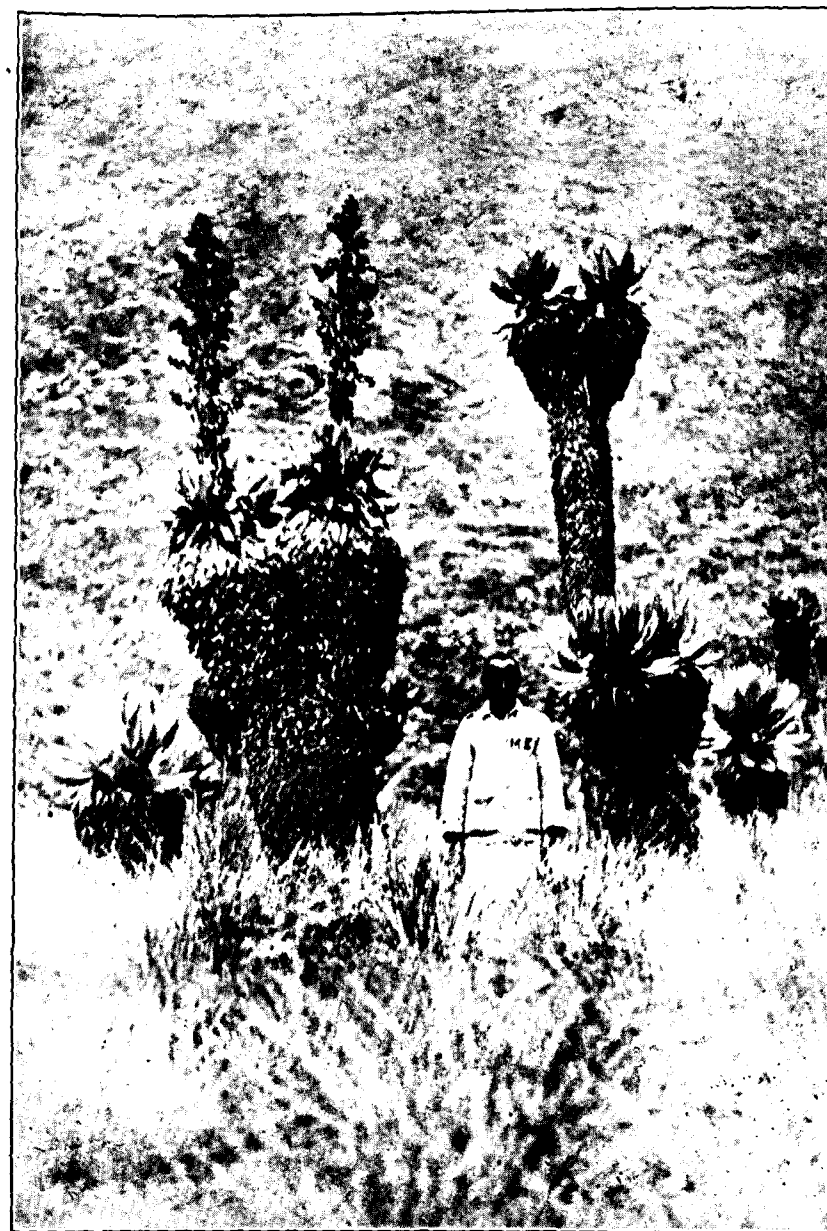
The description of the new species is as follows :—

Senecio erioneuron Cotton, sp. nov. ; *S. adnivali* Stapf affinis sed trunco tantum 1-2-ramoso et lamina foliorum petiolo excepto infra omnino glabra differt.

Arbor usque 5 m. alta ; truncus simplex vel 1-2-ramosus, foliis marcescentibus dense vestitus. *Folia* tenuia, oblonga usque late elliptica, petiolata, irregulariter praecipue ad basin dentata ; lamina 30-40 cm. longa, 15-20 cm. lata, supra glabra, nervis lateralibus distinctis 1.5-2 cm. distantibus, infra glabra, costa apicem versus excepta densissime arachnoideo-villosa ; petiolus alatus in laminam sensim abiens, margine integro, usque 10 cm. longus et 6 cm. latus. *Inflorescentia* bracteata, paniculata, capitulis dense confertis ; axis ramulique tomento longo lanuginoso densissime vestiti ; bracteae foliaceae, anguste oblongae, acutae, integrae, glabrescentes, costa infra valde lanuginosa. *Capitula* late campanulata, usque 3 cm. lata, 1.5 cm. longa, pedunculata. *Involucri bracteae* 3-seriatae ; exteriores lineares, 15-16 mm. longae, 1 mm. latae, interiores 2-seriatae, oblongo-lanceolatae, acutae, 15-18 mm. longae, 3-5 mm. latae, glabrae. *Flores radii* pauci, breviter ligulati, flavi, corollae tubo 7-8 mm. longo, ligula lineari-oblonga 5-8 mm. longa apice 2-3-fida. *Flores disci* circiter 95-105 (-120), 10-12 mm. longi, tubo inferne cylindrico superne leviter dilatato. *Achaenia matura* 5 mm. longa, 1 mm. lata, valde striata, glabra. *Pappi setae* barbatae, circiter 1 cm. longae.

RUWENZORI. Massif versant Ouest, Juillet, 1929, 3600 m. H. Humbert 8929 (type). Bujuku Valley, Aug. 1931, 11,500 ft.,

PLATE VIII.



Senecio erioneuron Cotton, sp. nov. In Bujuku Valley, Ruwenzori, alt. about 13,000 ft. Photo: G. L. R. Hancock.

Fishlock & Hancock 70, 117; 12,500 ft., 81, 82, 83, 99; 12,000 ft., 116. (? Mt. Stanley, Aug. 1931, 14,000 ft., *Fishlock & Hancock* 98.)

The tree *Senecios* on the enormous massive of Ruwenzori are much more difficult to differentiate than those inhabiting other African summits or mountain ranges. Of the seven or eight species which have been recorded from this mountain, the following only are sharply defined and have been collected on several occasions.

(1) *S. longiligulatus* de Wildeman, forming the lowermost zone at about 10,000 ft., a species with thin, glabrous leaves and long ray florets.

(2) *S. adnivalis* Stapf, forming a much higher zone, probably extending from 12,000 to 14,000 feet, a repeatedly branched species characterized by very short ray florets and thick leaves with persistent arachnoid tomentum on the under surface.

(3) *S. Friesiorum* Mildbraed, apparently confined to the highest altitudes (about 14,000 ft.) and clearly distinguished from all other species on the mountain by the homogamous flower-heads and very dense, short, white tomentum on the under side of the leaf.

The new species here described occurs above the *S. longiligulatus* zone and continues into that of *S. adnivalis*, and the plant itself is in some respects intermediate in character between these two species. The fact, however, that Messrs. Fishlock and Hancock found it in plenty from 11,000 to 12,500 feet and that they differentiated it by field-characters confirms the decision, based on morphological features in the herbarium, that the plant is a distinct species. The latter characters consist in the ray florets being of medium length and in the under-surface of the leaf-blade being glabrous though traversed by a midrib clothed with a white villous tomentum. The glabrous leaf, it may be remarked, separates it also from the various new species recently described from Ruwenzori by Dr. de Wildeman which are not yet well understood and which are consequently not referred to above. The field characters which distinguish *S. erioneuron* from *S. adnivalis* are, according to Messrs. Fishlock and Hancock, its shorter stature, much less branched habit and more persistent leaves (*see* plate VIII). It moreover prefers boggy ground, whereas *S. adnivalis* occurs chiefly on drier moraines.

The first undoubted material of this species to reach Kew was a fine specimen collected by Prof. H. Humbert during his expedition to equatorial Africa in 1929 and presented to the Herbarium. Several rather fragmentary specimens, which occur in various herbaria, are also possibly referable to *S. erioneuron*, but these are not fully localized and, being questionable, are not cited. One doubtful specimen is, however, included, namely that collected on Mount Stanley, from which few, if any, plants exist in herbaria. This (No. 98) was from a rather small-leaved tree and was specially collected by Mr. Fishlock. The leaf appears to be typical *S. erioneuron*, though this species was not noted elsewhere as occurring at so high an altitude as 14,000 feet.

LIX.—PRELIMINARY INVESTIGATIONS IN GRAFTING COFFEE AT AMANI, EAST AFRICA. K. E. TOMS.

GRAFTING IN THE OPEN.

The first attempts were made in August, 1931, by grafting selected *Coffea robusta* on to stocks of the same species. The stocks were suckers from old trees grown under the shade of *Grevillea robusta* in the plantation. These trees were in a healthy and flourishing state before being cut back the previous January, for other purposes, to within 9 inches of the ground. One to three suckers were allowed to develop on each stump.

Several slight modifications of the ordinary veneer method of grafting were employed, with varying conditions of both stocks and scions. A 60 per cent. "take" was obtained, and at the time of writing the healthy shoots measure 3 to 4 ft. above the union, which can only be detected on close examination.

The success of grafting *C. robusta* on itself justified further attempts, using *C. arabica* as the scion. In November, during the rainy season, trials were made with the stocks described above, and scions from strong young shoots of *C. arabica* cut in an old plantation nearby. Shoots to the number of 59 were grafted on 29 plants. The "takes" at present, with shoots 2 to 4 ft. long and large healthy leaves, number 18 on 13 plants. This result may not appear particularly successful, but it should be remembered that the trial was purely experimental and not an attempt to achieve the largest possible number of "takes."

In all cases the grafts were tied with raffia and the point of union covered with grafting wax. Twenty-one grafts were given the added protection of inverted test tubes of one inch diameter. This method is an expensive and cumbersome one and as nearly all the grafts failed it was considered that further trials were unnecessary. An inexpensive method of protection reported to be used with success in Java is now being tested. Paper tubes are made about 1 inch diameter and 8–10 inches long, tied with twine at one end and dipped in melted paraffin wax. These are slipped over the graft and tied again at the bottom; no grafting wax is used.

Another experiment, also started in November during the rains, may not appear very successful, but is indicative of the best type of scion and therefore has value. The stocks were healthy plants about 8 years old supposed to be the progeny of a hybrid, *C. robusta* x *C. arabica*, but in appearance typical of *C. robusta*. Thirty-six plants were cut back to within 1 foot of the ground, the stems at that height varying in diameter from 1½ to 2½ inches. The bark ran very freely, rind grafting being the method used: 1 to 3 scions were inserted into each stump.

The stocks were divided into 3 groups of 12 plants and each group was grafted with a different type of scion as follows:

- A, Scions of terminal shoots about 6 inches long.
- B, Scions of firm green wood. (1 node.)
- C, Scions of mature brown wood. (1 node.)

The three types of scions were cut from the same long shoots.

Type.	Number of Stocks.	Number of Scions.	Number of "takes."
A	12	28	2
B	12	31	9
C	12	28	4

The type of scion used in Group B has also proved superior in all other trials where it has been used. The difference between Groups A and C is not significant, all other experience having shown that terminal shoots are superior to the mature brown wood.

Other grafting with the ordinary graft method was done during the hot dry weather of February. The stocks were the suckers of *Robusta* coffee and the scions were from four-year-old plants of Mocha coffee raised from imported seed. Fifty per cent. of the grafts are now making healthy shoots. This may be regarded as a satisfactory "take" as the plants from which the scions were taken were not in normal, vigorous growth.

During the same month, strong shoots from a healthy plant of *Coffee arabica* were grafted on to 8 eighteen-month old plants of *C. excelsa* in the seed bed. Seven are now growing rapidly and have been moved to permanent positions.

In the case of the stocks, the best union is effected on the firm green wood and it seems an advantage to make the cut where the wood is slightly older than that of the scion.

GRAFTING UNDER COVER.

While the above trials were in progress, another of a different nature was carried out with seedling grafts under glass in a propagating house. Seeds of *C. arabica*, *C. liberica*, *C. robusta* and *C. Quillou* were sown in August in about 4 inches of river sand on a bench. They germinated very unevenly but a few had fully developed cotyledons by November.

The *C. arabica* seedlings which were used as a scion were cut off just above the level of the sand. With a sharp razor blade two nearly parallel slices were cut down the stem making a long tapering wedge beneath the plumule and cotyledons.

A vertical cut was made in the stock, starting at the plumule and going towards the ground, so that the two cotyledons fell apart. The point of the wedge of the scion was inserted at the bottom of the slit, the two halves of the stock brought together and the whole bound with a thin strand of raffia. The finished graft had the appearance of a seedling with two pairs of cotyledons one above the other.

Each graft was covered with an inverted test tube for about 4 weeks.

More grafting was done in February when the seedlings were stiff and wiry and much easier to handle, but they seemed to take much longer to recover from the check in growth. It is quite possible that this check was caused by lack of food supplies, and it is

suggested that it would have been better if the seedlings had been raised in a good compost, to encourage a strong and continuous growth.

With a view to discovering the limit of conditions for grafting seedlings, 5 seedling Robusta and 4 Liberica were used as stocks in the seed beds outside in the nursery. For 2 days no protection was given other than that ordinarily provided for seed beds. This was found to be inadequate and protection from the drying winds was added. In spite of somewhat harsh treatment 2 of each kind survived and are now in a flourishing condition.

This method of seedling grafting is a promising one for raising plants of one species on the root system of another, and is worthy of further investigation. The nursery requirements for raising plants on a large scale would not be elaborate or expensive. Grafting would not be subject to weather conditions, a hundred per cent. success would be attained, and practice would soon make the operation a speedy one. In addition the graft would be strong, minimising the danger of mature plants being snapped off at the point of union by storms.

CONCLUSION.

To find the species or variety of *Coffea* making the best stock will, of course, need much further research and will probably vary with the locality. Grafting can be done at Amani at almost any time of the year, but the best time is during the dry season. The preliminary work recorded above gave no opportunity of determining which of the dry seasons is most favourable, but probably the cool dry season would give the best results.

According to reports from Java, grafting is being used fairly extensively for raising new stock and for improving established plantations.

So far the data collected here is in general agreement with that reported from Java.

Coffee is not a difficult plant to graft and if grafting is proved to be a more profitable method of cultivation, there is no doubt that propagation by this means could easily be developed on a large scale in East Africa.

This article may seem somewhat premature, but as circumstances prevent the writer from undertaking further work on this subject, it is considered desirable that an account of the work done, and the conclusions reached, should be placed on record. The future behaviour of the grafted plant may prove these conclusions to be wrong. They have, however, a potential value in indicating the direction of future investigations.

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LX.—NOTES ON THE FLORA OF SOUTHERN AFRICA :

II.* NEW OR NOTEWORTHY PLANTS. R. A. DYER.

GERANIACEAE.

Sarcocaulon Vanderietiae L. Bolus¹.—In connection with the revision of the flora of the Albany and Bathurst Divisions, the genus *Sarcocaulon* has been critically examined, especially the status and range of *S. Patersonii* Harv. This species, according to Harvey², occurs in various localities from the Orange River, the type locality, through the Karroo to Albany Division. The result of this study revealed the fact that more than one species was included by Harvey under *S. Patersonii*, and that this species is restricted to the western Karroo region. Recently Mrs. Bolus has also made a study of the genus and has described a new species, *S. Vanderietiae*, from the Albany Division, grown by Mrs. van de Riet, of Grahamstown. This species corresponds with certain material quoted by Harvey, l.c., and to *S. Vanderietiae* should be added the following synonymy : *S. Patersonii* Harv. in Harv. and Sond. Fl. Cap. i. 256 (1860), partim ; Kunth in Engl. Pflanzenr. Geraniaceae, 313 (1912), partim ; *S. L'Heritieri* Eckl. et Zeyh. Enum. no. 436, 57 (1836), non DC. ; *S. Burmanni* Hook. in Bot. Mag. t. 5729 (1868) ?, non DC.

In the wild state *S. Vanderietiae* is a small plant, 12–20 cm. high, with somewhat horizontally spreading branches ; the branches are seldom fully turgid, owing to the prevailing dry conditions, and are closely set with spinescent petioles. The bases of these modified petioles are swollen when young and almost as broad as the stem, but shrink and flatten with age.

It may be seen from the synonymy that this plant has been referred to three different species, all of which inhabit the western areas of the Karroo and Namaqualand. The earliest collection of *S. Vanderietiae* was made by Ecklon about 1830 in the Fish River valley, Albany Division, and was referred by Eckl. and Zeyh., l.c., to

*Continued from K.B. 1932, 155.

¹South Afr. Gard. & Country Life, xxii. 110 (1932).

²Harv. & Sond. Fl. Cap. i. 256 (1860).

S. L'Heritieri (DC.) Sweet, from which it is readily distinguished by its smaller flowers and very much shorter awns on the calyx-segments. The fact that the plant figured in the Botanical Magazine, t. 5729 (1868), came from the Botanical Gardens, Grahamstown, Albany Division, suggests that it originated from the Fish River valley, and represents a cultivated form of *S. Vanderietiae*, but the spine-bases are not shown as swollen and the apical leaf margin is minutely serrate. Kunth, l.c., cites this fig. in the synonymy of *S. Burmanni* (DC.) Sweet. *S. Patersonii* (DC.) Eckl. et Zeyh., to which species both Harvey, l.c., and Kunth, l.c., referred the eastern Cape plants, is based on fig. 14 in Paterson's Travels in Africa. The stem is very thick and fleshy, with truncate branches sparsely covered with spines and leaves, and is quite unlike the Albany species.

The following specimens in the Kew Herbarium are considered to represent the wild state of *S. Vanderietiae* and indicate its distribution:—Albany Div.: Fish River valley, Oct., *Ecklon and Zeyher* Enum. 436; Dec., *Schlechter* 6114; April, *Dyer* 909; *Bowker*, without no. Uitenhage Div.: *Alexander Prior*, without no. Graaff Reinet Div.: March, *Bolus in Herb. MacOwan* 39; Middelburg Div.: Sneeuwberg Mt. between Compas Berg and Rhenoster, *Drege* 7515a; Cradock Div.: *Cooper* 491; Somerset East Div.: *Atherstone* 21; 206; *Bowker*, without no.

Sarcocaulon spinosum (Burm. f.) O. Kuntze.—Kunth, l.c., although quoting in the synonymy of *S. Burmanni* (DC.) Sweet, the names *Geranium spinosum* Burm. f.³ and *Monsonia Burmannii* DC.⁴, retains the latter specific epithet. This is incorrect according to the International Rules since *spinosum* has priority.

Pelargonium ovale L'Hérit. Geran. t. 28 (1788).—Harvey⁵ quoted this plate as a variety of *P. ovale* Harv. (*Geranium ovale* Burm. f.). Knuth⁶ followed Harvey's classification and ignored the fact that L'Héritier and not Harvey was the first to use the name *P. ovale*. The plate of *P. ovale* L'Hérit. is excellent in character and detail, and with the accompanying dissections, validates the publication of the name. If then, *P. ovale* Harv. is a distinct species, it is also a later homonym of *P. ovale* L'Hérit., and according to the International Rules, would require a new name. Harvey, after examining a wealth of material and considering the figures and descriptions, stated that he found it impossible to recognise more than one species. His view was accepted by Knuth, l.c., who not only retained the four varieties established by Harvey, but in addition recognised two forms of the variety *Dregei*.

As constituted at the present time, the species *P. ovale* Harv. is too heteromorphous for convenience, and it is considered more

practical to resuscitate some of the species of earlier author which are found in synonymy.

To facilitate the study of the flora of Albany and Bathurst, and until such time as a more comprehensive investigation of this group of plants is possible, it is here only necessary to deal decisively with those found east of Van Staadens River, in the Port Elizabeth, Uitenhage and Bathurst Divisions. All the plants in this area, formerly referred to *P. ovale* (Burm. f.) Harv. var. *ovatum* Harv., agree very closely with *P. ovale* L'Hérit., the type of Harvey's variety *ovatum*. As stated, *P. ovale* L'Hérit. has priority over Harvey's combinations and L'Héritier's name is therefore retained for the eastern Cape plants. They differ from the western Cape forms in having a larger and comparatively regular purple corolla; calyx 15–20 mm. long; stipules lanceolate, about 15 mm. long, shortly pubescent, or the margin glabrescent. The plants are branched from a woody base, and the inflorescences are usually over 30 cm. high; the stems and leaves are covered with a long greyish indumentum.

For the time being, however, in addition to the above change in nomenclature, the Kew Herbarium material of *P. ovale* Harv. has been subdivided provisionally by the recognition of ***P. eriostemon* Jacq.**⁷ [= *P. ovale* (Burm. f.) Harv.] ***P. blattarium* Jacq.**⁸ [= *P. ovale* var. *blattarium* Harv.], and ***P. veronicifolium* (Eckl. et Zeyh.) Steud.**⁹ [= *P. ovale* var. *veronicifolium* Harv.]. The residue, including *P. ovale* var. *Dregei* Harv., should probably be divided into two species. *Geranium ovatum* Cav.¹⁰ is possibly indistinguishable specifically from one or other of the first two, but his figure has not been matched exactly with herbarium specimens at Kew. Further material of all forms with full field notes is required before a satisfactory revision can be written.

Pelargonium aridum R. A. Dyer, nom. nov.—*P. dissectum* (Eckl. & Zeyh.) Harv., l.c., non Sweet¹¹. Sweet applied the name *P. dissectum* to a garden hybrid, nevertheless, it invalidates the later homonym.

Pelargonium (Peristera) parvirostre R. A. Dyer, sp. nov.; affine *P. grossularioidi* (Linn.) Ait. sed foliis omnibus tripartitis, segmentitis profunde pinnatifido-incisis, floribus minoribus, fructus rostro multo brevior differt.

Herba annua diffusa. *Caules* 30–50 cm. longa, 1.5–2 mm. diametro, angulosi, tenuiter et breviter pubescentes, rubri, internodiis usque 6 cm. longis. *Folia* tripartita, segmentitis profunde pinnatifido-incisis, lobulis inciso-crenatis, usque 1.5 cm. longa, 2 cm. lata, cordata, utrinque glabra, margine pagina superiore

⁷ Jacq. Hort. Schoenb. ii. 4, t. 132 (1797).

⁸ Jacq. l.c. ii. 3, t. 131 (1797).

⁹ Steud. Nom. ed. 2, ii. 291 (1841).

¹⁰ Cav. Diss. iv. 238, t. 103, f. 3 (1787).

¹¹ Sweet Geran. iii. t. 247 (1825).

³ Burm. f. Spec. Geran. 16 (1759).

⁴ DC. Prod. i. 638 (1824).

⁵ Harv. & Sond. Fl. Cap. i. 291 (1860).

⁶ Knuth in Engl. Pflanzenr. Geraniaceae, 416 (1912).

leviter incrassato; petioli breviter pubescentes vel glabrescentes, foliorum basalius usque 6 cm. longi, superiorum breviores; stipulae amplexicaules, semiorbiculares vel late ovatae, obtusae. *Pedunculi* 1-3.5 cm. longi, 3-8-flori; bractaeae plerumque 6, ovatae vel lanceolatae, acutae. *Flores* pedicellati, pedicellis gracilibus, breviter glandulosis, usque 4 mm. longis calycis calcari excluso. *Calycis* calcar pedicello multo latius, sepala versus sensim ampliata, glandulosum, 2-2.5 mm. longum; sepala ovata vel lanceolata, 3 mm. longa, extra glandulosa et pilis paucis brevibus instructa. *Petala* 3 mm. longa, dilute rosea, 2 superiora ligulata, 3 inferiora spathulata. *Stamina* fertilia 5, antesepala, sepalis breviora; staminodia 5, antepetala, brevissima. *Ovarium* dense villosum. *Fructus* rostro excluso subglobosus, 2.5-3 mm. longus, 3 mm. diametro; rostrum 2.5-3.5 mm. longum, breviter puberulum; semina oblongo-obovata, plana, glabra.

EASTERN CAPE PROVINCE: Albany Division; near Grahams-town, Sept., *Schonland* 370 (type). Bathurst Division; near Port Alfred, Sept., *Burchell* 3792; Trappes Valley, Dec., *Daly* 688. Port Elizabeth Division; Port Elizabeth, waste places, *Holland*.

This species is apparently endemic in the Eastern Cape Province and for some time has been considered a form of *P. grossularioides* (Linn.) Ait., but is distinguished from that in all the leaves being tripartite, the smaller flowers, and the broad fruit with very short rostrum.

Pelargonium (Ciconium) frutetorum R. A. Dyer, sp. nov.; affine *P. inquinanti* Linn. et *P. zonali* Linn. ab illo foliis zonatis, petalis salmoneis nec cruento-rubris, ab hoc petalis latioribus, florum colore, sepalis oblongo-linearibus apice rotundatis vel breviter apiculatis, foliis mollius pubescentibus lobis crenatis differt.

Planta suffrutescens, sparse ramosa, ramis plus minusve scandentibus, usque 1-2.5 m. alta. *Caules* teretes, 5-7 mm. crassi, carnosulo-sublignosi, pubescentes. *Folia* orbiculata vel reniformi-orbiculata, basi cordata, 5-lobata, lobis crenatis vel crenato-dentatis, usque 5 cm. longa, 4-7.5 cm. lata, vix carnosula, zonata, utrinque indumento molli satis induta; stipulae latae vel latissime ovatae, 11-18 mm. longae, 9-13 mm. latae, abrupte acuminatae, mox membranaceae. *Pedunculi* 8-20 cm. longi, pubescentes, pilis glandulosis longis instructi, usque 12-flori; bractaeae plerumque 6, stipulis similes sed multo minores. *Flores* pedicellati, pedicellis 3.5-5.5 cm. longis, calycis calcare tenui 3.3-4.7 cm. longo eis adnato, pilis brevibus glandulosis et perpaucis longioribus eglandulosis ornatis. *Sepala* oblongo-linearia, 6-8 mm. longa, circiter 1.5 mm. lata, apice obtusa vel breviter apiculata, extra pilosa. *Petala* subaequalia, obovata vel obovato-cuneata, apice rotundata, 3 inferiora usque 20 mm. longa, 10 mm. lata, extra rosea dilutissima, intus salmoneo-rosea, 2 superiora saturatius colorata. *Stamina* fertilia 7.5 antesepala calyci fere aequilonga,

2 posteriora, antepetala, breviora. *Ovarium* dense villosum. *Fructus* fere 3 cm. longus, rostro pilis patulis albidis hirsuto.

EASTERN CAPE PROVINCE: Bathurst Division; in the coastal bush between the Kasouga and Kowie Rivers, Oct., *Burchell* 4029, 4090 (type); *Britten* 689. Alexandria Division; in bush at Bushmans River mouth, occasional, May, *Galpin* 10,664.

This species assumes a scrambling habit in its native habitat, but in cultivation at Kew it shows a more compact growth and an intensification of the zonal leaf-marking. A cultivated plant is being figured in the forthcoming part of Hooker's *Icones Plantarum*.

Pelargonium (Ciconium) salmoneum R. A. Dyer, sp. nov.; affine *P. zonali* Linn. sed foliis haud zonatis magis carnosulis saepe subglaucis, petalis maioribus truncato-obtusis roseo-salmoneis, 2 superioribus rubrinerviis, staminibus fertilibus tantum 5 differt.

Planta suffrutescens, sparse ramosa, ramis plus minusve erectis, florifera usque 80 cm. alta. *Caules* teretes, 4-5 mm. crassi, carnosulo-sublignosi, breviter pubescentes. *Folia* semi-orbiculata vel reniformia, basi magis minusve cordata, obscure 5-lobata, lobis grosse crenatis, crenis saepe crenulatis et interdum apiculatis, usque 4.5 cm. longa, 5 cm. lata, carnosula, haud zonata, utrinque minutissime glanduloso-scaberula et praeterea pilis longioribus eglandulosis sparsis apicem versus porrectis munita, undique viridia vel subglauca; stipulae lanceolatae vel late ovatae, 5-13 mm. longae, 4-7 mm. latae, mox membranaceae. *Pedunculi* 5-14 cm. longi, tenuiter et breviter pubescentes, 4-14 flori; bractaeae plerumque 6, stipulis similes sed minores, mox deciduae. *Flores* pedicellati, pedicellis 2.8-3 cm. longis, calycis calcari usque 2.5 cm. longo eis adnato, pilis brevibus glandulosis ornatis. *Sepala* lanceolata vel oblongo-lanceolata, acuta, 10-12 mm. longa. *Petala* subaequalia, 2 superiora leviter angustiora, obovato-cuneata, subtruncata, 2.3-2.5 cm. longa, 1-1.4 cm. lata, roseo-salmonea. *Stamina* fertilia 5, antesepala, sepalis subaequilonga; staminodia antepetala, multo breviora. *Ovarium* dense villosum. *Fructus* 4-4.5 cm. longus, rostro pilis patulis albidis hirsuto.

EASTERN CAPE PROVINCE. Origin unknown. During the Director's official tour in the Union of South Africa, 1930-31, he noticed this species growing in Port Elizabeth on the municipal rockeries under the charge of Mr. F. R. Long. Up to the present time no definite information is available as to its wild habitat; however, owing to its large, beautiful, salmon-pink flowers, it is a very desirable species for cultivation. The plant described was brought to Kew in 1931 by Miss Hill, and a specimen has been preserved in the Herbarium under number P. 104.

ARALIACEAE.

Seemannaralia *Viguiet* in Ann. Sci. Nat. ser. 9, iv. 116 (1906), descr. ampl.; affine *Cussoniae* Thunb. et *Panace* Linn., ab illa foliis simplicibus, seminibus haud ruminatis, ab hoc pedicello cum ovario

continuo, ab ambobus fructu lateraliter multo compresso membranaceo, petalis leviter imbricatis differt.

Calyx brevissime 5-dentatus. *Petala* 5, leviter imbricata. *Ovarium* 2-loculare, compressum; styli 2, divaricati, persistentes. *Fructus* lateraliter compressus, obovatus, membranaceus, longitudinaliter costatus. *Arbuscula* vel *arbor* usque 18 m. alta. *Folia* palmatifida, basi cordata, lobis deltoideis acuminatis inaequaliter glanduloso-dentatis vel serratis, 5-nervia. *Flores* umbellati, umbellis pedunculatis racemosis vel racemosim paniculatis, pedicello cum ovario continuo.

Species 1, endemic in forests of eastern South Africa.

Seemannaralia Gerrardii (Seem.) Viguier, l.c. 118.

Arbuscula vel *arbor* usque 18 m. alta, 20–40 cm. diametro, cortice cinereo. *Folia* 7–15 cm. longa et lata, palmatifida, basi cordata, 5-lobata, lobis deltoideis acutis vel acuminatis inaequaliter glanduloso-dentatis vel serratis, palmatim 5-nervata, subtus in axillis nervorum ad basin laminae plerumque barbato-tomentella, petiolo 6–12 cm. longo. *Racemi* axillares vel terminales, bracteis deltoideis, umbellis multifloris, bracteolis minutis, pedicello leviter 1 cm. longo cum ovario continuo. *Calyx* brevissime 5-dentatus, dentibus late deltoideo-ovatis. *Petala* 5, ovata, leviter imbricata, 2 mm. longa. *Ovarium* 2-loculare, compressum, costatum, glabrum; styli 2, divaricati, demum recurvi, persistentes. *Fructus* lateraliter compressus, late obovato-oblongus, membranaceus, 9–10 mm. longus, 7–8 mm. latus, longitudinaliter plerumque 5-costatus; semen 1, planum compressum.—*Cussonia Gerrardii* Seem. Journ. Bot. iv. 298 (1866); Benth. & Hook. f. Gen. Pl. i. 945 (1867); Seem. Rev. Hederaceae 74 (1868); Oliv. in Hook. Ic. Plant. t. 1454 (1884); Harms in Engl. & Prantl. Nat. Pflanzenf. iii. Abt. 8, 54 (1898); Wood, Revised List Fl. Natal, 162 (1908). Burt Davy in Kew Bull. 1908, 149; Thonner, Die Blütenpfl. Afr. Nachtr. u. Verbesser. 61 (1913); Fl. Plts. S. Afr. (1915); Engl. Pflanzenwelt Afr. 784 (1921); Burt Davy, Fl. Pl. Transvaal, ii. 514 (1932). *Panax Gerrardi* Harv. Gen. S. Afr. Pl. ed. 2, 147 (1868); Wood, Hand-book Fl. Natal, 57 (1907); Revised List, 162 (1908); Sim, Fl. Trees & Shrubs in S. Afr. 180 (1919); Native Trees of S. Afr. 95 (1921); Bews, Fl. Natal & Zul. 150 (1921); Marloth, Fl. S. Afr. ii. pt. 2. 234 (1925); Phillips Gen. S. Afr. Fl. Pl. 444 (1926).

PONDOLAND: Port St. Johns, Boshoff in Herb. S. Afr. Forestry 5289; Flagstaff, Isililo forest, March, Miller in Herb. S. Afr. Forestry 4080. NATAL: Alexandra District, near Dumisa, 2400–3000 ft., April, Rudatis 909; 997; 1660; near Durban Ismont, Gerrard 1264; Wood 1879; near Pietermaritzburg, June, Henkel & Bayer, without no. ZULULAND: Qudeni forest, Fernando in Herb. S. Afr. Forestry 1449.

A specimen consisting of a leafy twig collected by Rehmann (6785) in the Transvaal (without locality) shows a strong likeness to this species and it would be of interest to obtain complete material.

The systematic position of *Seemannaralia Gerrardii* has been the subject of divergent views almost since it was first collected by Gerrard. In 1866 Seemann, l.c., described it under the name *Cussonia Gerrardii*, and two years later Harvey, l.c., who had evidently not seen Seemann's work, described duplicate material as *Panax Gerrardi*. Later, when Oliver figured it as a *Cussonia* in Hook. Ic. Pl. t. 1454 (1884), he added the following qualification, "I think a very doubtful member of the genus *Cussonia*." Sim, in his Native Trees of S. Afr. 95 (1921), cites it as a *Panax* but adds, "Panax is now divided up, and this is no longer a *Panax*, nor is it a *Cussonia*, so its generic place is not clear."

Recent authors have apparently overlooked the work of R. Viguier on the classification of the Araliaceae, which was mainly concerned with the anatomy of the family. In the Ann. Sci. Nat. (1906) he established several new genera, amongst them, *Seemannaralia*, founded on *Cussonia Gerrardii* Seem. This was reduced again to *Cussonia* by Thonner, Die Blütenpfl. Afr. Nachtr. u. Verbesser. 61 (1913). An independent study of more complete material has confirmed Viguier's view and an amplified description is given above with full synonymy.

ERICACEAE.

Erica (Elytrostegia) orientalis R. A. Dyer, sp. nov.; affinis *E. glumiflorae* Klotzsch sed corolla suburceolata quam calyce longiore, sepalis obovatis scariosis et inflorescentia laxiore differt.

Caules 20–60 cm. alti, ramis et ramulis pubescentibus, ramulis lateralibus 1–1.5 cm. longis. *Folia* ternatim verticillata, 6–7 mm. longa, linearia, erecta, supra plana, subtus sulcata, glabra vel juniora minute ciliata, petiolis brevibus. *Flores* ad apices ramorum brevium 3-nati. *Pedicelli* 2–3 mm. longi, pubescentes, bracteis obovatis calyci similibus sed brevioribus imbricatis. *Calyx* 3 mm. longus, segmentis obovatis carinatis ciliatis scariosis. *Corolla* 4–5 mm. longa, suburceolata, lobis brevibus non recurvis. *Antherae* exsertae, caudis instructae. *Ovarium* glabrum; stylus exsertus; stigma subpeltatum.

EASTERN CAPE PROVINCE: Bathurst Division; Trappes Valley, near a vleij, shrublet, flower white, Dec., Dyer 2278 (type); Kleinmond, July, White 51. Albany Division; Alicedale, Sept., Cruden 82. Stutterheim Division; Fort Cunningham, in very limited area, Sim 1895. Note:—the flowers of the last two specimens are smaller than in the type, but are otherwise equal. A specimen in the Kew Herbarium collected by Alexander Prior, without exact locality, seems intermediate between *E. glumiflora* and *E. orientalis*.

MYRSINACEAE-CELASTRACEAE.

Myrsine Gerrardii Harv.—Harvey, ex C. H. Wright in Dyer, Fl. Cap. iv. pt. 1, 436 (1909), founded this species on somewhat incomplete material, Gerrard 1157 in part. A comparison of his type with

Ecklon and Zeyher Enum. 972 (1835), the type number of **Cassine eucleiformis** (Eckl. et Zeyh.) O. Kuntze, in the Kew Herbarium, shows the two plants to be the same species. *Myrsine Gerrardii* Harv., therefore becomes a synonym of *Cassine eucleiformis* (Eckl. et Zeyh.) O. Kuntze.

It is interesting to note that a duplicate of *Gerrard* 1157 is referred to the latter species by Davison in *Bothalia*, ii. i, 327 (1927). Davison, l.c., cites in synonymy *Celastrus filifolius* Thunb., a specific epithet which dates from Linn. f. *Suppl.* 153 (1781), based on one of Thunberg's specimens. If the two plants were actually conspecific, the latter name would have priority. However, in Thunb. *Fl. Cap.* ed. Schultes, 217 (1823), the description includes the phrase "*folia opposita*," whereas *Cassine eucleiformis* has alternate leaves. Sonder, in Harv. & Sond. *Fl. Cap.* i. 470 (1860), also dissociates the two species.

LVI.—ON THE FLORA OF THE NEARER EAST: XIII.* MISCELLANEOUS NEW RECORDS AND EXTENSIONS OF KNOWN DISTRIBUTIONS. W. B. TURRILL.

Linum virgultorum Boiss. et Heldr.—a species new to Europe.

This annual species of flax with capitate stigmata and glandular, 3-nerved sepals was described by Boissier and Heldreich in Boiss. *Diagn. ser.* i, viii. 105 (1849) from material collected by the latter author "in herbidis inter frutices faucis supra *Tsimbouckkan Pamphyliæ* sitae (Heldr. Maio. 1845)." Two sheets of Heldreich's are in the Kew Herbarium.

Mr. L. C. Pinatzi has sent three plants, collected by himself on Mt. Corydalus, Attica, which must be considered as rather small, few-flowered, representatives of *L. virgultorum*. In an accompanying letter he informed the writer that "l'aire de distribution de ce *Linum*, sur la colline en question est plutôt restreinte, occupé par un terrain calcaire sec couvert de quelques arbrisseaux de *Pinus Halepensis*. Le sol lui même est courvert d'une couche rare de phrygana, formation habituelle de l'Attique." In addition to providing yet another example of trans-Aegean floristic connection, the discovery of this species, whose known distribution is extremely limited in Asia Minor, on a hill about 5 km. west of Athens indicates how much botanical exploration remains to be done even in relatively well-known areas in the Nearer East.

Arenaria oxypetala S. et S. and allied species.

In the *Floræ Græcae Prodromus* i. 303 (1806) Sibthorp and Smith published the species *Arenaria oxypetala* based on material collected by Sibthorp "in agro Eliensi." The description is to be associated with the figure afterwards published in *Flora Græca*, t. 437 (1825). No record has been found of the species having been collected since Sibthorp's time on the mainland of Greece. Mr. L.

Pinatzi of Athens has, however, forwarded specimens, collected by himself on Mt. Parnes, Attica, in April, 1930, with both flowers and fruits, which certainly belong to this species. Various specimens from other countries of the Eastern Mediterranean Basin have been referred to *A. oxypetala* and an extended investigation has shown that there are a number of morphologically ill-defined species which must be considered in any attempts to trace the geographical distribution of *A. oxypetala*.

Apparently the earliest binomial for any member of the group of species here considered is *Arenaria graveolens* Schreb. in *Nov. Act. Nat. Cur.* iii. 478 (1767). The habitat is given as "in Oriente," and "*Alsine graveolens saxatilis & verna, foliis lanceolatis*. Tourn. cor. 17." is cited as a synonym. The description is a fairly complete one but it is difficult to know exactly what value to give to certain of the terms used. By use of the symbol ○ Schreber describes the plant as annual, while Boissier, Halácsy, Hayek, and other authors describe it as perennial and even use this as a key character for the separation (*inter alia*) of *A. graveolens* from *A. oxypetala*. Comparing the original description of *A. graveolens* with that of *A. oxypetala* in the *Flora Græca* the only differences, apart from slight differences in measurements and relative lengths, are the acute leaves and "calyx" of *A. oxypetala* and the acuminate leaves and "calyx" of *A. graveolens*. Relative, however, to material assigned by later authors to *A. graveolens* the sepals of Sibthorp's type material of *A. oxypetala*, kindly loaned by the Sherardian Professor of Botany, Oxford, are decidedly acuminate as that term is now generally applied. We are thus in a dilemma, since Schreber's description of *A. graveolens* (of which the original material has not been seen) applies better to Sibthorp's material than Sibthorp's own description under the name *A. oxypetala*!

The Cretan material referred to *A. oxypetala* (by Halácsy, *Consp. Flor. Græc.* i. 232-23: 1900, and others) and also Sieber's specimen in the Kew Herbarium sub. nom. *Arenaria muralis* (reduced by Halácsy and others to *A. graveolens*) differs from the Greek material of *A. oxypetala* (Sibthorp, Pinatzi) in having acute not acuminate sepals. The earliest name for the Cretan plants is *Stellaria muralis* (Link, *Enum.* i. 429: 1821), transferred to *Arenaria* as *A. muralis* Sieb. ex Spreng. *Syst.* ii. 397 (1825). This species, as indicated by Link, is normally an annual.

For the allied perennial species distributed from Asia Minor (and the near-lying islands) to Syria, Palestine, and Sinai the earliest name appears to be *A. pubescens* d'Urv. in *Mém. Soc. Linn. Par.* i. 306 (1822) from Cos (Coum). A synonym of *A. pubescens* is *A. deflexa* Decne. in *Ann. Sci. Nat. sér.* 2, iii. 277 (1835), from Sinai, *Bové* 176, 177.

Arenaria rhodia Boiss. *Diagn. ser.* i, i. 52 (1842) from Rhodes (*Auch.-Eloy* No. 575), described as an annual, is scarcely distinguishable from the Cretan *A. muralis* except by the slightly larger

*Continued from *K.B.* 1932, 250.

flowers and fruiting calyces. *A. cypria* Holmboe (Stud. Veg. Cyprus, 68, fig. 16 : 1914) can be best placed under *A. rhodia*.

Arenaria pamphylica Boiss. et Heldr. Diagn. ser. 1, viii. 102 (1849) is a relatively well distinguished species on account of the foliaceous bracts. A specimen from Cyprus (ad rupes pr. Kantara, 2.5.1880, *Sintenise et Rigo* 233, in Herb. Kew.) appears to be this species, though the number is quoted by Holmboe, l.c., under *A. oxypetala* S. et S.

Of the varieties included by Boissier under *A. graveolens* (Flor. Or. i. 701 : 1867), *grandiflora* is probably a distinct species, *glabrescens* (*A. sipylea* Boiss.) has not been seen, *graeca* is a distinct species (*A. graeca* Hal.) and *athoa* is also a distinct species which must bear the name *A. filicaulis* Fenzl.

The species closely allied to *A. oxypetala* and here considered can be distinguished as follows :—

Bracts foliaceous, plant annual : *A. pamphylica* (Asia Minor, Cyprus).

Bracts not foliaceous, subulate or shortly triangular

Sepals acuminate.....*A. oxypetala* (Greece).

Sepals acute

Plant perennial.....*A. pubescens* (Asia Minor south to Sinai).

Plant annual

Sepals 3-3.5 mm. long.....*A. muralis* (Crete).

Sepals 4-4.5 mm. long.....*A. rhodia* (Rhodes, Cyprus).

To which, if any, of these microspecies the name *A. graveolens* Schreb. should be applied and whether it would be better to consider them as varieties or subspecies of one species to which the name *A. graveolens* could be applied cannot be decided with the material at present available.

Cornucopie cucullatum L. in Greece.

The monotypic genus *Cornucopie*, with its strange, scarcely grass-like inflorescence, is widely distributed in the extra-European parts of the Nearer East. Specimens at Kew show that its range includes much of Asia Minor from the western sea-board east to Kurdistan, Syria, Palestine, and Iraq. Mr. Pinatzi has sent specimens to Kew, collected by himself in the Athens district, Kallithea, "dans les vergers, rare," April 1932. While this grass may have been recently introduced into Greece it is of interest to note that it is common in the Smyrna district on the opposite Aegean coast and that Sibthorp recorded it from Patmos (see Shaw and Turrill in Kew. Bull. 1926, 122).

Trifolium leucanthum M. Bieb. Flor Taur. Cauc. ii. 214 (1808).

This species has a rather wide distribution in the Mediterranean Basin, and in the Balkan Peninsula is recorded from Thessaly, N. Macedonia, Thrace, N. and S. Bulgaria, Rodope Massif, Serbia, Hercegovina, and Dalmatia. The var. *declinatum* Boiss. is known from Mt. Oeta Phthiotidis (Sprun.). Material collected by Mr.

Pinatzi on Mt. Parnes, Attica, "pr. loc. Vountima dictum—dans le maquis," in May, 1931, extends the known range of the species southwards in the Balkan Peninsula.

Scorpiurus muricata L. var. *laevigata* (S. et S. pro sp.) Boiss., known previously from Crete, near Canea, and the Greek Archipelago, has been collected by Mr. Pinatzi "in arvis pr. Gortynam," Crete, 30.4.1932.

Campanulata spathulata S. et S. var. **Giuseppii** Milne-Redhead et Turrill.

Radix tuberoso-incrassata, inferne dichotoma. *Caulis* tenuis, flaccidus, ramosus, prostratus vel pendulus, circiter quinqueflorus, 20-25 cm. longus, basem versus sparissime hirsutus. *Folia* caulina inferiora elliptica, apice obtusa, inferne in petiolum usque ad 2.5 cm. longum, angustata, margine obscure crenata, lamina usque ad 2 cm. longa et 1.3 cm. lata, pilis paucis dispersis in pagina superiora et in petioli basi instructa ; superiora gradatim angustiora et parviora fere sessilia. *Sepala* patula vel leviter deflexa, linearia, acuta, 8-9 mm. longa, 1 mm. lata, margine fere integra sed cum hydathodis 2-4 instructa. *Corolla* infundibuliformis, 1.6-1.7 cm. longa, lobis patulis vel leviter reflexis 0.9-1 cm. longis, 0.5 cm. latis oblongo-lanceolatis.

The above description has been drawn up from a living specimen grown by Dr. Giuseppi at Trevese, Felixstow, from a plant which he informs us he collected on Mt. Chelmos in Greece. Halácsy (Consp. Flor. Graec. ii. 268-9 : 1902) records the species, as *C. Sibthorpiana* Hal. (= *C. spathulata* S. et S. non. W. et K.), but Giuseppi's plant differs from all the material of the species we have seen in the spreading, or even slightly reflexed, sepals and corolla lobes. The habit is rather that of the var. *filicaulis* (Hal.) than of the type except that the stems are branched and more floriferous. The colour of the corolla-lobes has been matched with "Amparo Purple" (Ridgeway, t. xi.).

Plants from Sithonia (Longos) Peninsula, Greek Macedonia.

The Khalkidikē Peninsula, to the south-east of Salonika is divided by two deep bays, on its south-eastern sea-board, into three relatively long and narrow peninsulas, those of Kassandra, Sithonia (more often in western European maps named Longos), and Athos. Of these the last is by far the most famous, and the highest, and has been most visited by botanical collectors. Indeed, Kassandra, except the northern part, and Sithonia are botanically unknown or almost unknown territories. A small collection of plants made by the Hon. H. G. Chick, H.M. Consul-General at Salonika, has, therefore, considerable interest phytogeographically, since it is of sufficient size to indicate that the flora is essentially of a Mediterranean type and rather more characteristically so than the parts of Macedonia to the west and north of Salonika. The specimens were collected early in May of this year mainly near Neos Marmaras, between this

place and Parthenon, around Toroni, and inland from the Koufo Inlet. The first two localities are on the west side of Sithonia, about the middle of the peninsula, and the last two on the west side near the southern end.

The following are represented in the collection: *Anemone hortensis* L. (intermediate between var. *fulgens* Hayek and var. *stellata* Gren. et Godr., near to the former), *Malcolmia flexuosa* S. et S., *Cistus monspeliensis* L., *C. salviifolius* L., *Helianthemum guttatum* (L.) Mill. var. *plantagineum* (Willd.), *H. ovatum* (Viv.) Dun. (probably a stunted form of var. *hirsutum* (Thuill.) sensu Hayek), *Tamarix parviflora* DC., *Silene subconica* Friv., *S. vulgaris* Garcke, *Linum angustifolium* Huds., *Erodium cicutarium* L'Her., *Astragalus macedonicus* Heldr. et Char., *Hymenocarpus circinnatus* (L.) Savi, *Melilotus neapolitanus* Ten., *Vicia dasycarpa* Ten., *Bupleurum junceum* L. (forma *depauperatata*), *Tordylium apulum* L., *Chrysanthemum segetum* L., *Crepis neglecta* L. var. *graeca* Vierh., *Senecio vernalis* W. et K., *Campanula phrygia* Jaub. et Spach., *Arbutus Unedo* L., *Erica arborea* L., *Alkanna tinctoria* (L.) Tausch., *Echium plantagineum* L., *Linaria pelisseriana* Mill., *Lavandula Stoechas* L., *Prasium majus* L., *Euphorbia veneta* Willd., *Muscari comosum* Mill., *Orchis morio* L., *Serapias vomeracea* Briq., *Vulpia bromoides* S. F. Gray.

Muscari Charrelii Hal. et Nadji.—I am unable to distinguish *M. Charrelii* as a species distinct from *M. comosum* Mill. The name was first published as a nomen nudum (Halácsy ex Rouy in Bull. Soc. Bot. Fr. xxxviii. 135: 1891). Later Halácsy and Nadji Effendi (Charrel), in Nadji Effendi, Empire Ottoman Géographie Botanique, 42 (1892), published a short description in French. Neither with the aid of this description nor with that provided by the four sheets at Kew collected by Nadji, can I find any characters to separate the Macedonian plants from *M. comosum* Mill.

LXII.—A NEW BERBERIS FROM CHILE AND ARGENTINA. T. A. SPRAGUE.

The genus *Berberis* is well represented in the South American Andes, especially in Chile and Argentina, 27 species being recognized from these two countries alone in Dr. C. K. Schneider's revision of the genus (Bull. Herb. Boiss. sér. 2, v. 822: 1905). Perhaps the most remarkable species yet known from South America is *B. Comberi* (Kew Bull. 1927, 175) which, as regards its vegetative characters, is among the least specialized, spine-leaves being completely absent, whereas its *pentamerous* flowers with *superposed* whorls represent a maximum of floral modification. *B. Comberi* was discovered at Cerro Lotena, Argentina, by Mr. H. F. Comber, who saw it also on the road from Zapala to Chos Malal, and between Malala and San Martin, in all three places near to oil drillings and prospectings. Mr. Comber informs us that "one of the peculiarities of *Berberis Comberi* was the way in which the seeds were stuck

together in a round ball, the segments like pieces of an orange," and that the species was raised from seeds, and is still in cultivation at Nymans and Wakehurst, though not growing very well owing to the wet winters. He collected fine herbarium material as well as seeds of various other species of *Berberis* in Argentina. Among these was his no. 415 from Pulmari which was assigned provisionally to *B. montana* C. Gay (*vide* H. F. Comber, Andes Exped. 21: 1928). Plants of this and of no. 415a were raised in this country, where they have proved to be hardy. Flowering specimens of no. 415a were exhibited at the Chelsea Show of the Royal Horticultural Society in May 1932, and it was then noticed that this number differed in several respects from typical *B. montana*, which had also been raised from seed of no. 798 brought back by Mr. Comber. Specimens were submitted to the writer for identification, and the plant was found to differ sufficiently from *B. montana* to be treated as a separate species. The leaves and flowers are considerably smaller than in *B. montana*, and the stamens are nearly as long as the petals instead of being at most two-thirds of their length as in that species. Perhaps the most important distinction, however, lies in the inflorescence, which is fasciculate or umbellate in *B. montana*, whereas in the new species the flowers are solitary on the short shoots.

Mr. Comber's no. 415a agrees essentially with a specimen in the Kew Herbarium, collected in the Cordillera de Chillan by Ph. Germain in 1856 or 1857 and named "*B. montana* var. *chillanensis* C. K. Schneider" by Dr. Schneider in 1906. This specimen is not, however, the actual type of var. *chillanensis*, which is preserved in the Natural History Museum at Vienna (Bull. Herb. Boiss. sér. 2, v. 395: 1905), but there is no reason to doubt the correctness of the identification.

The new species, *Berberis chillanensis*, described below, is based: (1) on the above-mentioned specimen at Kew collected by Ph. Germain on the Cordillera de Chillan; (2) on fresh cultivated material of H. F. Comber's no. 415a, received from Mr. James Comber, Gardener to Lt.-Col. L. C. R. Messel, Nymans, Handcross, Sussex.

***Berberis chillanensis* Sprague** ex Bean in New Flora & Sylva, v. 50, fig. 16 (1932), anglice, sp. nov.; affinis *B. montanae* C. Gay, a qua foliis floribusque minoribus, floribus singulis, staminibus petala subaequantibus recedit.

Frutex 1-2.5 m. altus. *Rami* subangulati, 3.5-4 mm. diametro 20 cm. infra apicem, cortice cinereo vel cinereo-fusco minute pilosulo longitudinaliter fisso obtekti; *spinae* simplices, vel trifidae ramis lateralibus patentibus, 4-8 mm. longae, tenues; *ramuli* ascendentes, dense minute pilosuli, cinereo-fusci; *ramulorum spinae* simplices, e basi ovato-deltaeidea attenuatae, rectae vel apicem versus leviter recurvae, 3-6 mm. longae; *ramuli abbreviati* in axillis spinarum singuli vel bini, folia 4-8 (plerumque 5-6) gerentes. *Folia* brevissime petiolata, petiolo sub anthesi 0.3-0.6 mm. longo, sub fructu circiter 1 mm.

longo, anguste obovata, rhomboideo-obovata vel oblanceolata, sub anthesi 4-10 mm. longa, 2-5 mm. lata, sub fructu ad 1.5 cm. longa et 7.5 mm. lata, apice obtusa rotundata vel apiculata, inferne in petiolum sensim angustata, herbacea, anguste hyalino-marginata, superne vel apicem versus minute papillato-ciliolata, ceterum glabra, trinervia nervis lateralibus costae parallelis ad vel ultra $\frac{2}{3}$ procurentibus ibique cum venulis anastomosantibus, nervis et venulis translucetibus, supra satis pallide viridia, venis inconspicuis, subtus pallidiora. Flores singuli in ramulis abbreviatis, expansi ad 1.5 cm. diametro; pedunculi 5-10 mm. longi. *Sepala* lutea, 3-seriata: extima ovato-oblonga vel oblonga, 2.5-5.5 mm. longa, 1-2.5 mm. lata, apice nonnunquam leviter bifida; intermedia elliptico-oblonga, 7-8 mm. longa, 3.5-4 mm. lata, apice breviter bifida lobis rotundatis; intima late obovata, 8-10 mm. longa, 5-6 mm. lata, vix unguiculata. *Petala* pallide aurantiaca, e basi horizontali erecta, suborbiculari-elliptica, 5-5.5 mm. longa, 4 mm. lata, truncata vel retusa; nectaria allantoidea, 0.6-0.7 mm. longa. *Stamina* petalis paullulo breviora, 4.5 mm. longa, filamentis antheras aequantibus. *Pistillum* lageniforme, 4-4.5 mm. longum; stigma 1.2 mm. diametro; ovula 5-12. *Bacca* limoniformis, in sicco 6 mm. longa, stylo cum stigmate 1.5 mm. longo.—*B. montana* var. *chillanensis* C. K. Schneider in Bull. Herb. Boiss. sér. 2, v. 395 (1905), fide specimen authenticato in Herbario Kewensi.

CHILE. Cordillera de Chillan, ann. 1856 et 1857, Ph. Germain (typus in Herb. Kew.).

ARGENTINA. Baño de Palau Mahida, 1800 m., fl. Jan. 16, 1926, H. F. Comber 415a (fide H. F. Comber, Andes Exped. 21: 1928).

Mr. Comber's nos. 479 (fl.) and 415 (fr.) have solitary flowers and agree on the whole with *B. chillanensis*, but have distinctly larger leaves and flowers, intermediate in size between those of *chillanensis* and *montana*. The branchlets, however, are more strongly hirsute than in *chillanensis*, and the peduncles are shortly but densely hirsute. It is therefore convenient to treat these numbers as representing a distinct variety of *B. chillanensis*.

***Berberis chillanensis* var. *hirsutipes* Sprague** ex Bean in New Flora & Sylva, v. 50 (1932), anglice, var. nov.; a typo pedunculis breviter at densiuscule hirsutulis differt; ramuli dense breviter hirsuti; folia ad 1-2 cm. longa.

ARGENTINA. Suangulo, 1950 m., fl. Jan. 16, 1926, H. F. Comber 479 (typus in Herb. Kew.); Pulmari (Queseria), 1050 m., fr. Jan. 16, 1926, H. F. Comber 415.

The precise inter-relationships of the Andean species of *Berberis*, and the question as to what extent the numerous perplexing forms are due to hybridization or other causes, are problems which can be elucidated only with the aid of extensive special studies in the field. In the meantime it is necessary to have descriptions and names for

the plants actually in cultivation, whatever the status which may ultimately be assigned to them.

Mr. H. F. Comber informs us that in his opinion his nos. 415, 415a, 479 and 798 are all well-connected varieties of *Berberis montana*. He considers that this species, as he found it in the Andes, is a variable plant best distinguished from *B. buxifolia*—to which Reiche in the Flora de Chile united it—by the usually larger flowers, two, three or four in a fascicle or corymb, rarely solitary on the short shoots, the less prominent, brown (when mature) spines slightly but characteristically recurved, and by the fruits being lemon-shaped, not flattened-globose (orange-shaped), as in *B. buxifolia*. He regards his no. 415a as a dwarf mountain form, and nos. 415 and 479 as more or less intermediate forms.

The writer agrees that "*Berberis montana*" as circumscribed by Schneider is a natural group, but prefers, for reasons of convenience, to treat it for the present as including two species, *B. montana*, sensu stricto, and *B. chillanensis*, until it can be shown that the actual range of variation covers both extremes. Gay's description of his *B. montana* mentions that the leaves may reach two inches in length, and that the flowers are either solitary or several together on the short shoots, so that he evidently took the species in a wide sense. Schneider (Bull. Herb. Boiss. sér. 2, v. 295) was apparently the first to segregate varieties, and he selected as type a plant with glabrous branchlets and fascicled or corymbose flowers, represented by Lechler's no. 1990 from the Cordillera de Ranco. This then may be accepted as the lectotype of the name *Berberis montana*.

LXIII.—THE GENUS *MARISCOPSIS*. F. BALLARD.

The monotypic genus *Mariscopsis* was described by M. H. Chermeson in 1919 (Bull. Mus. Hist. Nat. xxv. 60: 1919) from specimens collected in Madagascar and Zanzibar. It was based on *M. suaveolens* Cherm., which was published as a new species. Later, in 1926, R. E. Vaughan collected further material of the species in Mauritius. From the fact that it has appeared only spasmodically and at rare intervals in these islands it was felt that the plant might be an alien weed, imported in some way from the Indian or African mainland. India, as a source, seemed more probable and a search made in certain likely genera of the *Eucypereae* revealed that it was identical with *Pycneus hyalinus* (Vahl) Domin. In the Flora of British India it appears as *Pycneus pumilus* Nees.

The question to be settled, therefore, is whether to retain *Mariscopsis* as a genus or to leave the plant in the genus *Pycneus*. The sole reason for retaining it in *Pycneus* seems to lie in the possession of a biconvex nut, since it cannot be said to resemble in general facies any known species of *Pycneus*. It is generally admitted that the genera of the tribe *Eucypereae* are to a large extent artificial but that they serve as convenient groups. This being so, *Mariscopsis* has as much right to generic segregation as any other genus of the

tribe. On purely technical characters our plant falls into none of the genera possessing two styles and a biconvex nut. From *Pycneus* it differs in possessing a deciduous rhachilla, the spikelets falling entire. *Juncellus* possesses a dorsally compressed nut, whereas the fruit of our species is compressed laterally. Its natural position is probably near *Kyllinga*, in which the spikelets of some species resemble closely those of *Mariscopsis*. It differs, however, in the open umbellate inflorescence, that of *Kyllinga* being densely capitate.

The synonymy of our plant is of interest and an account of it by W. B. Turrill will be found in Kew Bull. 1922, 122, where *Pycneus pumilus* Nees is given as a synonym. Actually, this combination was made by Nees as the result of a wrong identification. We know from his determination of a Wight specimen that our plant was identified by him with *Cyperus pumilus* L. and when transferring a number of species of *Cyperus* to *Pycneus*, a new combination, *Pycneus pumilus* Nees was made for it. Since true *Cyperus pumilus* L. is also a *Pycneus*, Nees' combination, under the present Rules, must be retained for it, while another specific epithet must be found for the plant misidentified by Nees. The earliest name for it appears to be *Cyperus hyalinus* Vahl and, transferring it to Chermeson's genus, it becomes **Mariscopsis hyalinus** (Vahl) Ballard, comb. nov.

The synonymy is as follows:—*Cyperus hyalinus* Vahl, Enum. ii. 329 (1806). *C. pumilus* Nees in Wight, Contrib. 74 (1834) excl. syn., non L. *Pycneus pumilus* Nees in Linnaea, ix. 238 (1834), quoad specim., excl. syn. *P. hyalinus* Domin in Bibl. Bot. lxxxv. 417 (1915). *Mariscopsis suaveolens* Cherm. in Bull. Mus. Hist. Nat. xxv. 60 (1919).

E. G. Camus in Lecomte, Fl. Indo-Chine, 32, records our species from Annam and Cochin-China (as *P. pumilus* Nees) and while his description seems to fit quite well, the illustration given of a spikelet undoubtedly refers to another species. It probably portrays the Linnaean *Cyperus pumilus* (*Pycneus pumilus* Nees) which is included in the same work under *P. nitens* Nees. There are no specimens of *Mariscopsis* in the Kew Herbarium from Indo-China.

According to C. B. Clarke in the Flora of Tropical Africa, viii., *Mariscopsis hyalinus* has been collected in Mozambique and Timor, although no specimens from the African mainland or from Malaya are now to be found at Kew.

An interesting feature of the plant which appears to have escaped the attention of botanical writers is the possession by it, at least when dry, of a strong odour which exactly resembles that of dried specimens of *Trigonella Foenum-graecum* L. Specimens collected by Wight in India over one hundred years ago still retain this odour to an astonishing degree. The smell is very pungent, reminding one somewhat of curry powder and is due in part, in *Trigonella* at any rate, to the presence of coumarin. Although this substance is present in a number of plants there is no previous record of its occurrence in any member of the Cyperaceae.

LXIV.—MISCELLANEOUS NOTES.

RETIREMENT OF MR. AIKMAN.—The retirement of Mr. John Aikman, M.B.E., on October 8th, 1932, under the age-limit has, to our great regret, brought to a conclusion a career of nearly 44 years in the public service, under three Directors.

Mr. Aikman came to Kew as a Student Gardener on December 10th, 1888, and on January 6th, 1890, was promoted to be "Label-Writer"—a wise selection, as all those familiar with his excellent handwriting will appreciate. On January 1st, 1891, he was appointed a Temporary Technical Assistant in the Herbarium. Four months later he became an acting Assistant, and was established in the latter capacity on July 7th, 1891. He then took up duty in the Director's Office, and he has been the Director's Confidential Assistant during the whole of his established service, extending over a period of more than 41 years. Commencing his work under Sir William Thiselton-Dyer, he developed those methods of accuracy in every detail which have proved invaluable to the establishment.

In recognition of his meritorious service, Mr. Aikman received the Honour of the M.B.E. from H.M. the King at the New Year, 1930.

In wishing Mr. Aikman many years of happiness in his retirement the present Director cordially endorses a statement placed on record by Sir William Thiselton-Dyer when he himself retired in 1905:—

"The work of the Director's Office is of the most varied kind and requires in its transaction equally varied technical knowledge. Mr. Aikman has acquired a remarkable grasp of it and in the details of daily routine is never at fault. His memory for books, papers and men is simply invaluable.

"But he possesses another qualification which is even more indispensable. The business of my office is frequently of the most confidential kind. I have for a long period of years found myself able to place entire confidence in Mr. Aikman's discretion.

"We have both often had to work at high pressure and Mr. Aikman has never spared himself in rendering me assistance. I feel that I should be wanting in gratitude for his faithful help if I did not place this statement on record." W.T.T.D. 14.xii.05.

In succession to Mr. Aikman, the Minister of Agriculture and Fisheries has appointed MR. STUART FREDERICK ORMSBY as Chief Clerical Officer in the Director's Office.

MR. LEONARD RODWAY.—We learn with regret that Mr. Leonard Rodway, C.M.G., has resigned his position as Honorary Government Botanist of Tasmania, mainly on account of failing health.

Mr. Rodway, after a varied early naval and medical career, went to Tasmania in 1880 and soon after joined the Royal Society of Tasmania, of which he has been for so long a very active and highly valued member. He was appointed Honorary Government Botanist in 1896 and, during his term of office, he has built up the Tasmanian

Herbarium and written his well-known "Flora of Tasmania." In addition he has published a very useful book on "The Wild Flowers of Tasmania" and has prepared a complete description of the Mosses and Hepatics of the State.

His services to Tasmanian Botany were very fittingly recognised in the conferment of the Honour of the C.M.G. by H.M. the King in 1917. He was also honoured by his own countrymen when he was presented with the first Royal Society of Tasmania medal in 1928.

Mr. Rodway has been active in many directions in Tasmania and in particular he has been a member of the Scenery Preservation Board, Advisory Officer to the Forestry Department and for some years Lecturer in Botany to the University. As a Trustee of the Botanical Gardens he has done much to keep alive interest in the fine Gardens at Hobart; latterly, since the retirement of the Superintendent, he has resided in the Gardens and it is to be hoped he will be able to supervise their maintenance until the Government of Tasmania finds itself in a position to appoint a new Superintendent.

Mr. Rodway has been a valued correspondent of Kew since the year 1897, and has sent many consignments of Tasmanian plants for the enrichment of the Kew Herbarium.

KARL RITTER VON GOEBEL.—The death of Geheimrath Professor Dr. Karl Ritter von Goebel on October 9th, in his 78th year, has removed the most prominent figure among the plant-morphologists of his time. He had been Professor of Botany in the University of Munich, and Director of the Botanic Garden there since 1891, and was at his death President of the Bavarian Academy of Sciences. He was foreign Fellow of the Royal Societies of London and Edinburgh, of the Linnean Society, and of many of the Academies of Europe and America. The event does not merely remove a figure universally known in scientific circles, but it closes a brilliant period of Botanical Science in Germany. Doubtless his influence lives through his pupils, and through the readers of his prolific writings. Their effect will continue to be felt wherever Botany is studied. Nevertheless his death breaks a traditional sequence continuous from Hofmeister himself. He was in fact the last surviving pupil of that great master.

Nursed in the methods of von Mohl, and in the clear inductive reasoning of Schleiden, and with our own Robert Brown as a contemporary, Hofmeister in 1847 formulated, on the basis of his own original observations, the underlying scheme of life as seen in Mosses, Ferns and Conifers, thereby introducing the great synthesis centred in the expression "Alternation of Generations." To him, as he was serving his last years in the Chair at Tübingen, came young Goebel, a native of Bellighem in Baden. Nothing learned there was lost on him, as we may judge from his filial essay written in 1924 to celebrate the Centenary of Hofmeister's birth. An English translation of this essay was published by the Ray Society in 1925. None of the vast

contributions of von Goebel to the literature of Botany conveys more clearly his deep philosophical insight than this volume of appreciation, tinged as it is with the natural criticism of a later age. Nor could any writer place more justly in its frame the portrait of the founder of a new phase of botanical thought. But it rested with the pupil, thus "blooded" in the pursuit of Science, to extend its scope.

Young Goebel passed from Tübingen to Würzburg, where he was stimulated by the radiant intellect of Sachs, and to the Institute in Strassburg, then directed by De Bary. After such favourable training his own natural powers of investigation carried him through rapid steps of promotion to the important Chair of Botany in the University of Munich. Here he established a thriving school of investigation, and developed his own researches, the results of which are now summarised in his great work "Organographie der Pflanzen," of which the third edition awaits only the issue of its last part for its completion. The book stands unrivalled, whether as the achievement of a single brain, or as an epitome of the work of a long life of intense activity and unusual opportunity.

Botanists in Britain knew von Goebel well. His frequent visits, his attractive personality, and his knowledge of our language all helped to cement friendship based upon supreme scientific quality. There was a strong bond between Kew and the Botanic Garden at Munich, and, among other gifts, Kew received an interesting collection of Ferns and Stove plants in 1930. Students knew him by the translation of his "Outlines" and of the first edition of the "Organographie," both having been published by the Oxford Press. For plant-morphologists his influence was wide and deep, though persuasive rather than dogmatic. His chief aim seems to have been to read the riddle of causality, rather than to pursue the elusive and protean phantom of phylogeny. His life leaves our science greatly enriched. His many friends will rejoice that he maintained his powers of thought to the very end.

F. O. B.

EVERARD IM THURN.—By the death of Sir Everard im Thurn, K.C.M.G., K.B.E., on October the 8th, at the age of 80, Kew loses one of her oldest and most valued correspondents.

Educated at Marlborough and Exeter College, Oxford, where he graduated in 1875, Sir Everard's first connection with Kew was in 1877, when Sir Joseph Hooker was instrumental in obtaining for him the post of Curator of the British Guiana Museum at Georgetown. From here he soon commenced sending back collections of living and dried plants to Kew, a practice which he continued throughout a long career of colonial administration.

In 1882 he was appointed Special Magistrate of the Pomerun District, a post which, however, did not interfere with his botanical activities and in 1884 he published a paper entitled "The Palms of

British Guiana" in "Timehri," a Guiana journal of which he was the editor and founder.

In the same year he accomplished his historic ascent of Roraima, a most vivid account of which appeared in the proceedings of the Royal Geographical Society for 1880. The plants collected on this expedition were described by Professor Daniel Oliver in the Transactions of the Linnean Society for 1886, and are now in the Herbarium at Kew.

In 1890 Sir Everard was appointed Government Agent in the North West District, a post which he held until 1899, when he was transferred to the Colonial Office. Here he remained only a year, proceeding to Ceylon as Colonial Secretary and Lieutenant Governor in 1901. In Ceylon official routine kept him exceedingly busy and it was not until 1904, when he was appointed Governor of Fiji and High Commissioner of the Pacific, that he again became botanically active.

Between 1904 and 1910, when he retired, Sir Everard collected extensively in the Fijian Islands and sent his plants to be worked out at Kew. In 1915 a list of the Phanerogams in his collections was published in the Journal of the Linnean Society. Out of a total of 72 species, 24 were new, the majority of which came from the Nandarivatu District and Kandava. The Ferns were enumerated later in the *Kew Bulletin*, 1930, 343.

Sir Everard was a zoologist and a distinguished anthropologist as well as a botanist, and was the author of several books of travel, notably "Among the Indians of Guiana" (1883). He also published an interesting account of the Western Pacific in the *Geographical Journal* for 1909.

Sir Everard received the Honour of the K.C.M.G. in 1905 and the K.B.E. in 1918.

The name *Pinus laricio*.—The specific epithet is commonly spelt with a capital initial letter, but as it is neither a personal nor a generic name, it should be spelt as above. The Italian vernacular name "Larizio" or "Laricio" appears to be applied to one or two species of *Pinus*, namely, to *P. nigra* Arnold (*P. laricio* Poir., 1804), and possibly to *P. Pinaster* Sol. (*P. laricio* Savi, 1798). Savi (Fl. Pis. ii. 353 : 1798*) gave the Italian name of his *Pinus Laricio* [sic] as "Pino Larizio," and O. Targioni Tozzetti (Diz. Bot. Ital. ed. 2, i. 216 : 1825) cited it as "Pino Laricio." Poiret (Lam. Encycl. v. 339 : 1804) in publishing his *Pinus laricio* omitted to explain the derivation of the specific epithet. The vernacular Italian name "Pino laricio" was, however, cited for it by Tenore (Fl. Nap. v. 267 : 1835-36), and the form "Pino Laricio" by Bertolini (Fl. Ital. x. 263 : 1854) and Parlatore (Fl. Ital. iv. 53 : 1867). Piccioli (Piant. Legn. Ital. 77 : 1890) cited "Pino laricio," "Laricio" and "Larice

*Bertolini (Fl. Ital. x. 261) and Parlatore (Fl. Ital. iv. 38) cited this name from Santi, Viagg. terz. 60, t. 1, which I have not seen.

di Corsica" among the vernacular names of *P. laricio* Poir. He gave no similar name under *P. Pinaster* Sol., so that it seems probable that the epithet *laricio* was applied to that species owing to confusion with *P. nigra* Arnold. Penzig (Fl. Pop. Ital. i. 355 : 1924) also cited "Pino laricio," "Laricio," and "Larice di Corsica" among the Tuscan vernacular names of *P. laricio* Poir., but gave no similar name under *P. maritima* L. (*P. Pinaster*). The statement by K. Koch (Dendrol. ii. Abth. 2, 287 : 1882) that the vernacular name "Laricio" is applied in Italy to *P. Pinaster* as well as to *P. maritima* Mill. (*P. laricio* Poir.) is apparently based on Savi.

The existence of the variant "Larice di Corsica" suggests a connection between "Laricio" and *Larix* (Ital. "Larice"). At the same time it is difficult to see any resemblance between either of the two species concerned and the common Larch. Nevertheless the names "Larch Pine," and "Lärchen-kiefer" (or "Lerchen-kiefer") have been coined by English and German botanists respectively for *P. laricio* Poir. Loudon (Arb. et Frut. Brit. iv. 2200 : 1838) used the former; and the latter is cited among the German names of *Pinus laricio* Poir. by Gerth van Wijk (Dict. Pl. Names, 1006 : 1911). According to Pritzel and Jessen (Deutsch. Volksnam. Pfl. 278 : 1882) the form "Lerchenkiefer" is employed in Austria for *P. laricio* Poir.

T. A. S.

South Indian Weeds.*—This publication of the Department of Agriculture, Madras, is in the same series as "Some South Indian Grasses" and furnishes a further example of the value of systematic botany to the agriculture of a country. The major portion of the book is devoted to descriptions of individual weeds, most of which are accompanied by excellent line drawings of the plants, showing their seeds and other organs by which they can readily be recognized. As an introduction to each description the English name of the weed, if such exists, is given, as well as its name in the principal vernaculars. This is followed by a note of the flowering and fruiting season, the habit of the plant, its habitat, the soil types which it prefers, how it is propagated and the approximate number of seeds which a plant can produce. Below the description there is a short note suggesting methods of control and if the plant is reputed to be of economic importance (many of them have a reputation of medicinal value) mention is made of its uses.

As numbers of these weeds are cosmopolitan in the dry tropics and as others have close relatives which are also obnoxious weeds in other countries, this book deserves a much wider circulation, among those interested in village life in the tropics, than in the confines of an Indian Province.

The earlier chapters of the book consist of an introduction to botanical terms of nomenclature, a classification of weeds, and their

*Handbook of Some South Indian Weeds, by C. Tadulinggam, F.L.S., and G. Venkatanarayana, B.Sc. (Ag). Pp. vii. + 356. Printed and published by the Superintendent, Government Press, Madras. Price Rs. 4.

methods of propagation. This is followed by a descriptive and illustrated chapter on weed seeds and weed seedlings and another on general methods of weed control. At the close of the book there is a bibliography and a glossary of botanical terms.

The authors are to be congratulated both on the subject matter of the book and on the manner in which it has been presented. The Superintendent of the Government Press is also to be congratulated on the general style of the publication and the excellent reproduction of the illustrations.

Chromosomes and Plant Breeding.*—The practical plant-breeder finds particular difficulty in assimilating the results of modern work on chromosomes. He is frightened by the array of new terms and by the mathematical puzzles which are continually confronting him. Dr. Darlington, in the present volume, aims at presenting these results in as clear a way as possible and in a form easily applicable to the problems of plant breeding.

The earlier chapters are devoted to a brief outline of Cytological and Mendelian facts. These are followed by sections on various aspects of Polyploidy and its relation to plant breeding.

The later chapters show very strikingly the great light that the study of chromosomes has thrown on the history of our cultivated plants. They also show how much success in breeding for new forms depends on a knowledge of chromosome behaviour. In breeding apples and pears, for example, it might be expected that the most vigorous varieties would give the best seedlings. An examination of the chromosomes of such varieties, however, shows that they are frequently triploid and hence useless for breeding work.

This book, which had appeared previously in a slightly different form as a series of articles in "The Gardeners' Chronicle," should be extremely helpful both to breeders and to the "lay-scientist" wishing to obtain a clear view of modern work on chromosome behaviour.

*By C. D. Darlington, Ph.D., D.Sc., with a foreword by Sir Daniel Hall, K.C.B., F.R.S. Macmillan & Co., Limited, London, 1932. Pp. xiv+112, 25 figs. Price 7s. 6d.

BULLETIN OF MISCELLANEOUS INFORMATION No. 10 1932 ROYAL BOTANIC GARDENS, KEW

LXV.—THE ARBORESCENT SENECIOS OF MOUNT ELGON. A. D. COTTON.

INTRODUCTION.

Recent studies of the arborescent Senecios have shown clearly not only that there are several distinct species on each of the high mountain masses of East and Central Africa, but also that these species occur in zones and show, as might be expected, certain morphological features of ecological significance. The most obvious feature is to be found in the leaf-structure, the species occurring in the forest or in the subalpine zone above the forest-belt possessing thin leaves devoid of a dense tomentum, whereas those found in the highest or alpine zone possess thick leaves which are protected below by a dense woolly covering. Differences are also found in the anatomical structure of the leaf. These features are clearly seen in the species occurring in Kilimanjaro, the Virunga Mountains and Ruwenzori (see Kew Bull. 1930, 115, 1931, 289, and 1932, 438, respectively). The fact that floral differences accompany those in the leaf precludes the idea of their being merely variations of the same species due to habitat-conditions. As will be shown below, a similar state of affairs has now been found to exist on Mt. Elgon, from which mountain one species only has hitherto been described.

Mt. Elgon, as is well known, is an extinct volcano, over 14,000 ft. high and remarkable for the very large crater at the summit. Details of the mountain will be described by Major E. J. Lugard in a paper on the flora, shortly to be published in the *Kew Bulletin*. All, therefore, that need be stated here is that at about 9000 ft. the forest degenerates into open scrub which at about 10,000 ft. passes into subalpine grassland with scattered Ericaceous bushes and suffrutescent plants of temperate genera. The true alpine zone commences at about 12,000 ft. and extends to the summit. The crater is saucer-shaped, being tilted in a westerly direction; in its longest diameter it is 8 miles across. It is believed by some authorities to have been in eruption in Pleistocene times,* but it is now clothed with a characteristic alpine vegetation of grasses, species of *Alchemilla*, *Helichrysum*, and other plants, though it

* The late Prof. J. W. Gregory kindly drew my attention to the recent statement by O. H. Odman that "it may be considered established that the history of Mt. Elgon as an active volcano in the eruptive stage was completed in pre-Pleistocene time." (Geol. Foren. Stockholm, Forh. vol. 52, p. 534, 1930.)

contains also much swampy ground and several small lakes. Hail is frequent and snow occurs, but it seldom lies for any time. A luxurious growth of tree *Senecios* flourishes on the slopes of the mountain from about 11,000 ft. and also within the crater itself. For many years Jackson's Peak (13,650 ft.) on the Uganda side of the crater rim was regarded as the highest point, but revised readings show that other peaks exceed it.

HISTORICAL.

Before dealing with the tree *Senecios* which occur on Mt. Elgon a brief summary of the botanical exploration of the mountain may be given. The crater was first crossed by F. J. Jackson and E. Gedge during the Imperial East African Company's expedition in 1890. The following statement by E. G. Ravenstein, in his account of that expedition (1891, 202), provides the first reference to the giant *Senecios*. "A curious tree with straight rough stem and a large leafy top grows abundantly between 11,000 and 13,000 feet." Excellent photographs of the crater and *Senecios* were taken by Gedge, and these plants are also alluded to by Hopley (1897), who made a tour around the crater in 1896.

Although the mountain is on the frontier of Kenya and Uganda it was formerly included in the Central Province of the latter country. It is therefore dealt with in Sir Harry Johnston's well known work "The Uganda Protectorate" published in 1902 (vol. i. chapter 2). Johnston did not reach the crater himself, but he supplies notes on the general mountain flora and reproduces some of the photographs of the crater taken by Gedge. The plants collected during his visit were presented to Kew and the list of identifications was published (Johnston 1902, 326-328). These names are also included in a general list of Uganda plants by C. H. Wright (1902).

In 1913 Rudolf Kmunke ascended the crater from the west side and his plants, which include the first giant *Senecio* collected from Mt. Elgon, are preserved in the Botanical Institute of the University of Vienna. In his book "Quer durch Uganda" several pages are devoted to the vegetation and many excellent photographs of *Senecios* are reproduced, including one (t. 19, fig. 1) which probably depicts the new species described below as *S. Gardneri*.

In October, 1916, Mr. J. D. Snowden, of the Department of Agriculture, Uganda, starting from Mbale and using the route *via* Budadiri (4200 ft.), Butandiga (c. 7000 ft.) and Bulambuli ("Bamboo Camp," c. 9000 ft.), visited Mt. Elgon and ascended Jackson's Peak, the supposed highest point of the crater. His collection, which is preserved at Kew, contains a specimen of the plant subsequently named *S. elgonensis*, but which was determined at the time as *S. Johnstonii*. Some eighteen months later R. A. Dummer, using the same route as Snowden, and fortified with the latter's notes and list of plants, also visited the crater and Jackson's Peak. He published a breezy if perhaps somewhat superficial

account of his trip (1919). The first set of his specimens is at Kew, but duplicates are to be found at Berlin and elsewhere.

In 1920 the Swedish ethnographer, G. Lindblom, accompanied by S. Loven and H. Granvick, visited Uganda and included Mt. Elgon in their explorations. The two small books dealing with this expedition, Lindblom (1921) and Loven (1921), contain excellent photographs of the vegetation of the crater and Plate 44 in the latter work evidently portrays *S. Gardneri*. The material was largely worked out at Berlin, but is preserved at Stockholm. Mr. C. H. Lankester visited the crater and summit in 1921, following the usual track from Uganda. The small collection brought home was presented to Kew and was the subject of a short paper in the *Kew Bulletin* 1922.

In 1922 the brothers R. E. Fries and Th. Fries carried out their botanical expedition to Kenya and in 1923 commenced to publish in the "Notizblatt" of the Berlin Botanic Garden a succession of important papers and revisions on the flora of Mt. Kenya, the Aberdares, and Mt. Elgon, a series which is still being continued. Neither of the Fries brothers, however, actually visited Mt. Elgon, their papers dealing with their own Kenya specimens and the Mt. Elgon specimens collected by the Swedish expedition above referred to. Immediately previous to this, Mildbraed (1922) published a short but interesting account of the Mt. Elgon flora. He gives several extracts from Kmunke's volume and translations from Lindblom's Swedish account. He points out that the Elgon species of arborescent *Senecio*, which had been referred to by previous observers as *S. Johnstonii*, was not that species, and that, judging from photographs, there might be a second species on the mountain, possibly identical with his *S. Friesiorum* from Ruwenzori. Mildbraed gives a list of about 30 specimens collected by Lindblom.

Thore Fries, working at the Berlin herbarium in 1923, came across a duplicate of Dummer's specimens collected in 1918 and described it as *S. elgonensis*, sp. nov. This plant has a moderately thick leaf, but is devoid of a dense woolly covering on the under surface. It is the species which botanists had previously regarded as *S. Johnstonii* and is common between 11,000 and 12,000 ft. altitude.

In the *Pflanzenwelt Afrikas*, Engler (1925, 296-299) gives a valuable summary of our knowledge of the Mt. Elgon flora up to that date, incorporating some of the results of Swedish work and giving a list of species which includes *S. elgonensis* Th. Fries.

In 1929 G. L. R. Hancock, Entomologist, Department of Agriculture, Uganda, and W. W. Soundy made a trip to Mt. Elgon with the object of carrying out entomological investigations. They brought back a small collection of plants, which was presented to Kew, and published an interesting paper (1931) on the fauna and flora. The paper is illustrated with good photographs and contains a useful bibliography. They refer to *S. elgonensis*, though they did not collect specimens (their Plate 5, fig. 2, probably represents *S.*

Gardneri). L. C. C. Liebenberg, late of the Uganda Department of Agriculture, paid a brief visit to the mountain in 1930 and sent a fairly extensive collection to Kew, including a flowering specimen of *S. elgonensis*.

Arborescent *Senecios* from Mt. Elgon, therefore, were represented in European herbaria up to the time when the present investigations commenced (January 1930) by three gatherings of *S. elgonensis* only, namely, those of Snowden, Dummer and Liebenberg. A single other specimen existed in Europe, namely, a portion of a plant collected by Kmunke in 1913, but this was not available for study, being preserved in an exhibition case at the Museum of the Botanical Garden and Institute at Vienna. Dr. E. Janchen, however, has been good enough to make an examination and he reports that the leaves agree with those of *S. elgonensis*. As will be seen below, during the three years since that date more than a dozen gatherings, each consisting of ample material, have reached Kew.

RECENT COLLECTIONS.

In the light of the facts referred to in the Introduction it was reasonable to conclude that, since Mt. Elgon is 14,000 feet high, the uppermost species reported by observers would certainly be distinct from the smooth-leaved *S. elgonensis* occurring at 11,000 feet and that a third species might even be expected to occur. The possibility of a second high-alpine species had, indeed, been pointed out by Lindblom (1921, p. 42), Mildbraed (1922, p. 240) and Thore Fries (1923, p. 228) and the receipt in April 1930 of a leafless flowering shoot, collected by H. M. Gardner, tended to confirm this view and to arouse new interest in the area.

As it was impossible to obtain further information from material in Europe, letters, accompanied by a *questionnaire*, were sent in January, 1931 to various persons in Kenya and Uganda who were interested in the mountain flora, with a request for information and for material, particularly (if it could be found) of a densely-tomentose species from the highest altitudes. The result of these letters has been highly satisfactory and has led, not only to the discovery of two other well-marked new species, but to a much clearer understanding of the distribution of these plants on Mt. Elgon. Mr. H. M. Gardner has taken the greatest interest in the matter and through his help both leaves and flowering material, collected by Mr. E. J. Honoré, Forest Officer, were received in February 1931. The plant proved to be the same as that collected by Mr. Gardner himself the previous year and has been named *S. Gardneri*. In December, 1930, Major E. J. Lugard, who, with his daughter-in-law, Mrs. Cyril Lugard, was making an extensive collection on behalf of Kew, likewise obtained and sent home excellent specimens of both *S. Gardneri* and *S. elgonensis*. At a later date Capt. Cyril Lugard kindly sent a further series of specimens, accompanied by photographs and the subjoined memorandum (slightly edited) which

provides a clear picture of the growth and distribution of both species.

"I left Tanyelel on November 2nd, 1931, and ascended by the Wagishu track to a forestry hut at 8500 ft. Here I left the track, which goes on into Uganda, and branched off to the right. This led upward through the forest, which was mainly *Podocarpus*. At about 9000 ft. a bamboo forest was entered. This was finer than that found at 8300 ft., possibly because it had been less cut.

"The forest belt ended at about 10,000 ft. The turf is here short and tree heaths were plentiful, in many places forming patches of forest. I camped at 10,300 ft. near some scattered flat-topped huts of the Elgoni people. Continuing next morning through similar country I found *Senecio elgonensis* for the first time along a stream at 11,000 ft. No specimens were observed in the forest itself. The tree heaths gradually became scarcer and ended at about 12,800 ft. and the grass became tussocky. *S. elgonensis* was very common and always occurred in wet ground, indeed the whole mountain side about here was saturated with water. No flowers of this species were seen (nor were they during my previous visit in December, 1930) but a fair number of plants showed old flower-stalks. At about 13,000 ft. there were masses of flowers including a white *Helichrysum* and a scrub-like yellow Composite. These made a very fine display of colour.

"I was now on what I believe to be the slopes of Sudek. At approximately 13,300 ft. occurred the first specimens of *S. Gardneri*, growing as a fine grove in very wet ground, and this species extended to the summit. The zones of *S. elgonensis* and *S. Gardneri* just overlap and the two plants were found here growing together, but, except for two stunted individuals noted on the summit of Sudek, 13,300 ft. appeared to be the maximum altitude for *S. elgonensis*. *S. Gardneri* is frequently found in very wet conditions though it also occurs on the edge of rocks and tops of hills. I saw no flowers but noted a few flower-heads in bud last year (December, 1930) on Jackson's Summit at 13,650 ft. Only a very few plants of this species showed old flower-stalks. There were masses of old dead leaves hanging down on the stems of *S. Gardneri* and *S. elgonensis*—in fact the two trees have generally the same habit." Two of Captain Lugard's photographs are reproduced (figs. 3 and 4).*

Several collections have been received during 1932. Captain and Mrs. Cyril Lugard, accompanied by Mrs. D. R. Tweedie, made a further ascent in February and collected both species, the lower one in full flower. They also forwarded specimens of *S. Gardneri* showing its juvenile condition (see p. 472).

*Acknowledgments for permission to reproduce the photographs used in this paper are due to Mr. E. H. Robins of the Public Works Department, Kenya Colony, for photograph No. 1; to Mr. J. C. Rammel, of the Forest Department, Kenya Colony, for No. 2; and to Captain Cyril Lugard for Nos. 3 and 4.

PLATE IX

A very interesting gathering was received in March from Mr. G. Fairbairn (Kenya Forest Service) of a species allied to, but distinct from, *S. elgonensis*. This was characterised by a very thin leaf, oblong in form with an almost truncate apex. It is the only gathering of its kind in existence and is described below as *S. amblyophyllus*, sp. nov. (see footnote, p. 474). Another Forest Officer, Mr. R. V. H. Porter, sent a fine series of *S. elgonensis* collected in March 1932.

From the Uganda side of Mt. Elgon material was received of both *S. elgonensis* and *S. Gardneri* collected in August by Mr. A. S. Thomas, of the Department of Agriculture.

The notes on the route followed by Mr. Thomas are of special interest, since the distribution of the flora appears to be somewhat different from that on the usual route from the Kenya side.

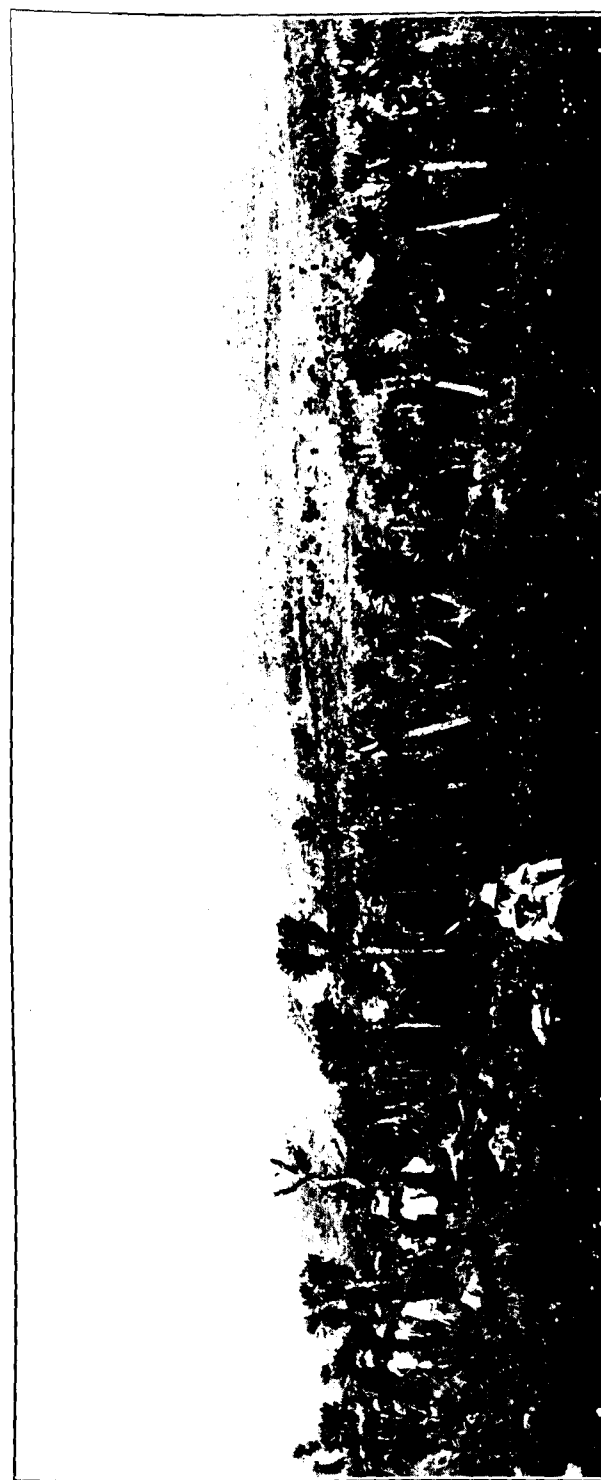
The arduous ascent necessary to secure these specimens and to collect data involves considerable time and effort as well as expense, and to all who have helped forward botanical science in the present investigation warmest thanks are due.

TAXONOMY.

The full description of the three species occurring on Mt. Elgon is given below and is followed by a key which will provide for their ready recognition in the field.

1. *Senecio elgonensis* Th. Fries jr. in Svensk Bot. Tidskrift, xvii. 229 (1923).

Stem repeatedly forked, 5 or more metres high, covered above with marcescent foliage and bearing large, terminal rosettes of leaves. *Leaves* thin to medium thickness, elliptical to oblong-elliptical, apex acute to subacute, finely dentate, or almost entire, teeth surmounted with hydathodes; lamina 30-40 cm. long and 15-18 cm. wide; upper surface glabrous when mature; midrib arachnoid-tomentose towards insertion; lateral nerves distinct arising at an acute angle, 2-2.5 cm. apart; under surface apparently glabrous but actually clothed with short silky hairs especially towards apex; midrib barbato-tomentose at base, glabrous when mature; petiole distinct, winged, 5-8 mm. long, 3-4 cm. wide. *Inflorescence* bracteate, thyrsoïd-paniculate, nearly 1 metre high, with flower heads racemosely arranged on ascending branches; main axis and branches arachnoid-tomentose; bracts leaf-like, with long, broadly winged base. *Flower heads* subcampanulate, 2 cm. wide and 13-15 mm. long (excluding rays), borne on slender peduncles. *Involucral bracts* 3-seriate; outer 1-seriate, linear, 6-7 mm. long; inner 2-seriate, 13-20, narrowly lanceolate, acute, 12-18 mm. long, 2-4 mm. wide, purplish at base. *Ray flowers* few, ligulate, yellow, tube 8 mm. long, ligule 13-15 mm. long. *Disk flowers* 55-80, tube 8-9 mm. long, cylindrical. *Achenes* strongly ribbed, 6 mm. long. *Pappus* barbed.



1. *Senecio elgonensis* Th. Fries. In sub-alpine meadows below crater of Mt. Elgon about 12,000 ft. alt. Photo. E. H. Robins.

PLATE X



2. *S. elgonensis* Th. Fries. 10,500 ft. alt. Photo. J. C. Rammell.



3. *S. Gardneri* Cotton, sp. nov. 13,500 ft. alt. An unusually fine example. Photo. Capt. Cyril E. Lugard.



4. *S. Gardneri* Cotton, at 13,300 ft. alt. The white tomentum of the leaves is conspicuous. Photo. Capt. Cyril E. Lugard.

MOUNT ELGON. Jan. 1918, *Dummer* 3382* (type); 1913, *Kmunke* (Mus. Vind.); Oct. 1916, *Snowden* 480; 11,500 ft., April 1930, *Liebenberg* 1609; 12,000 ft., Dec. 1930, *E. J. and Mrs. C. Lugard* 437; 13,000 ft., Nov. 1931, *Capt. and Mrs. C. Lugard* 696; 11,000 ft., Feb. 1932, 699; 11,000 ft., Feb. 1932, *Tweedie* 113 (Nairobi Herb.); 10,500 ft., June (?) 1932, *Porter* 2732; 12,800 ft., Aug. 1932, *Thomas* 628 and 630.

This species is abundant and occurs as a definite zone below *S. Gardneri*, extending, according to recent observations, from 11,000 to 13,000 ft. The older altitudinal records, when the two species were not distinguished, must be accepted with reserve. The almost glabrous leaf and the relatively short, broadly-winged petiole distinguish it at once from the upper species and, when in flower, it is also seen to be distinct in the more slender inflorescence and well-marked ray florets.

S. elgonensis, according to Capt. Cyril Lugard, always occurs on wet ground, a fact which is in accordance with the presence of large hydathodes which line the margin of the leaf. These vary in number in different specimens, and it is probable that their number is correlated with the habitat, as is the case with *S. Cottonii* on Kilimanjaro, where plants growing in dry situations have an almost entire margin, whereas those occurring in wet ground are dentate, the teeth being surmounted with hydathodes.

The altitudinal zone and the wet habitat of *S. elgonensis* are precisely similar to those of *S. Kilimanjari*, and it is interesting to note how the two species, which are obviously allied, have responded in slightly different ways to the conditions of their respective mountains.

2. *Senecio Gardneri* Cotton, sp. nov.

Arbor ramosa, usque 5 m. alta. *Folia* rigide coriacea, elliptica vel elliptico-lanceolata, cordata, petiolata, basim versus dentata; lamina 30-40 cm. longa, 15-18 cm. lata, supra sericeo-pilosa demum glabrescens, infra in plantis juvenilibus pilosa, in maturis dense albolanata, costa villosa-tomentosa superne demum glabrescente; petiolus longus (10-14 cm.), cylindricus, pilosus. *Inflorescentia* 1 m. alta, capitulis dense congestis. *Flores* disci numerosissimi (105-120). Species ab omnibus speciebus sectionis homogamis petiolo longo cylindrico distincta.

Tree, repeatedly forked, up to 5 metres high. *Stem* covered below with furrowed bark and above with remains of old leaves. *Leaves* in large terminal rosettes, bright green, thick, tough, broadly elliptic or elliptic-lanceolate, cordate, dentate or sub-entire towards apex, teeth surmounted by hydathodes, lamina 30-40 cm. long, 15-18 cm.

*There is a possibility that the type specimens collected by Dummer are a mixed gathering. The inflorescence and flower heads correspond to those of the plant found abundantly from 11-13,000 ft. and here accepted as *S. elgonensis* Th. Fries. The leaves in both the Kew and the Berlin specimens are identical and badly damaged, but are somewhat thinner than the normal leaves of *S. elgonensis*.

wide; upper surface arachnoid-tomentose at first, glabrous when mature, midrib arachnoid at base, lateral nerves distinct, arising almost at a right angle, 1.5–2.5 cm. apart; lower surface in young plants pilose, in mature plants clothed with a very dense, short, white, persistent tomentum, midrib densely barbate-tomentose, becoming glabrous with age and dark brown or black in colour; lateral veins very distinct; petiole distinct, cylindrical, up to 14 cm. long, densely pilose. *Inflorescence* bracteate, paniculate, up to 1 m. high, densely crowded with flower heads, subracemously arranged on short lateral branches; main axis and branches clothed with very dense, woolly tomentum; lower bracts leaf-like, with broadly winged base, purple when dried. *Flower heads* homogamous, widely campanulate, 2–2.5 cm. wide, 1.5 cm. long, borne on long peduncles; flowers yellow. *Involucral bracts* 3-seriate; outer linear, 15–17 mm. long, 1 mm. wide; inner 2-seriate, oblong-lanceolate, acute, 15–18 mm. long, 3–5 mm. wide, glabrous, purplish when dry. *Ray flowers* absent. *Disk flowers* hermaphrodite, very numerous, 105–120, tube 9–10 mm. long, cylindrical. *Achenes* 4 mm. long. *Pappus* barbed.

MOUNT ELGON. 13,500–14,000 ft., Feb. 1930, *Gardner* 2269; Sudek, 13,800 ft., Jan. 1931, *Honoré* 2520 (type); Jackson's Summit, 13,600 ft., Dec. 1930, *E. J. and Mrs. C. Lugard* 438; 13,300 ft., Nov. 1931, *Capt. and Mrs. C. Lugard* 697, 698 (young); 13,500 ft., Feb. 1932, *Capt. and Mrs. C. Lugard* 700, 701 (young); and *Tweedie* 112; March (?) 1932, *Fairbairn* 2677; 13,500 ft., Aug. 1932, *Thomas* 627.

ILLUSTRATIONS: Kmunke, Quer durch Uganda, t. 19, fig. 1. Loven, Kring Mt. Elgon, t. 44.

S. Gardneri commences at the top of the *S. elgonensis* zone at about 13,000 ft. and extends thence to the highest peaks of the rim of the crater. It is distinguished from *S. elgonensis* by the leaves being densely tomentose below and by possessing a long, cylindrical petiole. The flower heads also differ in being devoid of ray florets.

In the juvenile state the leaf covering is entirely different, as was proved by two interesting gatherings forwarded by Captain and Mrs. Cyril Lugard (Nos. 698 and 701). The specimens were collected from young plants 3–6 ft. high, and showed leaves which were clothed with long silky hairs on the under as well as on the upper surface. Although the leaves were identical in form with those of *S. Gardneri*, there was no development, even on the largest, of the dense short tomentum characteristic of that species. In spite of this striking difference, Capt. Lugard did not regard it as a distinct species but as a juvenile form of *S. Gardneri*. Some eight months after these specimens were collected, Mr. I. R. Dale, an Assistant Conservator of Forests in Kenya Colony, discovered a similar phenomenon in the case of *S. aberdaricus* on the Aberdare Mountains, and sent specimens to Kew accompanied by the following note: "The leaves of the young plants may be glabrous or hairy, and the former condition . . . usually, I think, changes when about 4 feet

high." Capt. Lugard's view has, therefore, been confirmed and is here accepted as correct. These observations in the field are not only of interest for the light they throw on the biology of the plants, but are of great value in the prevention of errors liable to occur in the herbarium.

The general affinity of *S. Gardneri* is with *S. keniodendron* Fries from Mt. Kenya and with *S. Friesiorum* Mildbraed from Ruwenzori, which are the only other species possessing homogamous flowers. They both occur at the highest altitudes and possess tomentose foliage. *S. Gardneri* is more nearly allied to the latter, which is, however, very distinct in the short, broadly-winged petiole of the leaf and its apparently much narrower lamina. The very long petiole of *S. Gardneri* is remarkable in a species growing at extreme altitudes and is indeed not found in any other of the arborescent *Senecios* except *S. Johnstonii*, which occurs at a very much lower level.

S. Gardneri occurs under climatic conditions of extreme contrasts, hot sun alternating with sharp frost at night, and periods of rain alternating with very drying winds. In common with many other species it is found on very wet ground and sometimes actually grows in water. With a soil temperature, however, so little above freezing point, the risk of excessive transpiration is at times very great, and the significance of the dense coating of hairs on the lower surface of the leaf is obvious. On the other hand, in seasons of prolonged rain there is a danger of the leaf-tissues being overcharged with water, hence the presence of large hydathodes on the leaf-margin.

3. *Senecio amblyophyllus* Cotton, sp. nov.

Arbor ramosa. *Folia* tenuia, oblonga vel oblongo-elliptica, cordata, apice rotundata vel fere truncata, dentibus minimis instructa; lamina in speciminibus extantibus 30 cm. longa, 15 cm. lata, nervis lateralibus a costa angulo fere 90° abeuntibus, infra breviter pilosa demum subglabrescens; petiolus brevis, alatus. *Inflorescentia* thyrsideo-paniculata; axis ramique laterales lanati, satis graciles. *Capitula* subturbinate, 1.5–2 cm. lata. *Flores radii* conspicui, ligula lineari-oblonga, 14–16 mm. longa. *Flores disci* haud numerosi (55–70).—*S. elgonensis* affinis sed foliis tenuioribus apice fere truncata differt.

Stem repeatedly forked, — m. high. *Leaves* thin, oblong or oblong-elliptic, cordate, apex rounded or almost truncate, shortly petiolate, finely dentate; lamina in existing specimens 30 cm. long, 15 cm. wide; upper surface pilose at first, glabrous when mature; midrib densely pilose; lateral nerves distinct, arising almost horizontally, 1–2 cm. apart; under-surface thinly and shortly pilose, becoming partly glabrous; midrib densely pilose, especially towards base; petiole long, broadly winged at base, 20 cm. long. *Inflorescence* bracteate, thyrsoid-paniculate, about 1 m. high; main axis and branches somewhat slender, lanate; bracts with broadly winged base. *Flower heads* subturbinate, 1.5–2 cm. wide, 12–13 mm. long (excluding rays). *Involucral bracts* 3-seriate; outer 8–10, linear,

6.7 mm. long, 1 mm. wide; inner bracts 2-seriate, 13-15, narrowly lanceolate, acute, 12-15 mm. long, 4-5 mm. wide. *Ray flowers* few (11-14), ligulate, yellow, tube 5-6 mm. long, ligule 14-16 mm. long, 3-4 mm. wide. *Disk flowers* about 60 (55-65), tube 8-9 mm. long, cylindrical. *Pappus* barbed.

MOUNT ELGON. On small stream, Kassowai River, site wet and shady, Feb. (?) 1932, *Fairbairn* 2678.

Though *S. amblyophyllus* is known only from a single gathering, the leaves are so remarkably distinct that it appears justifiable to describe it as new.* They differ from those of *S. elgonensis*, amongst which it occurs and to which it is allied, in being much thinner and more oblong in outline with a blunt, almost truncate, apex. The veins, moreover, are closer together and arise almost at a right angle, instead of at an acute angle, from the midrib. The inflorescence resembles that of *S. elgonensis*, but the branches are apparently more slender and the capitula smaller. The ray florets are long and showy and the plant must present a fine sight when in flower.

The species appears to be scarce on the mountain, at all events on the tracks usually used by the Kenya foresters, and nothing can be stated as to the extent of its altitudinal range. When collected it was not recognised as distinct from the common species, and consequently the data supplied as to range and habitat require verification. Being a thin-leaved species it is to be expected that it would form a zone lower than that of *S. elgonensis* and possibly be confined to localities where shade is provided. Further material and observations in the field would be most welcome.

KEY TO MT. ELGON SPECIES.

- (1) Leaf with long cylindrical petiole; under surface clothed with a dense, short, white tomentum; flower heads homogamous. Occurs from 13,000 ft. to summit.....1. *S. Gardneri* Cotton.
- (2) Leaf with winged petiole; under surface when mature glabrous, or nearly so; flower heads heterogamous.
 - (a) Lamina of leaf thin to of medium thickness, oblong-lanceolate. General from 11,000 to 13,000 ft....2. *S. elgonensis* Th. Fries.
 - (b) Leaf very thin, oblong, apex rounded or almost truncate. At 9000 ft.....3. *S. amblyophyllus* Cotton.

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*As this paper was passing through the press a second specimen of *S. amblyophyllus* was sent to Kew by Mr. A. S. Thomas (No. 655). This specimen confirms the decision that the species is distinct from *S. elgonensis* and the notes accompanying it show that it occurs in the bamboo forest zone at 9100 ft. The leaf lamina is stated to be flat and not recurved and the petiole and midrib to be flushed with purple.

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LXVI.—CONTRIBUTIONS TO THE FLORA OF SIAM.*— ADDITAMENTUM XXXVII.

Psychotria aganosmifolia Craib [Rubiaceae-Psychotrieae]; *P. lanceolariae* Ridl. habitu similis sed ramulis haud fuscis, calyce et corolla maioribus recedit.

Frutex circa 2 m. altus (ex Kerr); ramuli graciles, primo angulati, mox teretes, glabri, brunneo-corticati. *Folia* lanceolata vel oblanceolata, apice acute vel subacute acuminata, basi angustato-cuneata, 9-17 cm. longa, 1.5-4.5 cm. lata, chartacea, sicca plus minusve pallide brunnea, pagina utraque glabra, costa supra parum impressa subtus prominente, nervis lateralibus utrinque 9-10 pagina utraque conspicuis bene intra marginem arcuatim iunctis et ibi nervum intramarginalem conspicuum formantibus, nervulis vix conspicuis, margine mox irregulariter recurva, petiolo 0.8-3 cm.

*Continued from *K.B.* 1932, 437.

longo glabro suffulta; stipulae brunneae, 7 mm. longae, subulato-acuminatae vel pauci-fimbriatae, margine irregulariter denticulatae, cito deciduae. *Inflorescentia* terminalis vel lateralis, subsessilis vel pedunculo communi ad 7 mm. longo suffulta, 1.5-2.5 cm. longa, 1.7-3.5 cm. lata, ramulis lateralibus utrinque 2 brevibus vel ad 1 cm. longis, rhachi cum ramulis breviter facialiter ferrugineo-pubescente, pedicellis brevibus vel subnullis, floribus albis (ex Kerr). *Receptaculum* circa 1 mm. longum, glabrum. *Calycis* tubus 0.5 mm. longus, lobi 4, deltoidei vel lanceolato-deltoidei, circa 1.5 mm. longi, glabri. *Corollae* tubus 4.75 mm. longus, extra glaber, intra apice dense pilosus, lobi 4, suboblongi, circa 2 mm. longi et 1.5 mm. lati, glabri. *Filamenta* brevissima, antheris 1 mm. longis. *Stylus* bene inclusus.

Patalung, Kao Soi Dao, 600 m., evergreen forest, Kerr 19,213.

Psychotria alata Craib [Rubiaceae-Psychotrieae]; a *P. stipulacea* Wall. stipulis dorso basem versus alatis, haud tantum costatis, recedens.

Frutex circa 1 m. altus (ex Kerr); ramuli glabri, rubro-brunnei vel fusci, mox teretes, circa 4 mm. diametro. *Folia* oblongo-elliptica, oblongo-oblancheolata, vel oblanceolata, apice acute acuminata, basi cuneata, ad 22 cm. longa et 8 cm. lata, chartacea, sicca brunneo-rubra, subtus parum pallidiora, glabra, costa supra prominula subtus prominente, nervis lateralibus utrinque circa 12 supra conspicuis subtus prominentibus intra marginem anastomosantibus, nervulis paucis pagina utraque conspicuis, petiolo 1-2 cm. longo glabro suffulta; stipulae mox deciduae, 1-2.2 cm. longae, 0.7-1.3 cm. latae, siccae brunneo-rubrae, glabrae, inferne triangulato-alatae. *Inflorescentia* terminalis, corymbiformis, 5-10 cm. diametro, e basi ramosa vel pedunculo communi 2.5 cm. longo suffulta, pedunculo incluso 6-8.5 cm. longa, pedunculo communi ubi evoluto glabro apice trifurcato, ramulis ad 8 cm. longis puberulis apice trifurcatis, ramulis ultimis brevibus puberulis, pedicellis brevibus vel subnullis puberulis. *Receptaculum* puberulum. *Calycis* tubus 0.75 mm. longus, lobi 5-6, apice rotundati, tubo breviores.

Surat, Klawng Nam Wing, 100 m., evergreen forest, Kerr 12,246.

Psychotria ardisioides Craib [Rubiaceae-Psychotrieae]; probabiliter ex affinitate *P. calocarpae* Kurz a qua caule haud puberulo, foliis crassioribus haud puberulis nervis lateralibus haud prominentibus distinguenda.

Caules 15-42 cm. alti, erecti, glabri, straminei, longitudinaliter striati, ad 4 mm. diametro, lenticellis haud conspicuis. *Folia* oblongo-oblancheolata, oblanceolata, vel interdum elliptico-oblancheolata, apice acute acuminata vel saepius subacuminata, basi cuneata, 6-14.5 cm. longa, 2.5-4.7 cm. lata, chartacea vel rigide chartacea, sicca saepissime grisea, interdum brunnescentia vel lutescentia, pagina utraque glabra, costa pagina utraque saepius prominente, nervis lateralibus utrinque 8-10 pagina utraque conspicuis vel subobscuris, nervulis obscuris, margine mox parum recurva, petiolo

3-10 mm. longo glabro suffulta; stipulae 5 mm. longae, basi inter se connatae, cito deciduae. *Inflorescentia* terminalis, corymbiformis, ad 3.5 cm. diametro, subsessilis vel pedunculo communi ad 12 mm. longo suffulta, ramulis puberulis vel subglabris, floribus sessilibus. *Receptaculum* glabrum, circa 1 mm. longum. *Calycis* tubus brevis, segmenta deltoidea, circa 0.25 mm. longa, ciliolata. *Corollae* tubus 3 mm. longus, extra glaber, intra apice pilosus, lobi 5, ad 2.5 mm. longi et 1.75 mm. lati, glabri. *Antherae* exsertae.

Kao Kalakiri, 700 m., evergreen forest, Kerr 14,948.

Psychotria brunnescentia Craib [Rubiaceae-Psychotrieae]; a *P. angulata* Korth., cui facie subsimilis, stipulis conspicue ferrugineo-ciliatis facile distinguenda.

Frutex circa 0.5 m. altus (ex Kerr); ramuli primo inconspicue puberuli, compressi, cito glabri, teretes, subolivacei, 3 mm. diametro. *Folia* late lanceolata vel oblongo-oblancheolata, apice acute acuminata vel subacuminata, basi cuneata vel subacuminata, 6.5-10.5 cm. longa, 2-3 cm. lata, coriaceo-chartacea, sicca brunnescentia, pagina utraque glabra, subtus in nervorum axillis saepissime foveolata, costa supra conspicua subtus prominente, nervis lateralibus utrinque circa 9 subtus subconspicuis, nervulis obscuris, petiolo 5-10 mm. longo glabro suffulta; stipulae deltoideae, circa 5 mm. longae, margine dense ferrugineo-ciliatae, deciduae. *Inflorescentia* terminalis, circa 2 cm. longa, pedunculo communi haud evoluto, ramulis plus minusve puberulis, pedunculis ultimis circa 2 mm. longis flores congestos albos (ex Kerr) gerentibus. *Receptaculum* circa 1 mm. longum, glabrum. *Calycis* tubus lobis longior, lobi late deltoidei, 0.5 mm. longi, ciliolati. *Corolla* extra glabra, tubo 1.75 mm. longo, intra apice albo-barbato, lobis 5 oblongis fere 2 mm. longis 1.25 mm. latis glabris. *Antherae* breves, exsertae. *Stylus* distincte exsertus.

Nakawn Tai, 200 m., mixed forest, Kerr 5843.

Psychotria chartacea Craib [Rubiaceae-Psychotrieae]; a *P. sarmentosa* Blume foliis tenuioribus, inflorescentia glabra facile distinguenda.

Fruticulus scandens; ramuli graciles, glabri, primo compressi, fusco-brunnei, albo-lineolati, mox teretes, virides, circa 1.5 mm. diametro. *Folia* elliptica vel late elliptica, apice breviter acuminata, vel cuspidato-acuminata, basi cuneata vel late cuneata, 4.5-7.5 cm. longa, 2-4 cm. lata, chartacea, sicca matura subplumbea, subtus parum pallidiora, glabra, subtus saltem iuventute albo-lineolata, costa supra conspicua vel parum impressa subtus prominente, nervis lateralibus utrinque 6 pagina utraque conspicuis vel subprominulis intra marginem anastomosantibus, nervulis obscuris, petiolo 3-11 mm. longo glabro suffulta; stipulae ad 3 mm. longae, inferne inter se connatae. *Inflorescentia* terminalis, circa 1 cm. diametro, pedunculo communi ad 1 cm. longo apice bracteis ligulatis 3 mm. longis instructo suffulta, glabra, pedunculis partialibus brevibus; pedicelli 1-1.5 mm. longi. *Receptaculum* breve. *Calycis* tubus

0.5 mm. longus, lobi breves, irregulares. *Corollae* extra glabrae tubus 2.5 mm. longus, intra supra medium dense annulatum pilosus, lobi 5-6, tubo subaequilongi, glabri. *Filamenta* 1.5 mm. longa, apicem versus corollae tubi inserta, glabra, antheris vix 1 mm. longis. *Discus* conspicuus. *Stylus* 1.5 mm. longus, stigmatibus duobus vix 1 mm. longis. *Fructus* anguste ellipsoideus, 8 mm. longus, 5 mm. diametro, costis circa 14 longitudinalibus instructus. Satul, Kao Keo Range, 600 m., evergreen forest, *Kerr* 14,504.

Psychotria ellipsoidea Craib [Rubiaceae-Psychotrieae]; a *P. andamanica* Kurz foliis glabris, pedunculo communi evoluto recedens.

Frutex circa 4 m. altus (ex *Kerr*); ramuli, nodis exceptis, glabri, primo compressi, mox teretes, circa 5 mm. diametro, cortice fusco-rubro oblecti. *Folia* elliptica vel oblongo-elliptica, apice breviter subacute acuminata, basi cuneata, 10-17 cm. longa, 3.5-7.3 cm. lata, chartacea, sicca supra fuscescentia, subtus plus minusve brunnescentia, pagina utraque glabra, subtus in nervorum axillis foveolata, costa supra conspicua subtus prominente, nervis lateralibus utrinque 13-15 supra conspicuis subtus prominentibus, nervulis pagina neutra conspicuis, petiolo 1-4 cm. longo glabro supra canaliculato suffulta; stipulae deciduae. *Infructescentia* terminalis vel pseudolateralis, corymbosa, pedunculo communi 1.5-2 cm. longo incluso circa 6 cm. longa, 10-12 cm. lata, glabra. *Fructus* ellipsoideus, 8 mm. longus, 6 mm. diametro, glaber, calyce persistente circa 1.25 mm. longo coronatus, pedicello ad 3 mm. longo suffultus, seminibus dorso 5-costatis ventrice planis, albumine ruminato.

Surat, Kao Nawng, 1000-1100 m., common in evergreen forest, *Kerr* 13,264.

Psychotria fuscescens Craib [Rubiaceae-Psychotrieae]; a *P. andamanica* Kurz foliis longius petiolatis subtus glabris vel subglabris, a *P. minutiflora* Ridl. foliis maioribus inter alia distinguenda.

Arbuscula circa 5 m. alta (ex *Kerr*); ramuli glabri, primo fusi, compressi, mox olivacei, teretes, circa 3 mm. diametro. *Folia* elliptica vel oblongo-elliptica, apice acute acuminata vel subacuminata, basi cuneata vel subacuminato-cuneata, 15-23 cm. longa, 5.2-8.5 cm. lata, chartacea, sicca fuscescentia, subtus parum pallidiora, pagina superiore glabra, inferiore ad costam nervosque laterales puberula, mox fere glabra, in nervorum axillis foveolata, costa supra conspicua subtus prominente, nervis lateralibus utrinque 11-12 late arcuatis vel subrectis intra marginem arcuatim iunctis supra conspicuis subtus prominulis, nervulis fere omnibus obscuris, petiolo ad 5 cm. longo glabro suffulta; stipulae ellipticae, 7 mm. longae, dorso glabrae, cito deciduae. *Inflorescentia* terminalis, corymbiformis, pedunculo communi 1-1.5 cm. longo incluso ad 5.5 cm. longa, circa 8 cm. lata, sicca fusca, ramulis longitudinaliter puberulis, bracteis parvis deciduis, floribus sessilibus vel pedicellis

circa 1 mm. longis puberulis suffultis. *Receptaculum* 0.75 mm. longum, puberulum. *Calycis* tubus 0.5 mm. longus, lobis brevibus. *Corolla* extra glabra, tubo 3 mm. longo intra supra medium piloso, lobis 5 circa 1.5 mm. longis et 1 mm. latis glabris. *Stamina* exserta, antheris 1 mm. longis, filamentis glabris antheris paulo longioribus. Krabi, Lanta, 400 m., evergreen forest, *Kerr* 18,994.

Psychotria Hendersoniana Craib [Rubiaceae-Psychotrieae]; a *P. rhinocerate* Blume foliorum paginae inferioris indumento brevi pallido, fructu maiore recedit.

Frutex ramulis pilis brevibus ferrugineis adpressis tectis ad 5 mm. diametro cortice cinereo vel cinnamomeo oblectis. *Folia* oblongo-elliptica, elliptica, oblongo-obovata, vel oblongo-oblancoolata, apice breviter acute acuminata, basi cuneata, 11-25 cm. longa, 4-8.5 cm. lata, rigide chartacea, sicca viridia vel parum fuscescentia, subtus parum pallidiora, pagina superiore glabra, inferiore ad costam breviter pallide setulosa, aliter glabra vel ad nervos laterales hic et illic sparse similiter setulosa, costa supra impressa subtus prominente, nervis lateralibus utrinque 9-12 supra conspicuis subtus prominentibus, rete laxo pagina utraque subconspicuo, margine recurva, petiolo 0.5-2 cm. longo suffulta; stipulae deciduae. *Infructescentia* terminalis, ei *P. rhinocerotis* Blume similis et indumento subsimili tecta. *Fructus* ellipsoideus vel subellipsoideus, 8-9 mm. longus, 6.5-7 mm. diametro, sicco fuscus, ferrugineo-hirsutus; calyx persistens, tubo ad 2 mm. longo, lobis ad 4 mm. longis dorso et margine ferrugineo-hirsutis; semina dorso 4-sulcata.

Bachaw, *Kiah* 24,313.

Psychotria induta Craib [Rubiaceae-Psychotrieae]; ab affini *P. minutiflora* Ridl. ramulis, inflorescentia, et foliorum pagina inferiore plus minusve pilosis recedens.

Frutex ad 1.5 m. altus (ex *Kerr*); ramuli subsparse piloso-hirsuti, 2.5 mm. diametro. *Folia* oblongo-elliptica, oblongo-oblancoolata, vel oblancoolata, apice acute acuminata, basi cuneata vel angustato-cuneata, 7.5-18 cm. longa, 2-6.3 cm. lata, chartacea, sicca fuscescentia vel lutescentia, subtus pallidiora, supra ad costam sparse pilosa vel glabra, subtus ad costam nervosque laterales pilosa, aliter sparse pilosa, costa supra conspicua subtus prominente, nervis lateralibus utrinque 8-10 supra conspicuis subtus prominentibus, nervulis tantum paucis pagina utraque plus minusve conspicuis, petiolo 1-3 cm. longo indumento ei ramulorum simili tecto suffulta; stipulae acuminatae, 10 mm. longae, 5 mm. latae, dorso pilosae, deciduae. *Inflorescentia* terminalis, corymbiformis, ex ima basi ramosa, 1.5-3.5 cm. longa, 3-5.5 cm. lata, ramulis subsparse pilosis, floribus subsessilibus vel pedicellis brevibus glabris suffultis, bracteis parvis deciduis. *Receptaculum* 1.25 mm. longum, glabrum. *Calycis* tubus brevis, lobi deltoidei, 0.75 mm. longi. *Corolla* extra glabra, tubo 3 mm. longo intra apicem versus piloso, lobis 5 circa 2.5 mm. longis

et 1.5 mm. latis glabris. *Stamina* exserta, antheris paulo ultra 1 mm. longis, filamentis antheris longioribus.

Satul, Kao Keo Range, 700 m., evergreen forest, *Kerr* 14,565.

Psychotria kratensis Craib [Rubiaceae-Psychotrieae]; a *P. lanceolaria* Ridl. foliis subtus puberulis, pedunculo longiore, a *P. calocarpha* Kurz ramulis haud cito glabrescentibus, stipulis brevioribus haud glabris inter alia recedit.

Frutex circa 0.75 m. altus (ex *Kerr*); ramuli graciles, primo dense mox subsparsae breviter crispatis pubescentes, rubro-brunnei, fistulosi. *Folia* lanceolata, apicem versus angustata, obtusa, breviter apiculata, basi attenuato-cuneata, interdum parum inaequilateralia, 7-12.5 cm. longa, 1.5-3.2 cm. lata, chartacea, sicca supra viridia vel brunnescentia, subtus pallidiora, brunnescentia, pagina superiore glabra, inferiore ad costam nervosque dense puberula, aliter sparse inconspicue puberula, costa supra saepissime impressa subtus prominente, nervis lateralibus utrinque 9-11 pagina utraque conspicuis vel prominulis bene intra marginem arcuatim iunctis et ibi nervum intramarginalem efficientibus, nervulis paucis subtus plus minusve conspicuis, petiolo 10-18 mm. longo supra canaliculato et subglabro subtus dense breviter crispatis pubescente suffulta; stipulae circa 4 mm. longae, dorso indumento ei ramulorum simili instructae, cito deciduae. *Panicula* terminalis, pedunculo communi 1.5-3 cm. longo suffulta, ad 1.5 cm. longa et lata, ramulis lateralibus utrinque duobus cum pedunculis et pedicellis indumento ei ramulorum simili tectis; flores albi (ex *Kerr*), pedicellis usque ad 2 mm. longis suffulti; bractae minutae, deciduae. *Receptaculum* breve, subglabrum. *Calycis* tubus 0.5 mm. longus, lobi 4, deltoidei, 0.75 mm. longi. *Corollae* tubus 2.5 mm. longus, lobi 4, circa 1.75 mm. longi.

Krat, Kao Kuap, 400 m., evergreen forest, *Kerr* 18,078.

Psychotria lineolata Craib [Rubiaceae-Psychotrieae]; a *P. calocarpha* Kurz inflorescentia multo laxiore recedit.

Frutex circa 1.5 m. altus (ex *Kerr*); ramuli glabri, sicci rubescentes, ad 3 mm. diametro. *Folia* oblongo-elliptica, oblongo-ovata, vel oblongo-lanceolata, apice obtuse acuminata vel subacuminata, basi cuneata vel acuminata, 8-12 cm. longa, 2.8-4.8 cm. lata, chartacea, sicca brunneo-rubra, subtus pallidiora, supra glabra, subtus ad costam nervosque puberula, aliter subconspicue lineolata, costa supra conspicua haud rarius impressa subtus prominente, nervis lateralibus utrinque ad 14 supra conspicuis subtus prominulis patulis vel subpatulis intra marginem arcuatim iunctis et ibi nervum intramarginalem conspicue formantibus, petiolo 1-2.5 cm. longo glabro vel subtus puberulo supra canaliculato suffulta; stipulae 1 cm. longae, bilobatae, lobis longius acuminatis, dorso glabrae, deciduae. *Inflorescentia* terminalis, corymbosa vel subcorymbosa, pedunculo communi 1-2 cm. longo incluso 4-5 cm. longa, 2-4 cm. diametro, pedunculo et ramulis primo ferrugineo-furfuraceis mox

puberulis, pedicellis brevibus vel ad 1.5 mm. longis, bracteis parvis deciduis, floribus albis (ex *Kerr*). *Receptaculum* 1 mm. longum, glabrum. *Calycis* glabri tubus 0.75 mm. longus, lobi 4, circa 1.5 mm. longi, dentibus parvis inter lobos saepe additis. *Corolla* extra glabra, tubo circa 1 mm. longo intra apice albo-barbato, lobis 4 ovato-lanceolatis 1.5 mm. longis vix 1 mm. latis. *Stamina* exserta, filamentis 0.5 mm. longis ad corollae tubi apicem adfixis, antheris 1 mm. longis.

Mê Hawng Sawm, Doi Pêpô, 1000 m., evergreen forest, *Kerr* 6181.

Psychotria lutescens Craib [Rubiaceae-Psychotrieae]; a *P. sarmentosa* Blume foliis crassioribus sicco lutescentibus, inflorescentia sicca fusca haud grisea, calyce conspicue maiore inter alia recedens.

Fruticulus scandens; ramuli glabri, primo compressi, sicci fusi, mox teretes, subvirides, ad 5 mm. diametro. *Folia* elliptica lateve elliptica, apice obtuse acuminata, basi cuneata, 3.5-5.5 cm. longa, 1.2-2.6 cm. lata, coriacea, sicca saepissime plus minusve lutescentia, pagina utraque glabra, costa supra conspicua vel leviter impressa subtus prominente, nervis lateralibus utrinque 6-8 primo obscuris mox pagina utraque conspicuis vel prominulis intra marginem anastomosantibus, nervulis obscuris, margine recurva, petiolo 4-14 mm. longo glabro supra canaliculato suffulta; stipulae 2-3 mm. longae, inferne inter se connatae, deciduae. *Inflorescentia* terminalis, e basi ramosa vel interdum in speciminibus minoribus pedunculo communi ad 1.5 cm. longo suffulta, corymbiformis, 1.5-4 cm. longa, 2.5-6.5 cm. lata, pedunculis sicco fuscis ultimis distincte puberulis; bractae 1.5 mm. longae, deciduae; pedicelli ad 2.5 mm. longi; flores albi (ex *Kerr*). *Receptaculum* breve. *Calycis* tubus 0.5 mm. longus, irregulariter lobulatus vel tantum undulatus. *Corolla* extra glabra; tubus ad 3.5 mm. longus, intra apice dense albo-pilosus; lobi 5, tubo subaequilongi. *Filamenta* usque ad 3 mm. longa, glabra, infra tubi apicem adfixa, antheris 1 mm. longis. *Stylus* cum stigmatibus duobus 5 mm. longus.

Kao Kalakiri, 900 m., evergreen forest, *Kerr* 14,968.

Psychotria plana Craib [Rubiaceae-Psychotrieae]; a *P. stipulacea* Wall. stipulis multo minoribus, foliis subtus in nervorum axillis haud foveolatis distinguenda.

Frutex circa 1.5 m. altus (ex *Kerr*); ramuli glabri, sicco fusco-brunnei, primo compressi, annotini circa 4 mm. diametro. *Folia* oblongo-elliptica vel oblongo-oblancoolata, apice obtuse subacuminata, basi cuneata lateve cuneata, 11.5-25 cm. longa, 5-7.5 cm. lata, chartacea, sicca subtus rubescentia, pagina utraque glabra, costa supra conspicua subtus prominente, nervis lateralibus utrinque 8-10 supra conspicuis subtus prominulis, nervulis tantum paucis pagina utraque conspicuis, petiolo 1.5-5 cm. longo glabro suffulta; stipulae deciduae, circa 7 mm. longae et 4 mm. latae. *Inflorescentia* terminalis, corymbiformis, ad 5 cm. diametro, pedunculo communi ad 2.5 cm. longo incluso ad 5 cm. longa, ramulis

puberulis; pedicelli breves. *Receptaculum* subglabrum. *Calycis* tubus 0.75 mm. longus, lobis variabilibus interdum conspicuis interdum subnullis. *Corolla* extra glabra, tubo 2 mm. longo intra superne dense piloso, lobis 5 oblongis 2.75 mm. longis 1.25 mm. latis glabris. *Stamina* exserta, filamentis paulo ultra 1 mm. longis quam antheris longioribus. *Stylus* exsertus.

Trang, Kao Soi Dao, 500 m., evergreen forest, *Kerr* 19,174.

***Psychotria polita* Craib** [Rubiaceae-Psychotrieae]; ab affini *P. calocarpa* Kurz ramulis foliisque haud puberulis distinguenda.

Frutex circa 1 m. altus (ex *Kerr*); ramuli glabri, primo quadrangulares, sicco sulcati, mox teretes, ad 3.5 mm. diametro, fistulosi, cortice brunneo obtecti, lenticellis parvis inconspicuis. *Folia* saepissime elliptico-obovata, elliptica, vel elliptico-ovata, apice obtuse acuminata, basi cuneata vel subacuminata, 10.5–15 cm. longa, 3.8–6.8 cm. lata, chartacea, sicca plus minusve brunnescentia vel rubescentia, omnino glabra, costa supra conspicua subtus prominente, nervis lateralibus utrinque circa 12 supra conspicuis vel subprominulis subtus prominulis vel subprominentibus intra marginem arcuatim iunctis, nervulis paucis subtus conspicuis, margine parum recurva, petiolo 6–15 mm. longo glabro suffulta; stipulae deciduae, circa 4 mm. longae. *Infructescencia* lateralis, pedunculo communi 2–2.5 cm. longo suffulta, partibus omnibus glabra. *Fructus* ruber (ex *Kerr*), circa 7 mm. diametro, calycis segmentis suboblongis 3.5 mm. longis dorso costatis persistentibus coronatus; semina straminea, dorsaliter transverse corrugata, longitudinaliter 3–4-costata, costis vix prominentibus, ventrice concava.

Ranawng, La-un, 20 m., evergreen forest, *Kerr* 16,510.

***Psychotria rutila* Craib** [Rubiaceae-Psychotrieae]; a *P. cambodiana* Pierre ex Pitard inflorescentia sessili facile distinguenda.

Frutex circa 1 m. altus (ex *Kerr*); ramuli pilis ferrugineis divergentibus dense tecti, mox teretes, circa 2 mm. diametro. *Folia* oblanceolata, apice acute acuminata vel subacuminata, basi cuneata, 3.5–8.5 cm. longa, 1.3–2.8 cm. lata, chartacea, sicca ferruginea, subtus parum pallidiora, pagina superiore ferrugineo-hirsuta, inferiore similiter subhirsuta, utraque praesertim inferiore ad costam nervosque dense tecta, costa supra conspicua subtus prominente, nervis lateralibus utrinque 10–12 supra subconspicuis subtus parum prominentibus, nervulis obscuris, margine ciliata, petiolo ad 1 cm. longo indumento ei ramulorum simili tecto suffulta; stipulae deciduae. *Inflorescentia* terminalis, capituliformis, sessilis, bracteis angustis longius hirsutis. *Receptaculum* longe dense adpresse ferrugineo-hirsutum. *Calycis* tubus brevis, segmenta circa 2 mm. longa, dorso pilis longis ferrugineis dense tecta. *Corolla* expansa haud visa, tubo brevi extra glabro intra apice albo-piloso, lobis 5 circa 2.5 mm. longis extra hirsutis intra glabris. *Fructus* ellipsoideus, calyce persistente excluso 5 mm. longus, 4 mm. diametro, pilis longis ferrugineis instructus, seminibus dorso 4-costatis.

Kaw Chang, Klawng Nonsi, under 10 m., light evergreen forest, *Kerr* 9171.

***Psychotria Smithiae* Geddes** [Rubiaceae-Psychotrieae]; a *P. nicobarica* Kurz foliis sicco haud rubris, cymis laxioribus recedens.

Fruticulus (ex *Dr. Smith*), ramulis primo pilis paucis ferrugineis instructis compressis mox glabris teretibus. *Folia* oblongo-elliptica, instructis compressis mox glabris teretibus. *Folia* oblongo-elliptica, apice subacuta, basi cuneata, 9–14.5 cm. longa, 3.7–5.5 cm. lata, chartacea, sicca supra fusciscentia, subtus brunnescentia, pagina utraque glabra, costa supra conspicua subtus prominente, nervis lateralibus utrinque 11–13 supra conspicuis vel prominulis subtus prominentibus, nervulis paucis pagina utraque subconspicuis, margine recurva, petiolo usque ad 2 cm. longo supra canaliculato suffulta; stipulae circa 8 mm. longae, bilobatae, dorso subsparsae ferrugineo-hirsutae, cito deciduae. *Inflorescentia* terminalis, corymbiformis, sessilis, circa 4 cm. longa et 6 cm. diametro, pedunculis partialibus ad 2.5 cm. longis plus minusve ferrugineo-subpilosis inflorescentiam condensam circa 7 mm. diametro gerentibus; bractee lanceolatae, saepe lobatae, 4–5 mm. longae, ciliatae; flores albi (ex *Dr. Smith*). *Receptaculum* breve, pilis paucis ferrugineis instructum. *Calycis* tubus 1 mm. longus, lobi 5, deltoidei, fere 1.5 mm. longi, 1 mm. lati, ciliati. *Corollae* tubus circa 2 mm. longus, intra apice albo-barbatus, lobi 5, circa 1.5 mm. longi. *Antherae* exsertae, 1 mm. longae, filamentis brevibus ad corollae tubi apicem adfixis.

Nakawn Sritamarat, Kao Luang, 600 m., *Dr. Eryl Smith* 695.

***Psychotria viburnifolia* Craib** [Rubiaceae-Psychotrieae]; a *P. stipulacea* Wall. foliorum nervis lateralibus paucioribus recedens, *P. angulatae* Korth. parum similis sed inflorescentiis partialibus haud capituliformibus distinguenda.

Frutex circa 2 m. altus (ex *Kerr*); ramuli, nodis exceptis, glabri, primo compressi, sicci fusci, mox teretes, cortice brunneo nitido corrugato obtecti. *Folia* oblongo-oblanceolata vel anguste obovata, apice obtuse acuminata, basi cuneata vel subacuminata, 8–13.5 cm. longa, 2.5–5.5 cm. lata, coriaceo-chartacea, sicca saepissime rubescentia, pagina utraque glabra, costa supra conspicua subtus prominente, nervis lateralibus utrinque 9–10 supra conspicuis subtus prominulis intra marginem anastomosantibus, nervulis fere omnibus obscuris, petiolo 5–12 mm. longo glabro suffulta; stipulae oblongae, vix 1 cm. longae, ciliatae, dorso inferne conspicue triangulatim costatae, deciduae. *Inflorescentia* terminalis, corymbiformis, pedunculo communi 1–2 cm. longo suffulta, ad 1.5 cm. longa et 3 cm. lata, ramulis lateralibus utrinque 1–2 ad 1 cm. longis cum ramulis ultimis circa 3 mm. longis puberulis, floribus sessilibus vel subsessilibus, bracteis parvis deciduis. *Receptaculum* 1 mm. longum, puberulum vel subglabrum. *Calycis* tubus vix 1 mm. longus, lobi variabiles, interdum conspicui, interdum perbreves. *Corolla* extra glabra, tubo circa 3 mm. longo intra superne piloso, lobis 5–6 tubo

paulo longioribus 1.5 mm. latis glabris. *Stamina* exserta, antheris fere 1.5 mm. longis filamentis subaequilongis. *Stylus* exsertus.

Adang, 400 m., evergreen forest, *Kerr* 14,151.

Psychotria Winitii Craib [Rubiaceae-Psychotrieae]; a *P. kratense* Craib foliis conspicue maioribus distinguenda.

Fruticulus ad 0.7 m. altus (ex *Winit*); ramuli primo ferrugineo-furfuracei, compressi, mox teretes, ad 4 mm. diametro. *Folia* elliptica vel elliptico-oblancoolata, rarius oblonga, apice obtusa vel breviter acuminata, basi cuneata, 8-16 cm. longa, 3-7 cm. lata, chartacea, sicca supra fusco-viridia, subtus brunnea, supra glabra, subtus ad costam ferrugineo-furfuracea et ad nervos laterales furfuraceo-puberula, costa supra impressa subtus prominente, nervis lateralibus utrinque 11-14, supra conspicuis subtus prominulis intra marginem conspicue iunctis, nervulis paucis subtus subprominulis, petiolo usque ad 1.5 cm. longo ferrugineo-furfuraceo supra canaliculato suffulta; stipulae circa 5 mm. longae, deciduae. *Inflorescentia* terminalis, 2.5 cm. diametro, pedunculo communi 0.8-2 cm. longo ferrugineo-furfuraceo suffulta; flores albi (ex *Winit*), pedicellis ad 2 mm. longis subglabris suffulti. *Receptaculum* 1 mm. longum, glabrum. *Calycis* tubus 0.75 mm. longus, glaber, lobi 4, oblongo-deltoides vel oblongi, 1.75 mm. longi, 1 mm. lati, glabri. *Corolla* extra glabra, tubo 4 mm. longo intra superne piloso, lobis 4 suboblongis fere 4 mm. longis et 1.5 mm. latis glabris.

Lampang, Mè Yom, Mè Pèng, 150 m., evergreen forest, *Winit* 1845.

Saprosma brunneum Craib [Rubiaceae-Psychotrieae]; *S. pubescenti* Ridl. habitu similis sed calycis segmentis multo longioribus distinctum, a *S. Scortechinii* King et Gamble ramulis iuventute haud glabris recedens.

Frutex circa 3 m. altus (ex *Kerr*); ramuli primo subbrunneo-tomentosi, demum glabri, cortice stramineo obtecti, ad 5 mm. diametro. *Folia* opposita, paribus inter se saepissime parum inaequalibus, elliptica, oblongo-elliptica, vel elliptico-ovata, apice acute acuminata, basi cuneata, acuminata, vel rarius cuneato-rotundata, 7-16 cm. longa, 3-7 cm. lata, chartacea vel rigide chartacea, sicca supra fusco-viridia, subtus brunnea, supra glabra, subtus praesertim ad nervos pilosa, pilis plus minusve deciduis, costa supra conspicua vel leviter impressa subtus prominente, nervis lateralibus utrinque circa 7 supra conspicuis subtus prominulis, nervis transversis subtus subprominulis, petiolo 3-7 mm. longo suffulta; stipulae breves, rigidae, fimbriatae, stramineae. *Cymae* terminales, ad 2 cm. longae, pauciflorae, pedunculo et ramulis tomentellis, pedicellis 4 mm. longis etiam tomentellis; bractae stipulis similes. *Receptaculum* 2 mm. longum, tomentosum. *Calycis* tubus brevis, lobi 4-5, late lanceolati, acuti, 3.5-4 mm. longi. *Corolla* alba (ex *Kerr*), extra furfuracea; tubus 4 mm. longus, intra apice dense villosus; lobi 4-5, circa 3 mm. longi. *Stamina* 4-5,

inclusa, filamentis 0.5 mm. longis ad corollae tubi medium adfixis, antheris obtusis 1.5 mm. longis. *Stylus* 5 mm. longus, stigmatibus duobus 1 mm. longis. *Fructus* 7 mm. longus, 5 mm. diametro, calyce persistente coronatus.

Kao Kalakiri, 800 m., evergreen forest, *Kerr* 7769A.

Saprosma distans Craib [Rubiaceae-Psychotrieae]; ab affini *S. ternato* Hook. f. nervis transversis paucioribus inter se magis distantibus haud tam regularibus recedit.

Ramuli glabri, compressi, primo subfusci, mox cortice stramineo obtecti. *Folia* per 3 vel opposita, oblongo-elliptica, apice acute attenuata vel acuminata, basi cuneata, ad 27 cm. longa et 8 cm. lata, rigide chartacea, sicca supra fusco-viridia vel fusca, subtus pallidiora, pagina utraque glabra, costa supra conspicua subtus prominente, nervis lateralibus utrinque 11-15 supra conspicuis subtus prominentibus intra marginem anastomosantibus, nervis transversis inter se distantibus subtus prominulis, petiolo usque ad 1 cm. longo glabro supra canaliculato suffulta; stipulae fimbriatae, 5 mm. longae. *Inflorescentia* axillaris, pedunculo communi 4-5 cm. longo incluso 7-8 cm. longa, glabra. *Fructus* saepissime subovoideus, circa 9 mm. longus et 7 mm. diametro, calyce persistente lobato circa 2 mm. longo coronatus.

Pattani, Bukit, *Put* 3640.

Saprosma latifolium Craib [Rubiaceae-Psychotrieae]; ab affini *S. consimile* Kurz foliis pro rata multo latioribus basi fere semper rotundatis truncatis vel leviter cordatis recedit.

Ramuli annotini glabri, compressi, stramineo-corticati. *Folia* opposita, paribus inter se parum inaequalibus, saepissime oblonga vel elliptica, apice breviter acute acuminata, basi rotundata, truncata, late leviter cordata, vel rarius late cuneata, 5-10 cm. longa, 2.5-5.5 cm. lata, rigide chartacea, sicco supra fuscescentia, subtus pallidiora, pagina utraque glabra, costa supra conspicua subtus prominente, nervis lateralibus utrinque circa 10 supra saepe impressis subtus prominulis intra marginem anastomosantibus, nervulis paucis subtus conspicuis, subsessilia vel petiolo usque ad 3 mm. longo suffulta; stipulae 4 mm. longae, deciduae. *Fructus* sparsi, ad apices ramulorum positi, subsessiles, obovoideo-ellipsoidei, 8 mm. longi, 5 mm. diametro, fusci, glabri, calycis segmentis deltoideis 1 mm. longis persistentibus coronati.

Korat, Kao Lèrn, *Put* 3531.

Saprosma longicalyx Craib [Rubiaceae-Psychotrieae]; a *S. consimile* Kurz eiusque affinioribus calycis segmentis multo longioribus et angustioribus facile distinguendum.

Frutex circa 1.5 m. altus (ex *Kerr*); ramuli graciles, glabri, mox cortice stramineo obtecti, ad 3 mm. diametro. *Folia* opposita, paribus inter se conspicue inaequalibus, saepissime oblongo-oblancoolata vel elliptico-oblancoolata, apice acute acuminata, basi

cuneata vel late cuneata, 4.5-16 cm. longa, 1.5-6 cm. lata, chartacea, sicca supra viridia, subtus pallide viridia, subtus in nervorum axillis parce breviter hirsuta, aliter pagina utraque glabra, costa supra conspicua subtus prominente, nervis lateralibus utrinque circa 10 supra plus minusve conspicuis subtus prominulis intra marginem anastomosantibus, nervis transversis inter se distantibus subtus conspicuis vel subprominulis, petiolo usque ad 8 mm. longo glabro supra canaliculato suffulta; stipulae acuminatae, 3-5 mm. longae, glabrae, stramineae, deciduae. *Flores albi* (ex Kerr), ad ramulorum apices glomerati, subsessiles. *Receptaculum* breve, glabrum. *Calycis* tubus 1.5 mm. longus, glaber, segmenta 4, linearia, 3.75 mm. longa, basi 1 mm. lata, ciliolata, aliter glabra. *Corollae* tubus 8 mm. longus, intra superne villosus, lobi 4, circa 4 mm. longi et 1.5 mm. lati, supra basem versus pilosi.

Nakawn Sritamarat, Kao Luang, 400 m., evergreen forest, Kerr 15,412.

Saprosma parvifolium Craib [Rubiaceae-Psychotricae]; a *S. consimile* Kurz foliis subtus ad costam puberulis et in nervorum axillis pilosis recedit, etiam *Amaracarpus saxicolae* Ridl. simile sed ramulis magis distincte puberulis et foliis subtus puberulis distinguendum.

Frutex circa 1.5 m. altus (ex Kerr); ramuli annotini graciles, puberuli, pallide corticati. *Folia* opposita, paribus inter se plus minusve inaequalibus, elliptica, oblonga, vel oblongo-lanceolata, apice subacute acuminata vel subacuminata, basi cuneata vel rotundata, saepe parum inaequilateralia, 2.5-6.5 cm. longa, 1.3-3 cm. lata, rigide chartacea, sicca supra subfusca, subtus brunnea, supra glabra, subtus ad costam puberula et in nervorum axillis pilosa, costa supra prominula subtus prominente, nervis lateralibus utrinque 5-6 supra subconspicuis vel fere obscuris subtus prominulis intra marginem anastomosantibus, nervulis paucis subtus conspicuis vel subprominulis, petiolo usque ad 4 mm. longo supra canaliculato subtus puberulo suffulta; stipulae deciduae. *Inflorescentia* terminalis, glomerulata, pauciflora, floribus albis (ex Kerr) breviter pedicellatis. *Receptaculum* circa 1 mm. longum, puberulum. *Calycis* tubus brevissimus, segmenta late deltoidea, subobtusata, 1 mm. longa, basi fere 1 mm. lata. *Corolla* superne extra densius puberula; tubus 4 mm. longus, intra superne piloso-barbatus; lobi 5, circa 3 mm. longi et 1.5 mm. lati. *Stamina* exserta, filamentis 1.5 mm. longis 1 mm. infra corollae tubi apicem adfixis glabris, antheris 1.25 mm. longis. *Stylus* bene inclusus, stigmatibus ad filamentorum insertionem attingentibus.

Prachuap, Kao Luang, 300 m., by stream in evergreen forest, Kerr 10,794.

LXVII.—NEW SPECIES FROM MOUNT ELGON.

A. A. BULLOCK.

The following hitherto undescribed species have been detected while preparing for publication a list of Mt. Elgon plants collected by Major E. J. and Mrs. Cyril Lugard. A few new name-combinations were also found to be necessary, and these have been included.

The Orchidaceae have been worked out by Mr. V. S. Summerhayes, and *Combretum elgonense* was described by Mr. A. W. Exell, of the British Museum. In addition the writer is indebted to Dr. Diels and members of the staff at the Berlin Herbarium for the examination of a large number of specimens. Acknowledgment for this is made under the appropriate species. Grateful thanks are also due to Mr. J. Hutchinson, for much advice and for checking the manuscript and proofs.

Crassula Wrightiana Bullock, sp. nov. [Crassulaceae]; a *C. aquatica* (Linn.) Schoenl., omnibus partibus majoribus, foliis oblongis vel oblongo-spathulatis valde distincta.

Herba erecta vel procumbens, omnino glabra, 6-30 cm. vel ultra alta, caulibus simplicibus vel parce ramosis, internodiis 1.5 mm.-3.5 cm. longis, nodis inferioribus radices emetentibus. *Folia* opposita, decussata, basi in vaginam usque 2 mm. longam connata, oblonga vel oblongo-spathulata, apice obtusa vel rotundata, 5.5-18 mm. longa, 1.5-5 mm. lata. *Flores* tetrameri, axillares, solitarii vel in fasciculis paucifloris dispositi, minuti, pedicellis 5-10 mm. longis. *Sepala* basi connata, oblonga, obtusa, usque ad 1 mm. longa. *Petala* obovata, apice rotundata, sepalis fere duplo longiora. *Filamenta* complanata, sursum attenuata; antherae parvae, subgloboae. *Carpella* ovoidea, leviter alata, 1-1.2 mm. longa, stylo breve leviter uncinato coronata, ut videtur 1-ovulata. *Semina* oblonga, apice basique rotundata, dense minutissime tuberculata.

KENYA COLONY. Nairobi, 6000 ft., Dowson 476 (type). Aberdare Mts. and the base of Mt. Kenya, Dowson 73. Eldama Ravine, 7000-7500 ft., Oct. 1898, Whyte s.n. Third day's march from Eldama Ravine, Whyte s.n. Between Nandi and Mumias, Whyte s.n. Limuru, in water, herb 1-1½ ft. high, rather succulent, with small red and white flowers, 10 June, 1918, Snowden 582. Mau, on damp rocks, Nov. 1905, G. S. Baker 339. River in Mau Forest, a prostrate water plant, Mettam 236. Mt. Elgon: 6500-7500 ft., in swamp, erect herb to 1 ft., flowers white with a purple throat, Oct.-Nov. 1930, Major E. J. Lugard 215; 6400 ft., in swamp, erect herb to 3 in. high, flowers white, 28 Feb. 1931, Major E. J. Lugard 538. Rumuruli distr., 6000 ft., fleshy herb about 8 in. high with very pale pink flowers, growing in marsh, July, 1931, Napier 1229.

UGANDA PROTECTORATE. Behungi Marsh, 8000 ft., in ditch, and common in marshes throughout the Virunga Mts. at the same altitude, a herb with succulent leaves and pink strongly scented flowers, 1 Dec. 1930, B. D. Burtt 2924. Ankole, Shema County, at

Kitakata, a small succulent herb 3-6 in. high with small red flowers, growing near edges of water, or in water, at the hot springs, 24 Jan. 1929, *Snowden 1288*.

TANGANYIKA TERRITORY. Arusha, 5000 ft., in water, Dec. 1927, *Haarer 916*; Oct. 1925, *Haarer 79b*.

A member of the *Bulliarda* group, *Crassula Wrightiana* is named in honour of Mr. C. H. Wright who many years ago decided that the plants collected by Mr. W. J. Dowson, and cited above, represented an undescribed species. Mr. Wright's notes on his dissections of the flowers are preserved in a manuscript attached to one of the sheets in the Kew herbarium, and are embodied in the description with very minor additions to include the wide range of specimens now available.

The variation observed is due to the different habitats in which the plant is found. When growing in water, the stems (and internodes) become elongated in order to raise the floriferous upper portions above the water surface. Branching normally takes place only towards the base, where nodal rooting also occurs, but in the (comparatively) deep-water forms short branches are found in the floriferous region. The land form is quite different in appearance, and without the intermediate forms included in the Kew collection, might reasonably be regarded as a distinct species. Here the stems are short, and the internodes often no longer than the short sheath formed by the connate leaves; the latter then appear to be imbricate. All parts of the plant in this condition approach the smallest measurements given in the description, while the parts of the water form are always larger. Varying degrees of wetness of the habitat produce the intermediate forms, and conditions approaching both extremes may often be seen on the same plant.

C. Wrightiana appears, from the description, to have some affinity with *C. Granvikii* Mildbr., a Mt. Elgon plant which, however, has 4-seeded carpels.

***Crassula erubescens* Bullock**, sp. nov. [Crassulaceae]; *C. Granvikii* Mildbr. affinis, sed foliis majoribus oblongo-lanceolatis differt.

Herba parva, perennis, erecta, omnino glabra, usque 5 cm. alta, caulibus simplicibus dense foliatis, internodiis maturis usque 5-6 mm. longis sed plerumque (in regione florifera) 1-1.5 mm. longis, nodis inferioribus radicanibus. *Folia* rubra, opposita, decussata, imbricata, basi in vaginam 1-1.5 mm. longam connata, oblongo-lanceolata, apice acuta, 1-1.5 cm. longa, 2-3.5 mm. lata. *Flores* tetrameri, axillares, solitarii, perpauci, minuti, pedicellis filiformibus usque 1.5 cm. longis. *Sepala* basi connata, lanceolata, subacuta, circiter 1.5 mm. longa, intus concava. *Petala* sepalis subaequilonga, oblonga, apice obtusa. *Filamenta* filiformia, sepalis paulo breviora. *Antherae* subglobosae, minutae. *Carpella* ut videtur 4-ovulata.

KENYA COLONY. Mt. Elgon, 8250 ft., a rock plant 2 in. high with bright scarlet foliage and cream-coloured flowers, Dec. 1930, *Major E. J. and Mrs. Cyril Lugard 422*.

A species of the *Bulliarda* group, with (in the only specimen seen) short internodes, and imbricate leaves coloured bright scarlet. It is allied with *C. Granvikii* on account of the 4-ovulate carpels, but the large scarlet leaves and very short internodes render it distinct.

***Kalanchoe Lugardii* Bullock** sp. nov. [Crassulaceae]; a *K. Petiliana* A. Rich., floribus majoribus, calycis lobis longioribus, pedicellis longioribus, recedit.

Herba succulenta, omnino glabra, ut videtur glauca, usque 1.6 m. alta. *Folia* non visa. *Flores* in inflorescentiis corymbosis terminalibus dispositi, pedicellis circiter 1-1.5 cm. longis, bracteis inferioribus lanceolatis acutis circiter 1.5 cm. longis. *Calyx* fere ad basin 4-lobatus, lobis acutis anguste lanceolatis 5-8 mm. longis. *Corolla* pallide lutea, tubo sub anthesin circiter 1.7 cm. longo, lobis ovato-lanceolatis acutissimis usque 7 mm. longis. *Stamina* 8; superiora petalis opposita, inferiora petalis alterna; filamenta brevissima; antherae subglobosae, fere 1 mm. diametro. *Squamulae* 4, lineares, 3.5 mm. longae. *Carpellae* 4, lineares, erectae, 8 mm. longae, glabrae, stylis basi articulatis erectis 6 mm. longis, stigmatibus capitellatis subcohaerentibus. *Folliculi* membranacei, 1.1 cm. longi, apiculati; semina minuta, numerosa, longitudinaliter lamellata, lamellis transverse striatis.

KENYA COLONY. Mt. Elgon, 6500-7500 ft., very succulent herb to 5 ft., flowers pale yellow, Oct.-Nov. 1930, *Major E. J. Lugard 115*.

The confusion existing in this genus renders the classification of any individual specimen extremely difficult, and *K. Lugardii* is proposed as a new species with great reserve, the material available being somewhat inadequate. The following specimens may also belong to this species.

TANGANYIKA TERRITORY. Between Lakes Tanganyika and Rukwa, about 6000 ft., *Nutt s.n.* Sambala, Kondoia Distr., 4900 ft., a conspicuous waxy-white-flowered herb in *Commiphora* bush, up to 3½ ft. high, 12 July 1929, *B. D. Burt 2245*. Suji, Pare Distr., 5000 ft., Aug. 1928, *Haarer 1672*. Kyimbila Distr., Sept. 1910, *Stolz 261*.

***Impatiens phlyctidoceras* Bullock**, sp. nov. [Balsaminaceae]; *I. digitato* Warb. affinis sed foliis minoribus, calcari recto multo longiore basi haud digitatim lobato sed basin versus irregulariter 4-7-papillato differt.

Herba erecta, usque 1 m. alta, caulibus mox glabrescentibus, internodiis superioribus circiter 1.5-3 cm. longis. *Folia* alterna, herbacea, ovata usque elliptico-rotundata, apice vix acuminata, basi late cuneata, usque 2.5 cm. longa et circiter 1.5 cm. lata, utrinque leviter pilosa, marginibus regulariter mucronato-crenatis; petioli circiter 5 mm. longi. *Flores* in axillis foliorum superiorum solitarii,

pedicellis leviter hirsutis 2.5–4 cm. longis. *Sepala* lateralialia lanceolata, 6 mm. longa, 2 mm. lata, extra leviter pilosa. *Labellum* subglabrum, late infundibuliforme, dorso apiculatum, in calcar recto 2.5–3.5 cm. longo et 3 mm. diametro productum; calcar basin versus irregulariter 4–7-papillatum, glabrum vel parce pilosum. *Vexillum* cucullatum, subhemisphaericum, glabrum, 7 mm. longum, apice bilobulatum. *Alae* glabrae, 5 mm. longae, profunde bilobae, lobis bilobulatis, lobula inferiore suborbiculari 4 mm. diametro, lobulis superioribus paullo minoribus. *Capsula* matura non visa.

KENYA COLONY. Mt. Elgon, 11,700 ft., a herb up to 3 ft. high, with scarlet-crimson flowers, Dec. 1930, *Mrs. Cyril Lugard* 313.

This very striking new member of the section *Microcentron* Warb. is most closely allied to *I. digitata* Warb., from Mt. Kilimanjaro. The two species are, however, readily separable by means of their peculiar spurs. In both cases these are rather stout, that of *I. digitata* being about $\frac{3}{4}$ in. long, and terminating in several very distinct finger-like processes, whilst in *I. phlyctidoceras* the spur is about $1\frac{1}{4}$ in. long, and towards the base a few to several small warts or papillose protrusions are found. Further distinguishing characters are to be found in the smaller leaves, shorter petioles, and more glabrous, stouter stems with shorter internodes of *I. phlyctidoceras*. The writer is much indebted to Dr. Mildbraed for comparing the specimen cited with the material of the genus in the Berlin herbarium, where it could not be matched.

Trochomeria Harmsiana Bullock, sp. nov. [Cucurbitaceae]; *T. pectinatae* (Sond.) Cogn. affinis, petiolis glabris, foliorum segmentis integris supra (haud infra) scabrescentibus, floribus masculis fasciculatis majoribus, differt.

Herba repens vel scandens, cirrhosa, caulibus glabris tenuiter flexuosis quadrangularibus. *Folia* digitate 3-loba, lobis lateralibus saepe alte bilobulatis; lobi et lobuli lineares, infra subglabri, supra satis dense setose scabrescentes; petioli glabri, circiter 0.5–1.5 cm. longi; stipulae deciduae, amplexicauli-subrotundatae, usque 1.5 cm. diametro, marginibus fimbriato-dentatis, dentibus subulato-acuminatis usque 7 mm. longis, extra parce scabrido-puberulae, intus glabrae. *Flores masculi* axillares, solitarii vel 2–3-fasciculati, pedicellis gracilibus subglabris usque 1.5 cm. longis. *Receptaculum* circiter 1.5 cm. longum et apice 4 mm. diametro, basin versus paullo angustatum, intus basin versus leviter pilosum, ceterum glabrum. *Sepala* patula vel reflexa, subulato-triangularia, circiter 2 mm. longa. *Petala* patula, lineari-lanceolata, 1.5 cm. longa, basi 3 mm. lata, acuta, glabra. *Staminum filamenta* 5 mm. longa, crassa, basin versus pilosa; antherae in capitulo cylindrico 3.5 mm. longo cohaerentes. *Pistillodium* tenuiter cylindricum, 4 mm. longum. *Flores feminei* masculis similes sed leviter minores, axillares, ut videtur solitarii, receptaculo supra ovarium valde constricto. *Ovarium* ellipsoideum, 4 mm. longum et 2.5 mm. diametro, glabrum. *Stylus* (supra constrictionem) 6 mm. longus, ramis stigmaticis 3

clavatis 3 mm. longis. *Staminodia* 3, filiformia, 6 mm. longa. *Nectaria* 3, conica, obtusa, 0.5 mm. longa. *Fructus* "globosus, sanguineus," non visus. *Semina* elliptica vel subobovata, compressa, circiter 1.2 cm. longa et 8 mm. lata.

KENYA COLONY. Mt. Elgon, 6500–7500 ft., creeper, flowers green, fruit a scarlet ball, Oct.–Nov. 1930, *Major E. J. and Mrs. Cyril Lugard* 143 (type, ♂ and ♀).

UGANDA. Kyasoweri, Mt. Elgon, 6000–7000 ft., a climbing savannah herb with greenish-yellow flowers, 16 April 1927, *Snowden* 1072 (♂).

The writer is indebted to Dr. H. Harms, who has examined this plant and compared it with the Berlin material of the genus. A member of the section *Eutrochomeria*, *T. Harmsiana* is remarkable for the long filiform staminodia of the female flowers, which are inserted at the extreme base of the tube of the receptacle, and alternate with the minute conical nectaries. It will be observed that although Mr. Snowden first collected this species on the Uganda side of Mt. Elgon, he obtained male plants only, and the later specimens collected by Major E. J. and Mrs. Cyril Lugard on the Kenya Colony side of the mountain, including both male and female plants, have been therefore selected as the type.

Combretum elgonense Exell, sp. nov. [Combretaceae]; *C. ternifolium* Engl. et Diels affine, sed receptaculo conspicue lepidoto.

Arbor circa 6–7 m. alta, ramulis pubescentibus. *Folia* alterna vel plus minusve ternatim verticillata, petiolata, petiolo 10–18 mm. longo pubescente, lamina obovata vel late elliptica vel fere suborbicularia, 4–9 cm. longa, 3.5–5.5 cm. lata, apice breviter obtuseque acuminata vel obtusa vel rotundata, basi obtusa et plerumque acuminata, supra ad nervos sparsissime puberula, ceteroque glabra, nitidula, subtus pubescentia et subinconspicue lepidota, lepidibus margine haud contiguis, costis lateralibus utrinque 5–6 reticulatione supra prominulo. *Flores* tetrameri sessiles, in spicis axillaribus elongatis ad 8 cm. longis dispositi. *Receptaculum* inferius ad 3.5 mm. longum sparse puberulum et dense lepidotum, lepidibus margine contiguis, superius superne cupuliforme, inferne campanulatum, 3.5 mm. longum, 4.5–5 mm. diametro, sparse puberulum et basin versus dense lepidotum. *Calycis lobi* late deltoidei, 0.8 mm. longi, 1.5 mm. lati. *Discus* conspicuus, campanulatus, 3 mm. longus, 2.5 mm. diametro, margine libero dense piloso, ceteroque glaber. *Petala* transverse elliptica breviter unguiculata, 1.8 mm. longa, 1.6 mm. lata, glabra. *Staminum filamenta* exserta, 4 mm. longa. *Stylus* exsertus, 5 mm. longus, glaber. *Fructus* ignotus.

KENYA COLONY. Mt. Elgon, 6100 ft., spreading tree to 20 ft., flowers green, 1 Feb. 1931, *Major E. J. and Mrs. Cyril Lugard* 524.

This species belongs to Sect. *Glabripetalae* Engl. et Diels and resembles *C. ternifolium* Engl. et Diels in the leaf-shape and the verticillate arrangement of the leaves but differs from it in the conspicuously lepidote receptacle.—A. W. Exell.

Hypericum afromontanum Bullock, sp. nov. [Hypericaceae]; *H. intermedio* Steud. affinis, floribus capitato-congestis, petalis multo majoribus, sepalis latioribus, glandulis stipitatis brevioribus crassioribus, stylis brevioribus, foliis erectis multo minoribus parce puberulis, caulibus simplicibus differt.

Herba perennis usque 45 (raro 60–90) cm. alta; caules annui, simplices vel apicem versus parce ramosi, glabri vel praesertim inferne puberuli, teretes, graciles, internodiis basin versus circiter 1 cm. longis sed supra multo longioribus. *Folia* erecta, sessilia, oblonga vel oblongo-lanceolata, apice rotundata usque subacuta, basi truncata vel leviter auriculato-amplexicaulia, usque 2.3 cm. longa sed plerumque circiter 1.5–2 cm. longa et 5–7 mm. lata, utrinque puberula, plerumque nigro-glanduloso-punctata. *Flores* 5-meri, in cymas capituliformes terminales aggregati; pedunculi usque 10 cm. longi sed saepe minores, circa vel supra medium bracteis duabus oppositis praediti; bractee foliis similibus sed minores, basi glandulis nigris stipitatis (ut videtur subfasciculatis) dense instructae, laminis glandulis nigris punctatis marginibus laevibus vel glandulis nigris stipitatis praeditae (folia summa interdum basi stipitato-glandulosae). *Sepala* ovato-lanceolata, apice acuta, 5 mm. longa et fere 2 mm. lata, marginibus glandulis stipitatis nigris ciliata. *Petala* lutea, rubro-vittata, inaequilateralia, obovata, apice rotundata, 8 mm. longa et usque 5 mm. lata, nigro-glanduloso-punctata. *Stamina* 35; filamenta fere libera. *Ovarium* ovoideum, 1.5 mm. longum, glabrum, apice glandulis stipitatis 3 ornatum; styli 3, circiter 3 mm. longi. *Fructus* non visi.

KENYA COLONY. Mt. Elgon, 11,800 ft., erect herb to 18 in., flowers yellow striped with red, Dec. 1930, *Major E. J. and Mrs. Cyril Lugard* 338a (type); 11,000–12,000 ft., an uncommon single-stemmed moorland herb up to 18 in. high, leaves speckled black, petals yellow with a red streak on the back, sepals and bracts with stalked black glands, Feb. 1930, *Gardner* 2259.

UGANDA PROTECTORATE. Mt. Elgon. 10,000–12,000 ft., in short grassland, a purple-stemmed herb 2–3 ft. high with red and yellow flowers, 22 Oct. 1916, *Snowden* 479; 12,000 ft., a rare herb with yellow flowers in swampy grassland on the west side of the crater, Jan. 1918, *Dümmer* 3301; 11,400 ft., in grass country below Madangi Camp, a herb 18 in. high, flowers yellow, March 1930, *Liebenberg* 1622.

Dr. Mildbraed very kindly examined this plant and without hesitation declared it to be an undescribed species. Mr. Snowden was the first to find this interesting species, but his specimens were unfortunately badly damaged, and the flowers lost. It is hoped that a figure and further notes will appear in an early number of Hooker's *Icones Plantarum*.

Euphorbia Euryops Bullock, sp. nov. [Euphorbiaceae]; *E. Schimperianae* Scheele affinis, caulibus simplicibus dense foliatis, foliis anguste oblongis usque oblanceolatis, basibus prominentibus

tuberculiformibus foliorum delapsorum valde distincta; habitu ramulorum floriferorum *E. epicyparissias* E. Mey., sed foliis minoribus inflorescentiis majoribus multo laxioribus facile distinguitur; ab ambabus ovario 2-loculari differt.

Herba perennis, usque 6 dm. alta; caules pilis crispis leviter pubescentes, stricti, annui, petiolis tuberculiformibus foliorum delapsorum conspicue notati; rami floriferi cymam terminalem 4–7 radiatam efformantes, bracteis foliaceis oblongo-lanceolatis 2.5 cm. longis suffulti, ramis aliis similibus infra umbellam ex axillis foliorum orti. *Folia* brevissime petiolata, alterna, spiraliter disposita, exstipulata, anguste oblonga usque oblanceolata, apice obtusiuscula, mucronulata, basin versus angustata, 3.5–4.5 cm. longa, 4–5 mm. lata, utrinque minute densissime papilloso-pustulata, inferne decidua. *Rami inflorescentiae* 5–10 cm. longi, ramulis brevibus secundariis 1–3 vel 4 praediti. *Bractee* (saltem maturae) saturate sanguineo-coloratae, oppositae, altera saepe mox decidua altera persistente sessiles, ovatae usque rhomboideo-ovatae, apice subobtusae, mucronulatae, basi cuneatae usque fere rotundatae, usque 1.5 cm. longae et 8 mm. latae. *Involucra* solitaria, subsessilia, campanulata, 1 mm. longa et circiter 1 mm. diametro, glandulis 4 et glandula 1 abortiva minima cum lobis 5 inflexis oblongis vel ovatis ciliatis apice obtusis vel bifidis alternantibus; glandulae ambitu suborbiculares, 1.1 mm. diametro, superne crescentiformes. *Pedicelli* florum masculorum filiformes, glabri. *Filamenta* brevia, basi leviter incrassata, glabra. *Antherae* in alabastro suborbiculares, 0.4 mm. diametro, loculis ellipsoideis transverse dehiscentibus. *Ovarium* 2-loculare; styli 2, biramosi. *Capsula* glabra, exserta, graciliter pedicellata, bilocularis, leviter compressa, inter loculos valde constricta, ambitu quadrato-suborbicularis, circiter 2 mm. longa et lata, emarginata, basi truncata latissima, sursum satis angustata, saepe marginibus apice leviter recurvata, obtuse subrostrata. *Semina* oblongo-ellipsoidea, 1.5 mm. longa, apice unilateraliter carunculata, basi cordata, pallide cinerea, laevia.

KENYA COLONY. Mt. Elgon, 10,000 ft., erect to 2 ft., bracts deep crimson, Dec. 1930, *Major E. J. and Mrs. Cyril Lugard* 380.

It is hoped that a figure and description of this species will appear in an early part of Hooker's *Icones Plantarum*.

Crotalaria Lugardiorum Bullock, sp. nov. [Papilionaceae]; *C. glaucae* Willd. affinis, sed pilis brevibus basibus nigris vestita, floribus majoribus, fructibus longioribus differt.

Herba annua, ramosa, usque 4.5 dm. alta; caules primum pilis brevibus basibus nigris vestiti, demum glabrescentes. *Folia* unifoliolata, subsessilia, lanceolata usque anguste lineari-lanceolata, circiter 2.5–5 cm. longa et 0.3–1.2 cm. lata, apice rotundata usque acuta, mucronulata, basin versus angustata, supra glabra, subtus pilis brevibus basibus nigris vestita, costa supra impressa, nervis lateralibus utrinque circiter 5 sed saepe valde indistinctis. *Inflorescentia* terminalis, racemosa, laxa, circiter 8–12-flora, usque 20 cm.

longa, pedunculis 4-6 cm. longis, pedicellis gracilibus 4-7 mm. longis, bracteis minutis lineari-filiformibus deciduis circiter 2 mm. longis, omnino pilis brevibus basibus nigris vestita. *Calyx* usque 7 mm. longus, profunde 5-lobatus, lobis lanceolatis valde acutis 5 mm. longis et 1 mm. latis, extra pilis brevibus adpressis basibus nigris satis dense praeditus. *Vexillum* luteum, ellipticum, limbo 1 cm. longo et circiter 6 mm. lato, extra apicem versus leviter et breviter adpresse pubescens. *Alae* oblongae, circiter 7 mm. longae, 2 mm. latae. *Carina* acuta, 1 cm. longa, infra medium angulo recto curvata. *Legumen* cylindricum, 2.5 cm. longum, 5 mm. diametro, pilis brevibus adpressis basibus nigris satis dense vestitum. *Semina* parva, numerosa, longe funiculata, ovato-cordata.

KENYA COLONY. Mt. Elgon, 6700 ft., a spreading herb to 1 ft. high, flowers yellow above, russet below, 1 Feb. 1931 (fl. and fr.), *Major E. J. and Mrs. Cyril Lugard* 530; 6500-7500 ft., spreading herb to 18 in., flowers yellow above, russet below, Oct.-Nov. 1930, *Major E. J. Lugard* 197 (type).

Dr. Harms, to whom the writer is indebted for examining the specimens cited, is of the opinion that they are hardly distinguishable from *Crotalaria glauca* Willd. The peculiar indumentum with which the plants are more or less densely clothed is not, however, to be seen on any of the numerous specimens of *C. glauca* preserved at Kew, and this, coupled with the larger flowers and fruits, constitute sufficient grounds for establishing a new species.

Trifolium Lugardii Bullock, sp. nov. [Papilionaceae]; habitu *T. simensis* Fresen., sed *T. Steudneri* Schweinf. affinis, caulibus subsimplicibus, foliis longius petiolatis, foliolis et stipulis multo majoribus, inflorescentiis majoribus, calyce corollae excedente differt.

Herba erecta, usque 6 dm. alta, subglabra. *Folia* glabra vel ad apicem petiolorum leviter villosa, petiolis sulcatis 3-5 cm. longis, foliola subaequalia, oblongo-lanceolata vel anguste oblonga, apice subobtusata, mucronulata, basi subrotundata usque subacuta, marginibus acutissime serratis, nervis lateralibus numerosis subparallelis adscendentibus; stipulae usque 3 cm. longae, ad petiolum adnatae, bilobae, lobis liberis triangulari-lanceolatis acute acuminatis circiter 1 cm. longis. *Pedunculi* solitarii, ex axillis foliorum superiorum orti, circiter 6 cm. longi, glabri vel apicem versus leviter villosi. *Flores* purpurei, brevissime pedicellati, in capitulis involucriatis dispositi; bractae lanceolatae, acute acuminatae, 1-1.2 cm. longae. *Calyx* striatus, 11-12 mm. longus, dentibus anguste lineari-lanceolatis 6-7 mm. longis corollam superantibus. Corolla 9 mm. longa. *Fructus* non visi.

KENYA COLONY. Mt. Elgon, 6500-7500 ft., erect herb to 2 ft. high, with purple flowers, Oct.-Nov. 1930, *Major E. J. Lugard* 97.

Although similar to *T. simensis* Fresen. in habit, the presence of a conspicuous involucre of bracts subtending the heads of flowers places *T. Lugardii* in the section *Vesicastrum* near to the annual *T. Steudneri* Schweinf., from which it differs in habit, the greater size

of all its parts, and particularly in the relative lengths of the calyx and corolla.

Astragalus elgonensis Bullock, sp. nov. [Papilionaceae]; ab *A. somalensi* Taub. var. *Lindblomii* Harms, caulibus repentibus, stipulis persistentibus multo majoribus, racemis brevioribus densius floriferis, floribus majoribus differt.

Herba repens, caulibus quadrangularibus vel sulcatis glabris. *Stipulae* persistentes, ovato-triangulares, apice acutae, circiter 1 cm. longae et 5 mm. latae, inaequilaterales, indistincte nervosae, glabrae. *Folia* imparipinnata, ambitu oblonga, 4.5-6.5 cm. longa. *Foliola* 6-8-jugata, oblonga, circiter 1 cm. longa et 3.5 mm. lata, utrinque rotundata, mucronulata, brevissime petiolulata, marginibus parce albido-piloso-ciliatis, supra glabra, subtus costa albido-pilosa. *Racemi* laterales, in toto circiter 2.5 cm. longi, usque 12-flori, pedunculo 1-1.5 cm. longo parce nigro-puberulo, pedicellis 2 mm. longis dense nigro-puberulis, floribus caeruleo-roseis. *Calyx* anguste campanulatus, 4 mm. longus, parce nigro-puberulus, dentibus triangularibus usque 1.5 mm. longis. *Vexillum*, *carinae* et *alae* subaequilongae, circiter 8 mm. longae. *Fructus* immaturi oblongi, transverse nervosi, circiter 1.5 cm. longi et 4 mm. lati, apice basique triangulari-acuti, glabri.

KENYA COLONY. Mt. Elgon, 12,800 ft., a creeping herb with mauvy pink flowers, Dec. 1930, *Major E. J. and Mrs. Cyril Lugard* 334.

Dr. Harms has very kindly examined this plant and compared it with the material in the Berlin herbarium, where it could not be matched. The specimen cited is infected with the rust fungus *Uromyces Astragali* (Opiz) Sacc.

Ferula montis-Elgonis Bullock, sp. nov. [Umbelliferae]; inter species congeneres pedunculis brevibus, floribus bracteis inclusis valde distincta.

Herba perennis, circiter 2 m. alta, omnino glabra. *Folia* basalia magna, longe petiolata, pinnatim decomposita, segmentis ultimis linearibus circiter 1 cm. longis et 1 mm. latis; lamina ambitu triangulari-ovata, 30-40 cm. longa, 20-25 cm. lata vel ultra. *Umbellae* compositae, in inflorescentiis racemiformibus dispositae, ex axillis bractearum productae; bractae spathiformes apice saepe foliis laminis valde reductis ornatae, umbellas superantes et includentes; pedunculi usque 6 cm. longi, apicem versus bracteolis duabus instructi; radii numerosi, umbellato-radiati, circiter 3-5 mm. longi. *Calyx* minutus, lobis triangularibus fere 0.5 mm. longis. *Corolla* luteo-alba; petala ovata, apice acute acuminata, acumine inflexa, basi subcordata, 2 mm. longa et fere 1.5 mm. lata. *Filamenta* 1.5 mm. longa, filiformia. *Antherae* subglobosae, 0.75 mm. diametro, basifixae sed inflexo-pendentes. *Discus* 2 mm. diametro, marginibus undulatis. *Styli* minuti, obtusi. *Fructus* non visi.

KENYA COLONY. Mt. Elgon, 12,000 ft., a herb up to 7 ft. high, flowers cream, enclosed in pale green bracts, Dec. 1930, *Major E. J. and Mrs. Cyril Lugard* 425.

The mountains of tropical Africa are comparatively poor in their umbelliferous flora, and the material available for study is often scanty. The large, pale green bracts of this species, the lower ones at any rate crowned with a much reduced leaf lamina, are about twice as long as the umbel which they protect, and in the young state, hide.

The writer is much indebted to Major Norman, of the British Museum, who examined this plant and advised its description as a new species.

Heracleum elgonense (Wolff) Bullock, comb. nov. [Umbelliferae]. —*Malabaila elgonensis* Wolff in Notizbl. Bot. Gart. Berlin, viii. 231 (1922). *Heracleum inexpectatum* Norm. in De Wild. Pl. Bequaert. iv. fasc. 2, 308 (1927); et l.c. iv. fasc. 3, 355 (1928).

The material now available for study leaves no doubt that Major Norman, of the British Museum, was correct in assigning this species to the genus *Heracleum* Linn., and it is unfortunate that the trivial used by him is antedated. At Brussels Dr. E. A. Mearns specimens Nos. 1076, 1429, 1449, and 1464, all collected on Mt. Kenya at about 11,000 ft., are preserved, and there is a specimen collected in "East Tropical Africa" by Dr. Gregory at the Natural History Museum. The type specimen, which was collected by H. Granvik in 1920, at about 11,000 ft. on Mt. Elgon, is preserved at Berlin. The following specimens are incorporated in the Kew Herbarium:—

KENYA COLONY. Mt. Elgon, moorland, 9000–13,000 ft., a herb up to 3 ft. high, outer petals of the outer flowers of each umbel greatly enlarged, flowers greenish-white, Dec. 1930, *Major E. J. and Mrs. Cyril Lugard* 405. Mt. Kenya, common between 11,000 and 14,000 ft. (received at Kew in Jan., 1912), *Hutchins* 397; upper alpine region, about 2 ft. high, flowers white, foetid, Feb. 1922, *R. E. and Th. C. E. Fries* 1372.

UGANDA PROTECTORATE. Mt. Elgon, above Bulembuli, a tall herb growing near a stream, April 1930, *Liebenberg* 1681.

Tylophora Lugardae Bullock, sp. nov. [Asclepiadaceae]; *T. tenuipedunculatae* K. Schum. affinis, sed caulibus pubescentibus, pedunculis brevioribus minus gracilibus, floribus majoribus differt.

Herba volubilis, caulibus gracilibus primum breviter patente hirsutis demum glabrescentibus. *Folia* lanceolata vel oblongo-lanceolata, 3–4.5 cm. longa, 1–1.5 cm. lata, basi obtusa vel subrotundata, apice acuta, mucronulata, supra costa impressa pubescente, cetera utraque mox glabrescentia, nervis lateralibus indistinctis, petiolis circiter 0.1–1 cm. longis supra canaliculatis et pubescentibus. *Pedunculi* subaxillares vel sublaterales, glabri, graciles, circiter 1.5 cm. longi, fasciculis vel cymis duabus subdistantibus 3–6-floris praediti, bracteis minutis lanceolatis hirsuto-ciliatis, pedicellis glabris 6–8 mm. longis. *Calyx* fere ad basin lobatus, lobis lanceolatis

acutis 1 mm. longis. *Corolla* rotata, 1.2 cm. diametro, lobis viridibus ovatis subacutis vel gradato-acuminatis 5 mm. longis et fere 3 mm. latis utraque glabris sed marginibus saepe ciliatis. *Coronae lobis* tuberculi-formes longitudinaliter oblongi, columnam staminalem adnati, 2 mm. longi, apice in apiculo carnosio lineare 0.5 mm. longo producti. *Stylus* truncatus. *Fructus* non visi.

KENYA COLONY. Mt. Elgon, 6500 ft., a twiner, flowers green with maroon centre, 22 May, 1931, *Mrs. Cyril Lugard* 656.

Collected at the same time as, and evidently growing mixed with *Cynanchum altiscandens* K. Schum., this plant is proposed as new with some reserve. In its leaves and stems it bears a striking resemblance to species of *Cynanchum*, though the inflorescence and flowers are quite different. *T. Lugardae* differs from its close ally, *T. tenuipedunculata* K. Schum., in its stouter and shorter peduncles, larger flowers, and hairy stems; it is named in honour of the collector.

Oldenlandia scopulorum Bullock, sp. nov. [Rubiaceae]; inter species sectionis *Euoldenlandiae* habitu subericoideo caespitoso distincta.

Herba perennis, glabra, usque 10 cm. alta; caules annui, caespitosi, simplices vel parce ramosi, superne floriferi, internodiis circiter 5–15 mm. longis. *Folia* linearia 1–1.5 cm. longa et usque 1.5 mm. lata, uninervia, apice acuta, mucronulata, supra minute densissime papilloso-pustulata, ceterum laevia, marginibus valde recurvis. *Flores* circiter 3, in cymis axillaribus dispositi, pedunculis circiter 5 mm. longis, pedicellis 2–3 mm. longis, in statu fructifero longioribus. *Calyx* (ovario incluso) 2.5 mm. longus, lobis 4 triangulari-subulatis circiter 1.2 mm. longis. *Corolla* alba vel pallide purpureo-rosea, 5 mm. longa, tubo anguste infundibuliformi, limbo 4-lobato, lobis late triangularibus subacutis 2 mm. longis. *Capsula* subglobosa, calycis dentibus persistentibus coronata, circiter 2 mm. diametro, membranacea. *Semina* minuta, nigro-viridia, ambitu obovata, lateraliter triangulariter compressa, minute rugosa.

KENYA COLONY: Mt. Elgon, 7500 ft., around rocks in open spaces, a herb 3 in. high with white flowers, Oct.–Nov. 1930, *Major E. J. Lugard* 49 (type); 8250 ft., by rocks, herb with pale mauve-pink flowers, Dec. 1930, *Major E. J. and Mrs. Cyril Lugard* 346.

This is a cushion-forming perennial herb growing in rock-crevices. It is allied to a number of species of the section, but is at once distinguished by its tufted habit. The writer is indebted to Dr. Mildbraed for the report "nicht in Herb. Berol."

Rubia longipetiolata Bullock, sp. nov. [Rubiaceae]; petiolis laminis duplo longioribus vel ultra, laminis anguste ovatis vel lanceolatis gradatim acutis distincta.

Herba scandens; caules graciles, quadrangulares, angulis aculeatis ceterum glabri. *Folia* longissime petiolata, petiolis usque 8 cm. longis aculeatis, laminis anguste ovatis vel lanceolatis apice

gradatim acutis basi rotundatis vel cordatis usque 4 cm. longis et circiter 1 cm. latis supra leviter scabridis infra subglabris vel glabrescentibus marginibus aculeatis e basi 5-nervis. *Cymae* paniculatae, axillares, pedunculis 1.5–2.5 cm. longis, pedicellis gracilibus 5 mm. longis. *Calyx* minutus, 4–5-lobulatus, glaber. *Corolla* viridis, rotata, 3 mm. diametro, lobis late ovatis subacutis. *Fructus* (non visi) "nigri."

KENYA COLONY. Mt. Elgon, 6500–7500 ft., climbing herb, flowers green, fruit "a black berry," Oct.–Nov. 1930, *Major E. J. Lugard* 204 (type). Eldama Ravine and Mau, 1898, *A. Whyte s.n.*

UGANDA PROTECTORATE. Without exact locality, a jungle creeper with rough square stems and greenish-white flowers, May 1880, *C. T. Wilson* 117. Mwengi, Toro, 5000 ft., 1913, *Snowden* 41.

***Galium mollicomum* Bullock**, sp. nov. [Rubiaceae]; inter species afromontanas caulibus molliter pubescentibus haud aculeatis, foliis 8-natis leviter et molliter hispidis vel subglabris marginibus haud aculeatis distincta.

Herba suberecta vel repens, circiter 2–3 dm. alta; caules subquadrangulares, ramosi, dense molliter pubescentes, haud aculeati. *Folia* 8-nata, linearia, circiter 1–1.5 cm. longa, leviter et molliter hispida vel subglabra, marginibus laevibus, uninervia, apice acutissima. *Flores* lutei, in cymis paucifloris axillaribus dispositi; bracteae oppositae, foliis similes. *Calyx* minutus, subtruncatus. *Corolla* rotata, fere ad basin lobata, lobis patentibus ovatis subacutis 1.75 mm. longis et 1 mm. latis. *Ovarium* dicoccum, ambitu globosum, 1 mm. diametro, glabrum. *Fructus* non visi.

KENYA COLONY. Mt. Elgon, 12,000 ft., *Battiscombe* 675; 11,000 ft., a trailing herb with yellow flowers, Dec. 1930, *Major E. J. and Mrs. Cyril Lugard* 400; 11,800 ft., herb 8 in. high with yellow flowers, Jan. 1931, *Major E. J. and Mrs. Cyril Lugard* 400a (type).

UGANDA PROTECTORATE. Mt. Elgon, bamboo zone, April 1930, *Liebenberg* 1619; Madangi Camp, 10,000 ft., herb about 9 in., in grass, April 1930, *Liebenberg* 1621; 10,000 ft., edge of forest, Aug. 1930, *Soundy and Hancock* 81.

var. ***Friesiorum* Bullock**, var. nov., a typo caulibus subglabris vel brevissime puberulis differt.

KENYA COLONY. Mt. Kenya, about 7500 ft., Dec. 1921, *R. E. and Th. C. E. Fries* 479 (type); 1549. North-west slopes of Aberdare Mts., 7000 ft., *Dowson* 587. Summit of Mau, 10,000 ft., woody herb in damp situations, *Mettam* 183.

***Galium afro-alpinum* Bullock**, sp. nov. [Rubiaceae]; inter species afromontanas foliis crasse aculeatis 6-natis ceterum glabris distincta.

Herba repens vel scandens; caules ramosi, angulares, angulis aculeatis vel saepe laevibus, haud pilosi. *Folia* 6-nata, parva, linearia, usque 1 cm. longa et plerumque 1 mm. lata, marginibus crasse recurvo-aculeatis, uninervia. *Ramuli* floriferi brevissimi,

axillares, ad apicem flores 1–3 ferentes; pedicelli usque 1 mm. longi. *Calyx* obsoletus. *Corolla* pallide lutea vel viridi-lutea, rotata, 4 mm. diametro, lobis ovatis subacutis 1.5 mm. longis et fere 1 mm. latis. *Fructus* nigri, dicocci, laeves, 2 mm. diametro.

KENYA COLONY. Mt. Elgon, 11,500 ft., herb with greenish yellow flowers climbing on *Artemisia afra* Jacq., Feb. 1930, *Gardner* 2245; 10,000–12,000 ft., creeping or climbing herb with pale yellow flowers, Dec. 1930, *Major E. J. and Mrs. Cyril Lugard* 365 (type). Lake Naivasha: 6000 ft., Dec. 1893, *Scott Elliott* 6516; 6000 ft., 26 June 1931, *van Someren ex Napier* 1200. Mt. Kenya, climbing on *Senecio keniodendron* Fries in the upper alpine zone, 5 Feb. 1892, *R. E. and Th. C. E. Fries* 1276a.

UGANDA PROTECTORATE. Mt. Elgon, 13,000 ft., climbing on stems of giant *Senecio* sp. near the summit, Jan. 1918, *Dümmer* 3375; bamboo zone, 9500 ft., Aug., 1930, *Soundy and Hancock* 10.

***Gynura montuosa* (S. Moore) Bullock**, comb. nov. [Compositae].—*Senecio montuosus* S. Moore in Journ. Linn. Soc. Bot. xxxv. 354 (1902), incl. var. *minor* S. Moore, l.c. 355.

An examination of the style arms of this species leaves no doubt that it should be transferred from *Senecio* to *Gynura*. A large number of specimens from Uganda, Kenya Colony, Tanganyika, Nyasaland, Belgian Congo, Cameroons and Southern Nigeria, is now preserved in the Kew herbarium. It was collected on Mt. Elgon by Major E. J. and Mrs. Cyril Lugard (Nos. 44; 258; 350).

***Senecio Lugardae* Bullock**, sp. nov. [Compositae]; a *S. Theodori* K. Afz. foliis basalibus longe petiolatis laminis oblanceolatis multo brevioribus, capitulis multo minoribus recedit.

Herba perennis, ramis floriferis pauce foliosis erectis usque 45 cm. altis, striatis, puberulis. *Folia* basalia oblanceolata, apice rotundata, basi in petiolam usque 6 cm. longam gradatim angustata, marginibus repando-dentata; lamina usque 6 cm. longa et 2 cm. lata, utraque pilis glandulosus puberula; folia caulina minores, oblongo-oblanceolata, sessilia, basin versus angustata, subamplexicaulia, superiores lineares, multo reducta. *Inflorescentia* terminalis, paucicapitulata, cymosa; pedunculi capitulorum glanduloso-puberuli, graciles, circiter 5–15 mm. longi, circa medium bracteo parvo lineare instructi. *Capitula* cylindrico-campanulata, circiter 9 mm. longa et 4 mm. diametro, homogama. *Bracteae involucri* lineares, acutae, appendiculatae, 7 mm. longa et 1 mm. lata, extra glanduloso-puberula, margine hyalinae, appendicibus alabastro conniventibus sub anthesin reflexo-patentibus. *Flores* hermaphroditi, circiter 25; corolla 5.5 mm. longa; antherae 2 mm. longae, basi caudatae. *Pappi setae* albae, sub anthesin 6 mm. longae. *Achenia* immatura leviter puberula.

KENYA COLONY. Mt. Elgon, 6700 ft., erect herb to 18 in., flowers buff, Feb. 1931, *Major E. J. and Mrs. Cyril Lugard* 541.

The writer is indebted to Dr. Mildbraed for the report "*Senecio prob. nov. spec.*, nicht in Herb. Berol."

Chironia elgonensis Bullock, sp. nov. [Gentianaceae]; *C. angolensi* Gilg affinis, sed floribus minoribus sanguineis numerosioribus, foliis brevioribus basi leviter amplexicaulibus haud angustatis facile distinguitur.

Herba elata, usque 1.2 m. alta, omnino glabra, laxa ramosa, caulibus quadrangularibus anguste alatis. *Folia* sessilia, lanceolata, apice subacuta, basi latissima leviter amplexicaulia, trinervia, superiores (sub inflorescentia) circiter 4 cm. longa et 1.3 cm. lata. *Inflorescentia* cymoso-paniculata, magna, laxa, floribus numerosissimis. *Calyx* 5 mm. longus, fere ad basin lobatus, lobis anguste triangularibus acutis 4 mm. longis dorsaliter alato-carinatis. *Corolla* sanguinea, persistens, tubo calyce aequilongo, lobis suberectis lanceolatis acutis circiter 10 mm. longis et 4 mm. latis. *Filamenta* complanata, 1.5 mm. longa. *Antherae* oblongae, 5 mm. longae, basin versus dorsifixae, laete flavae, valde tortae, dense minutissimopapilloso-punctulatae. *Ovarium* oblongo-ellipsoideum, 6 mm. longum, 3 mm. diametro, laxa minute flavido-punctulatum. *Stylus* persistens, circiter 5 mm. longus, stigmatibus oblongo 1 mm. longo brevissime piloso. *Capsula* ovario leviter longior, valvis 3 demum recurvis. *Semina* numerosa, minuta.

KENYA COLONY. Mt. Elgon, 6500–7500 ft., found only in one swamp, an erect herb up to 4 ft. high, with crimson flowers, Oct.–Nov. 1930, *Major E. J. Lugard* 21.

The writer is indebted to Dr. Mildbraed for examining this plant and comparing it with the material of the genus in the Berlin Herbarium. It is extremely interesting as a representative of an almost entirely southern genus.

Swertia Lugardae Bullock, sp. nov. [Gentianaceae]; *S. wojeratseni* N. E. Br. similis, sed foliis minoribus, sepalis brevioribus, corollae segmentis unilateraliter purpureo-vittatis differt.

Herba perennis, erecta, glabra, usque 15 cm. alta; caules simplices vel e basi ramosi. *Folia* pauca, decidua, trinervia, elliptico- vel oblongo-spathulata, inferiores usque 2 cm. longa et 0.75 cm. lata, vix petiolata, sed basin versus angustata. *Cymae* paniculatae, saepissime 3-florae, pedunculis (terminalibus et lateralibus) adscendentibus usque 2.5 cm. longis, pedicellis 1–2 cm. longis. *Calyx* persistens, fere ad basin 5-lobatus, sub anthesin circiter 3 mm. longus, statu fructifero usque 6 mm. longus, lobis oblongis vel oblongo-spathulatis sub anthesin 1 mm. latis marginibus saepe purpureo-lineatis. *Corolla* persistens, circiter 8 mm. longa, 5-lobata, lobis oblongis 3 mm. latis albis vel luteo-albis sed late purpureo-vittatis (vittis unilateralibus) intus basin versus binectariferis; nectaria basi longe caudata. *Filamenta* dorsiventraliter compressa, 3 mm. longa; antherae oblongae, 1.2 mm. longae, loculis dimidio inferiore liberis. *Ovarium* lanceolatum, 3 mm. longum, stigmatibus

2 sessilibus hemisphaericis 0.5 mm. diametro. *Capsula* lanceolata, usque 1 cm. longa. *Semina* parva, haud alata.

KENYA COLONY. Mt. Elgon, 11,800 ft., an erect rock plant up to 3 in. high, flowers white with purple stripes, Dec. 1930, *Major E. J. and Mrs. Cyril Lugard* 409 (type). Aberdare Mts., Loreko, 8000 ft., by stream side, an erect herb up to 6 in. high, flowers yellowish, tinged with green and purple, 18 July 1931, *Napier* 1231.

The writer is indebted to Dr. Mildbraed for examining specimens of this species at Berlin, where it could not be matched. A member of the section *Binectariatae*, *S. Lugardae* is chiefly remarkable for the broad purple stripes on the backs of the corolla segments. These are unilaterally disposed, and owing to the contorted aestivation, are outside in the bud stage. There is thus a sharp contrast between the purple buds and the white or pale yellow open flowers, a character which at once distinguishes it from the Abyssinian *S. wojeratseni* N. E. Br., which has pink flowers.

Plumbago montis-Elgonis Bullock, sp. nov. [Plumbaginaceae]; aspectu *P. amplexicaulis* Oliv., sed floribus roseo-purpureis minoribus, corollae tubo calyce vix excedente, auriculis foliorum minoribus differt.

Herba glabra vel glabrescens, statura ignota. *Folia* (saltem superiora) sessilia, elliptica vel obovata, apice obtusa vel subacuta, vix acuminata, basin versus gradatim angustata, basi amplexicaulauriculata, in exemplare viso usque 18 cm. longa et 8 cm. lata, glabra, marginibus integris vel leviter irregulariter crenatis vel basin versus praesertim undulatis. *Panicula* parce ramosa, ramis apicem versus dense stipitato-glandulosis. *Flores* roseo-purpurei, breviter pedicellati, ex axillis bracteolarum orti, bracteolis ovatis amplexicaulibus puberulis circiter 3 mm. longis. *Calyx* anguste tubulosus, sicco sulcatus, circiter 1 cm. longus, limbo minuto roseo, pilis glandulosis sparse ornatus, ceteroque leviter puberulus vel glabrescens. *Corolla* circiter 1.7 cm. longa, anguste tubulosa; tubus supra calycem in limbo circiter 5 mm. longo gradatim incrassatus. *Fructus* non visi.

KENYA COLONY. Mt. Elgon, 6500 ft., in moist shady places, spikes very sticky, flowers magenta, 18 May 1931, *Mrs. Cyril Lugard* 657.

Although closely allied to the blue-flowered *P. amplexicaulis* Oliv., which was sent to Kew in 1875 by Lieut. Cameron from the district south of Lake Tanganyika, and has not since been collected, the present plant is easily distinguished by its magenta-coloured flowers; the corolla-tube of *P. montis-Elgonis* is only slightly longer than the calyx, whereas in *P. amplexicaulis* the tube is at least twice as long as the calyx, and frequently attains an even greater length. The auricles at the leaf-base of Oliver's species are also much larger than in the present plant, though it is doubtful if such a character will prove constant when a large series of specimens becomes available.

Justicia striata (Klotzsch) Bullock, comb. nov. [Acanthaceae].—*Adhatoda striata* Klotzsch in Peters, Reise Mossamb. 216 (1861). *Justicia Melampyrum* S. Moore in Trans. Linn. Soc. ser. 2, Bot. iv. 32 (1894); C. B. Clarke in Dyer, Fl. Trop. Afr. v. 199 (1900).

The name *J. Melampyrum* was evidently maintained by C. B. Clarke in accordance with the old Kew rule, but the International Rules require the above name-change. The plant is an erect herb 1 ft. high with axillary cymes of pink flowers, occurring in Kenya Colony, Uganda westwards to Ruwenzori, and southwards to Nyasaland, and westwards through Rhodesia to Angola. Major Lugard collected it (No. 242) on Mt. Elgon at 7000 ft.

Calamintha elgonensis Bullock, sp. nov. [Labiatae]; inter species africanas floribus multo majoribus valde distincta; a *C. simensi* Benth. foliis densius pilosis, habitu majore suffruticoso, floribus multo majoribus differt.

Herba suffruticosa, ramosa, aromatica, usque 1 m. alta, omnibus partibus pilis albis longe molliterque dense pubescens, ramis novellis quadrangularibus internodis circiter 1–2 cm. longis demum subteretibus et lignosis. *Folia* opposita, subsessilia, late ovata, apice obtusa, basi truncata vel subcordata, circiter 1.5 cm. longa et 1–1.2 cm. lata, superne marginibus crenatis, nervis lateralibus utrinque circiter 5, infra satis dense glanduloso-punctata. *Flores* caeruleo-rubri, in cymas 2–10-floras axillares dispositi; pedunculi usque 1 mm. longi, pedicellis gracilibus circiter 5 mm. longis. *Calyx* cylindricus, 12–14-costatus, extra longe pilosus et aurantiacoglandulosus, leviter bilabiatus, tubo circiter 7 mm. longo, intus infra faucem pilis longis erectis annulato, labio superiore 3-dentato, inferiore 2-dentato, dentibus triangularibus acutissimis 1–1.5 mm. longis. *Corolla* obliqua, obscure bilabiata, 1.8 cm. longa, extra pilis longis albis vestita, tubo inferne anguste cylindrico superne (parte e calyce exserto) valde ampliata, labio superiore 6 mm. longo 3-lobato, lobis subaequalibus ambitu rotundatis obtusis 3–3.5 mm. diametro, labio inferiore elliptico-rotundato 6 mm. diametro, apice 2-fido. *Stamina* 4; filamenta complanata, 7.5 mm. longa; antherae parvae, 2-locellatae. *Stylus* 1.2 cm. longus, stigmatē lineari 1 mm. longo. *Nuculae* brunneae, ellipsoideae, 1.25 mm. longae, 1 mm. latae.

KENYA COLONY. Mt. Elgon, 12,000 ft., aromatic, erect to 3 ft., flowers mauve, Dec. 1930, *Major E. J. and Mrs. Cyril Lugard* 364 (type).

UGANDA PROTECTORATE. Mt. Elgon, above Butandiga Camp, 11,000–12,000 ft., April 1930, *Liebenberg* 1660.

This species is remarkable among its African congeners for its large flowers; otherwise it is closely allied to *C. simensis* Benth. which also occurs on Mt. Elgon (*Snowden* 435; *Lugard* 40) at from 8000–10,000 ft. It is, however, more densely hairy, and of somewhat woody habit.

Leucas (§ Astrodon) tricrenata Bullock, sp. nov. [Labiatae]; *L. masaiensi* Baker affinis, sed foliis oblongis apice 3- (raro 4-) crenatis, bracteis lineari-subulatis longe setaceo-pilosis haud subfoliaceis, calyce dimidio inferiore subglabro differt.

Herba perennis, ramis ascendentibus leviter pilosis. *Folia* brevissime petiolata, oblonga, apice ambitu rotundata vel truncata, crenis 3 (raro 4) praedita, basi breviter cuneata, 8–14 mm. longa et 4–7 mm. lata, utraque pilis longis vestita et ciliata, infra dense glanduloso-punctata. *Flores* albi, numerosi, in verticillastris densas axillares 1–3 dispositi; bractae lineari-subulatae, usque 5 mm. longae, setaceo-pilosae. *Calyx* infundibuliformis, sub anthesin 6 mm. longus, circiter 6–8 dentatus et costatus, dentibus brevibus acutis, extra superne pilosus, inferne subglaber, intus glaber, statu fructifero paullo major, superne transverse rugoso-venosus. *Corolla* 1.2 cm. longa, bilabiata, labio superiore extra dense albido-villoso bifido, inferiore extra leviter piloso trifido, tubo intus circa medium pilis brevibus densis patentibus incomplete annulato.

KENYA COLONY. Mt. Elgon, 8600 ft., spreading herb to 12 in. high, flowers white, Jan. 1931, *Major E. J. and Mrs. Cyril Lugard* 471 (type). Nandi Forest, 7000 ft., herb about 6 in., flowers white, *Sir Harry Johnston* s.n.

Aloe elgonica Bullock, sp. nov. [Liliaceae]; ab *A. Hildebrandtii* Baker foliis crassioribus dentibus majoribus, pedicellis congestioribus longioribus, floribus multo majoribus recedit.

Habitus erectus, usque 1.3 m. altus (teste collectore). *Folia* crassa, succulenta, elongato-triangularia, acuta, 20 cm. longa, sed matura probabiliter longiora, marginibus regulariter pungente dentata, dentibus triangularibus 7 mm. longis basi usque 1 cm. latis. *Inflorescentia* paniculata, glabra; rami dense floriferi, racemiformes; bractae scariosae, patentiae, ovatae, apice subulato-acuminatae, 1 cm. longae et 2.5 mm. latae; pedicelli persistentes, arcuato-patentes, 2.5 cm. longi et satis crassi. *Perianthium* aurantiacominiatum, persistens, anguste cylindricum, 4 cm. longum, 3.5 mm. diametro, 6-nervium, nervis latis, lobis anguste oblongis obtusis 5 mm. longis basi 2 mm. latis apicem versus ad 1 mm. latis angustatis. *Filamenta* gracilia, perianthi aequantia; antherae oblongae 4 mm. longae, basin versus dorsifixae, minutissime papillato-pustulatae. *Ovarium* ambitu anguste ovatum, apice obtusum, circiter 6 mm. longum; stylus circiter 3.4 cm. longus, stigmatē minute bilobo. *Capsula* coriacea, extra rugoso-reticulata, intus nitida, 3-valvata, ambitu anguste elliptica, apice basique obtusa, usque 1.5 cm. longa et 6 mm. diametro. *Semina* nigro-grisea, membranaceo-alata, 6 mm. longa.

KENYA COLONY. Mt. Elgon, 6500–7500 ft., erect to 4 ft., flowers orange-scarlet, Dec. 1930, *Major E. J. Lugard* 299.

Chlorophytum elgonense Bullock, sp. nov. [Liliaceae]; a *C. blepharophyllo* Schweinf. omnibus partibus minoribus, floribus bracteis haud excedentibus recedit.

Herba parva, usque 2 dm. alta, glabra. *Folia* membranacea, circiter 10–12, oblongo-lanceolata, gradatim acutissima, usque 18 cm. longa et 2 cm. lata, nervis parallelis circiter 18–20 distinctis, nervis transversis distantis indistinctis. *Inflorescentiae* solitariae vel paucae, simplices, foliis paullo superantes, bracteis membranaceis anguste lanceolatis subulato-acuminatis inferioribus usque 2 cm. longis saepe minutissime ciliatis. *Flores* ex axillis bractearum 2–3 fasciculati, albi, pedicellis usque 3 mm. longis. *Perianthium* bracteas haud excedens, circiter 4.5 mm. longum, segmentis oblongis obtusis vix 1 mm. latis. *Filamenta* filiformia, 1.5 mm. longa. *Antherae* oblongae, 2 mm. longae. *Ovarium* ovoideum, 1 mm. longum. *Capsula* ambitu oblonga, profunde sulcata, anguste alata, circiter 7 mm. longa et 5 mm. diametro.

KENYA COLONY. Mt. Elgon, 6500 ft., rhizomatous herb up to 8 in. high, with white flowers, 16 April 1931, *Major E. J. and Mrs. Cyril Lugard* 629.

Drimia congesta Bullock, sp. nov. [Liliaceae]; *D. robustae* Baker affinis, floribus congestioribus majoribus, pedicellis brevioribus crassioribus differt.

Herba bulbosa; bulbus sicut folia ignota. *Pedunculus* sulcatus, usque 1 m. altus, floribus ad apicem in racemum spiciformem circiter 15 cm. longum congestis. *Pedicelli* erecti, satis crassi, circiter 4 mm. longi, sed inferiores usque 6 mm. longi. *Bracteae* scariosae, inferne 2 cm. longae, 3.5 mm. latae, dorsaliter roseo-purpureo-vittatae, lanceolatae, apice acute acuminatae, cucullo dorso 2.5 mm. longo praeditae. *Perianthium* luteo-album, segmentis dorsaliter roseo-purpureo-vittatis linearibus 1.5 cm. longis apice subpatulo-cucullatis, tubo 4 mm. longo. *Filamenta* filiformia, fauce inserta, circiter 1.3 cm. longa. *Antherae* oblongae, dorsifixae, 1.5 mm. longae, purpureae. *Ovarium* oblongum, 5 mm. longum; stylus fere 1 cm. longus, basin versus articulatus. *Capsula* oblongo-obovoidea, sulcata, usque 1 cm. longa. *Semina* triangulari-compressa, nigra, oblonga, fere 4 mm. longa.

KENYA COLONY. Mt. Elgon, 8700 ft., a bulbous herb up to 3 ft. high, flowers cream with mauve lines, 6 Jan. 1931, *Major E. J. and Mrs. Cyril Lugard* 474.

Drimia elgonica Bullock, sp. nov. [Liliaceae]; a *D. zombensi* Baker omnibus partibus multo majoribus recedit.

Herba erecta, bulbosa; bulbus sicut folia ignota. *Pedunculus* 3.5–9 dm. alta, floribus ad apicem in racemum subclaxum usque 20 cm. longum dispositis. *Pedicelli* patentis vel ascendentes, circiter 5–10 mm. longi. *Bracteae* scariosae, circiter 1 cm. longae et 2 mm. latae, anguste lanceolatae, acute acuminatae, cucullo dorso parvo praeditae, dorsaliter roseo-vittatae. *Perianthium* griseo-album, fauce saturate rubro-vittatum, segmentis linearibus 1.2 cm. longis apice subpatulo-cucullatis, tubo cylindrico 5 mm. longo. *Filamenta* filiformia, fauce inserta, 1 cm. longa. *Antherae* oblongae,

2 mm. longae, dorsifixae. *Ovarium* ovoideum, 4 mm. longum; stylus 1 cm. longus, basi articulatus. *Capsula* matura non visa, ut videtur globosa.

KENYA COLONY. Mt. Elgon, 6900 ft., erect bulbous herb to 3 ft., flowers appearing before the leaves, dirty white with maroon throat, 15 March, 1931, *Major E. J. and Mrs. Cyril Lugard* 563 (type); 6,700 ft., bulbous herb 15 in. high with dirty white flowers, 4 March, 1931, *Major E. J. and Mrs. Cyril Lugard* 569.

Urginea porphyrantha Bullock, sp. nov. [Liliaceae]; ab *U. altissima* Baker omnibus partibus multo minoribus recedit.

Herba parva usque 1.5 dm. alta. *Folia* novella oblongo-lanceolata vel lanceolata, apice acuta, basin versus in vaginam sensim angustata, 10 cm. longa, 1.5 cm. lata, glabra, marginibus membranaceo-hyalinis. *Pedunculi* usque 10 cm. longi; racemi laxiflori 10 cm. longi; bracteae lanceolato-subulatae, 2 mm. longae; pedicelli patentis, graciles, 1.5–2 cm. longi. *Perianthium* saturate rubro-purpureum, 6.5 mm. longum, segmentis uninervis oblongo-ellipticis obtusis 2 mm. latis. *Filamenta* complanata, 3 mm. longa. *Antherae* oblongae, 1 mm. longae. *Ovarium* ovoideum, 2 mm. longum. *Stylus* 2 mm. longus. *Capsula* non visa.

KENYA COLONY. Mt. Elgon, 6500 ft., bulbous herb, erect to 6 in., flowers maroon, 16 March, 1931, *Major E. J. and Mrs. Cyril Lugard* 556.

Crinum heterostylum Bullock, sp. nov. [Amaryllidaceae], inter species africanas heterostyla, filamentis brevibus, antheris fere basifixis rectis (nec arcuatis), distinctissima.

Bulbus membranaceo-tunicatus, ovatus, circiter 6 cm. diametro. *Folia* circiter 6, disticha, liguliformia, apice rotundata usque subacuta, 10–20 cm. longa, 1.5–2 cm. lata, leviter carnosae, marginibus minutissime scabridis. *Pedunculus* lateralis, 10–15 cm. longus, 7.5 mm. latus et circiter 2.5 mm. crassus, spathae valvis triangularibus membranaceis circiter 3.5 cm. longis basi 1 cm. latis, bracteis linearibus 2–3 cm. longis. *Perianthium* album demum roseum, vel lobis roseo-carinatis, circiter 10 cm. longum, tubo anguste cylindrico usque 6 cm. longo et 2.5 mm. diametro, lobis lanceolatis acutis circiter 4 cm. longis et 1 cm. latis. *Stamina* 2-seriata; filamenta linearia, 5–7 mm. longa; antherae lineari-oblongae, 4.5 mm. longae, basin versus dorsifixae. *Stylus* inclusus, 4 cm. longus, vel leviter exsertus et 6.5 cm. longus, sed stamina nunquam excedens. *Bacca* circiter 1.5 cm. diametro.

UGANDA PROTECTORATE. Kabaroni, Mt. Elgon, 6000–7000 ft., in peaty soil on rocks, 6–12 in. high, bulbs large, flowers white inside with pale pink stripes, red outside, pedicels red, 12 April, 1927, *Snowden* 1055 (type).—Sabei name "Singotyö."

KENYA COLONY. Mt. Elgon, 6000–7000 ft., small plants growing in shallow soil on exposed rocky patches, flower-heads 9 in. high, flowers white inside, pink outside, Feb. 1930, *Gardner*

2276; 7700 ft., plants up to 6 in. high, with flat, ribbon-like leaves and flattened scapes, flowers cream, veined with pink or yellow, Dec. 1930, *Major E. J. and Mrs. Cyril Lugard* 421.

Bulbs of this plant, sent to Kew by Lady Muriel Jex-Blake from her garden, flowered towards the end of July, 1931, and the above description, although taken from the herbarium material cited, is in exact agreement with the living plant. It is not, however, so successful from a horticultural standpoint as are some other well-known species. The flowers are at first pure white, then the keels of the perianth-lobes begin to turn pink, the colour spreading and gaining strength first outside then inside, until the whole flower is almost uniformly pink. In fairly bright sunlight, the colour change was complete at Kew in about 48 hours. The strap-shaped leaves become very flaccid at the time of flowering and, although quite glabrous, are almost silky to the touch.

***Commelina elgonensis* Bullock**, sp. nov. [Commelinaceae]; inter species africanas floribus azureo-purpureis majoribus longe pedicellatis valde distincta.

Herba erecta, usque 1.5 dm. alta, glabra vel satis dense pilis albidis longiusculis vestita. *Folia* lanceolata vel ovato-lanceolata, apice subacuta, basi in vaginam brevem vel usque 1 cm. longam leviter angustata, usque 6 cm. longa et 1.7 cm. lata, utrinque glabra usque satis dense albido-pilosa. *Spathae* solitariae, multiflorae, pedunculo usque 4.5 cm. longo sed saepe breviores, usque 2.5 cm. longae, acute acuminatae. *Flos* solitarius longissime pedicellatus, pedicello usque 2.5 cm. longo, ceteris floribus ad apicem pedunculi fere 1 cm. longi in cymis scorpioideis ortis, pedicellis usque 1 cm. longis. *Petalum* ventralum major; lamina suborbicularis, usque 1 cm. diametro. *Capsula* non visa.

KENYA COLONY. Mt. Elgon, 6700 ft., appearing after grass fires, an erect herb to 6 in. high with bluish-mauve flowers, 4 March 1931, *Major E. J. and Mrs. Cyril Lugard* 549.

***Commelina Lugardii* Bullock**, sp. nov. [Commelinaceae]; aspectu *C. subulatae* Roth sed foliis brevioribus, spathis densius pubescentibus differt.

Herba repens, pubescens, caulibus repentibus sulcato-striatis, internodiis circiter 6 cm. longis, floriferis subsimplicibus erectis circiter 6–10 cm. longis. *Folia* lineari-subulata, usque 3.5 cm. longa, parce pilosa vel subglabra, marginibus incurvis; vaginae satis dense longe pilosae, 5–10 mm. longae. *Spathae* solitariae, subterminales, 2–3-florae, extra pilis longis purpureis vel albis dense indutae et ciliatae, purpureae vel purpureo-nervosae, marginibus haud connatis, ambitu inaequaliter ovatae, acutae, usque 1 cm. longae. *Flores* pallide aurantiaci, ceterum ut in *C. subulatae* Roth apparentes.

KENYA COLONY. Mt. Elgon, 8000 ft., a trailing herb with buff-orange flowers, Oct.–Nov. 1930, *Major E. J. Lugard* 145.

***Eriocaulon Friesiorum* Bullock**, sp. nov. [Eriocaulonaceae]; *E. Schimperii* Koernicke ex Engl. affinis, foliis angustioribus apice subacutis angustatis, bracteis involucri nigris vel brunneo-nigris majoribus haud demum reflexis differt.

Herba robusta, acaulescens. *Folia* numerosa, late linearia, plana, 5–15 cm. longa, circiter medium 7–9 mm. lata, glabra, apicem versus subacutis angustata. *Pedunculi* 2–4, circiter 7-sulcati, 5–25 cm. longi, 1.5 mm. diametro; vaginae usque 7 cm. longae, apice limbo 2-lobato ornatae, lobis 2 cm. longis triangularibus acutis. *Capitula* 1–1.5 cm. diametro, semi-globosa, monoica, receptaculo glabro. *Involucri bractearum* nigrae vel brunneo-nigrae, 2–3-seriatae, ovatae vel ellipticae, vel interiores apicem versus ovato-spathulatae, circiter 3 mm. longae et 1.5 mm. latae, interdum extra apicem versus albido-pilosae; bractearum floriferae nigrae, oblongo-spathulatae, 3.5 mm. longae et 1.5 mm. latae, apicem versus dense albido ciliatae et pilosae, apice acutae. *Flores foeminei* subsessiles, sepalis late ellipticis vel ovatis 3 mm. longis et 1.5 mm. latis acutis saturate nigro-viridibus apicem versus pilis albidis barbatis, petalis lineari-oblongatis vel spathulatis 2.5 mm. longis et 0.5 mm. latis apicem versus glandulo nigro ornatis et albido-pilosis. *Flores masculi* similes, sed petalis in tubum coalitis. *Stamina* 2–4, exserta; antherae globosae, nigrae. *Fructus* non visi.

KENYA COLONY. Aberdare Mts., in swamp in the upper bamboo zone, about 10,000 ft., 17 March 1922, *R. E. and Th. C. E. Fries* 2402 (type); in moorland glades in the bamboo zone above 8000 ft., *Gardner* 1159. Mt. Elgon, 10,200 ft., Feb. 1932, *Mrs. Cyril Lugard* 673.

ORCHIDACEAE (V. S. Summerhayes).

***Holothrix (§Scopularia) elgonensis* Summerhayes**, sp. nov.; affinis *H. pleistodactylae* Kraenzl. a qua planta robustiore, floribus fere duplo majoribus, labello supra calcar vix gibboso, calcaris pro rata crassiore differt.

Herba terrestris, 27–39 cm. alta; tuber ellipsoideum, 1.5 cm. longum. *Folia* bina, saepius radicalia, humistrata, carnosae, inferius orbiculare, 2–4 cm. longum, 3–5.5 cm. latum, superius multo minus, ovatum, 1.5–3 cm. longum, 1–2 cm. latum, fere glabra, densiuscule ciliata. *Scapus* strictus, dense retrorseque pubescens. *Spica* secunda, dense multiflora, 4–9 cm. longa, rhachi sparsiuscule pubescente, bracteis ovatis acutis vel acuminatis densiuscule pilosis 2.5–10 mm. longis. *Flores* patentes, albidis, interdum roseo-vel pallide purpureo-tinctis. *Sepalum* intermedium anguste ovatum, acutum, breviter acuminatum, 4 mm. longum, 2 mm. latum; sepala lateraliter ovata, acuta vel acuminata, basi margine anteriore cordata, 5 mm. longa, 2.5–3 mm. lata; omnia sepala uninervia, extra longiuscule pilosa. *Petala* obcuneata, triente superiore 4–6-partita, partitionibus linearibus, in toto 8 mm. longa, 2 mm. lata, glabra. *Labellum* anguste flabellatum, triente superiore 13-partitum,

partitionibus linearibus, in toto 9 mm. longum, partitionibus exclusis 4.5 mm. latum, glabrum, inferne columnam subamplectens; calcar subconicum vel late cylindricum, leviter curvatum, obtusum, 2.5-3 mm. longum. *Columna* brevissima, obtusa, 1.5 mm. longa. *Ovarium* 2.5 mm. longum, pubescens.

KENYA COLONY. Mt. Elgon, 10,200 ft., Dec. 1930, *Major E. J. and Mrs. Cyril Lugard* 379; 10,500 ft., Jan. 6th, 1931, *Major E. J. and Mrs. Cyril Lugard* 379a (type).

This species is closely allied to *H. pleistodactyla* Kraenzl., recorded from Kilimanjaro, but differs in being much larger in all its parts except the column. It may prove later to be only a large form of Kraenzlin's species but the differences are so great as to make specific segregation advisable until more is known of this group. The genus *Holothrix* requires careful collecting in as many places as possible since the relation of many of the described species to one another remains very obscure.

Platycoryne montis-Elgon (Schltr.) Summerhayes, comb. nov.—*Habenaria montis-Elgon* Schltr. in Notizbl. Bot.-Gart. Berl. viii. 225 (1922).

Satyrion (§ Chlorocorys) dizygoceras Summerhayes, sp. nov.; forsan *S. leptopetalo* Kraenzl. affine, a quo ovario papilloso, sepalis et petalis papillato-pubescentibus, calcaribus secundariis 0.5 mm. longis additis, rostellis lobo intermedio producto apice triangulari differt.

Herba terrestris usque 50 cm. alta. *Folia* non visa. *Scapus* erectus, teres, cataphyllis lanceolatis vel ellipticis acutis vel acuminatis vaginantibus fere omnino obtectus. *Spica* cylindrica, usque 22 cm. longa, circiter 2.5 cm. diametro, subaxe multiflora; bractee sub anthesi reflexae, lanceolatae, acuminatae, usque 2.5 cm. longae, floribus longiores. *Flores* suberecti vel erecto-patentes, virides, ovario papillato 7-10 mm. longo. *Sepala* cum petalis per 3-3.5 mm. connata; sepala intermedii pars libera obovato-cuneata, obtusa, 2.2 mm. longa, 0.75-1 mm. lata, papillato-puberula; lateralium pars libera semilunata, acuta, 2.5-3 mm. longa, 1.5-1.6 mm. lata, fere glabra. *Petalorum* pars libera cuneato-obovata, obtusa, 1.8-2 mm. longa, 0.6-0.7 mm. lata, dense papillato-pubescentia et ciliolata. *Labellum* ellipsoideo-globosum, lateraliter compressum, basi sepalis lateralibus per 2 mm. longum connatum, 6-6.5 mm. longum, ostio angusto marginibus recurvulis, apice recurvatum, denticulatum, papillosum; calcaria 4, 2 posteriora cylindrica, dependentia, tenuia, circiter 2 cm. longa, 2 anteriora sacciformia, obtusa, 0.5 mm. longa. *Columna* leviter incurvata, 3 mm. longa; labium stigmatiferum fere orbiculare, 2 mm. diametro; rostellum 2.5 mm. longum, basi 1.5 mm. latum, trilobum, lobis lateralibus dentiformibus, lobo intermedio ex ungue leviter curvata deltoideo obtuso basi $\pm$ truncato.

KENYA COLONY. Mt. Elgon, about 7000 ft., April 1931, *Major E. J. and Mrs. Cyril Lugard* 595.

This is yet another species in sect. *Chlorocorys* with an additional very short spur in front of each of the normal long spurs. From *S. sacculatum* Rolfe it is distinguished by the smaller flowers and much longer spurs; *S. shirens* Rolfe differs, *inter alia*, in having radical leaves at the base of the flowering stem whereas in *S. dizygoceras* they are apparently on separate sterile shoots. In general characters the species seems to approach nearest to *S. leptopetalum* Kraenzl. from which it may be distinguished by the characters given in the diagnosis.

Eulophia montis-Elgonis Summerhayes, sp. nov.; *E. abyssinicae* Rchb. f. et *E. dichromae* Rolfe proxima, ab utraque florum colore, labelli lobo intermedio obovato-oblongo obtuso, ab illa labelli lobo intermedio nervis breviter barbatis praedito, ab hac floribus duplo minoribus differt.

Herba terrestris usque 1 m. alta, basi non visa. *Folia* inferiora in vaginas $\pm$ foliatis redacta, superiora anguste lanceolata, verosimiliter acuta, utroque angustata, basi in petiolum falsum producta, sub anthesi in toto 60 cm. longa, medio 2.5-3 cm. lata. *Scapus* teres, cataphyllis paucis acutis longe amplexantibus fere omnino obtectus. *Racemus* cylindricus, 8-12 cm. longus, 4-5 cm. diametro, inferne laxiuscule, superne dense, usque 25-florus; bractee lineari-lanceolatae vel lineares, aristatae, usque 3.5 cm. longae. *Flores* rosaceo-lilacini, subnutantes, pedicellis cum ovario suberectis 2-2.5 cm. longis gracilibus. *Sepalum* intermedium lanceolato-ovatum, 18 mm. longum, 8-9 mm. latum; sepala lateralibus oblique oblongo-ovata, apiculata, 18 mm. longa, 10 mm. lata. *Petala* oblique oblongo-lanceolata, apiculata, 13 mm. longa, 6 mm. lata. *Labellum* e basi cuneata trilobatum, 14-15 mm. longum, 11 mm. latum; lobus intermedius obovato-oblongus, rotundatus, 7 mm. longus, 5.5 mm. latus, inferne venis barbatis; lobi laterales leviter divergentes, oblique oblongi, obtusi, 4 mm. longi; discus carinis duabus rectis parallelis secus jugum acute canaliculatis antice subito truncatis et vena incrassata inter carinas instructus; calcar anguste cylindricum, obtusum, 3 mm. longum. *Columna* leviter incurvata, antice excavata, 6 mm. longa, pede 2 mm. longo.

KENYA COLONY. Mt. Elgon, May-June 1931, *Major E. J. and Mrs. Cyril Lugard* 663.

A striking species with relatively broad leaves appearing with the flowers, a rather short raceme of pinkish-mauve flowers and a narrow cylindrical spur. It is most closely related to the species mentioned in the diagnosis.

Aerangis floribunda (Rolfe) Summerhayes, comb. nov. *Listrostachys floribunda* Rolfe in Kew Bull. 1918, 236.

LXVIII.—NOTES ON THE FLORA OF SOUTHERN AFRICA :
III. MISCELLANEOUS NEW SPECIES. J. HUTCHINSON.

Amellus capensis Hutch. comb. nov. [Compositae]—*Haenelia capensis* Walp. Rep. ii. 974 (1843). *Kraussia capensis* Sch. Bip. in Flora, xxvii. 672 (1844). *Amellus Lychnitis* var. *flosculosus* Benth. ex Harv. in Harv. & Sond. Fl. Cap. iii. 62 (1864).

Caules ascendentes, arcuati, usque ad 30 cm. alti, obtuse costati, adpresse pubescentes, dense foliati. *Folia* inferiora opposita, late linearia, basi semiamplexicaulia, apice rotundata, 4–5 cm. longa, 6–7 mm. lata, 1-nervia, utrinque brevissime pubescentia. *Capitula* solitaria, discoidea, longe pedunculata, magna, circiter 2 cm. diametro; pedunculi paucibracteati, bracteis subfoliaceis. *Involucrum* bracteae circiter 5-seriatae, numerosissimae, ab exteriori gradatim longiores, exteriores oblongo-oblancheolatae, apice triangulari-acutae, interiores lineari-oblongae, circiter 1 cm. longae, extra adpresse pubescentes. *Receptaculi* paleae lineari-oblancheolatae, membranaceae, supra medium serrato-ciliatae. *Flores* omnes disciformes, flavi. *Achaenia* complanata, superne setulosa, pappo coroniformi brevissimo serrato coronata.

SOUTH AFRICA. Cape Div.: near Cape of Good Hope, Cape Peninsula, Pillans 4120. Swellendam Div.: sandy soil near Klein River mouth, Dec., Krauss 575 (type).

This is so distinct from *A. Lychnitis* Linn., that it is surprising that Harvey, who had a critical eye, did not keep them specifically distinct. Besides there being ray-flowers present in *A. Lychnitis*, the pappus and paleae of the receptacle are quite different, whilst the involucre bracts are equally distinct.

Corymbium Fourcadei Hutch. sp. nov. [Compositae], affinis *C. scabro* Linn. f., sed foliis obscurissime 3-nervis pustulato-punctatis, bracteolis ultimis minoribus differt.

Caulis usque ad 30 cm. longus, scabrido-puberulus, basi dense villosus, foliorum delapsorum basibus persistentibus indutus. *Folia* radicalia pauca, erecta, late linearia, rigide subacuta, 8–12 cm. longa, 6–10 mm. lata, glabra sed minutissime pustulato-punctulata, obscure 3-nervia, marginibus cartilagineis et stramineis; folia caulina pauca, lanceolata, 1–3 cm. longa, pustulato-puberula. *Corymbi* circiter 4 cm. diametro; rami scabrido-puberuli, bracteis paucis subfoliaceis ovato-lanceolatis, bracteolis ultimis subulatis brevibus; pedunculi ultimi brevissimi. *Capitula* uniflora; bracteae 2, imbricatae, oblancheolatae, apice obtusae vel subtruncatae, purpureo tinctae, 8 mm. longae, extra scabrido-pubescentes. *Flos* breviter stipitatus. *Achaenia* dense villosa, pappo breviter cupulari margine inciso coronata. *Corollae* tubus 2 mm. longus, lobis late lanceolatis 5 mm. longis. *Antherae* 2.5 mm. longae. *Styli* rami 3 mm. longi.

SOUTH AFRICA. Uniondale Div.: Blaauw Bosch Pass, north side, 2200 ft., Nov. 1923, flowers light purple, Fourcade 2849 (type). Blaauw Bosch Berg, 5000 ft., Dec. 1925, Fourcade 3153.

Disparago rosea Hutch. sp. nov. [Compositae], foliis spiraliter tortis, capitulis glomeratis vel solitariis 5–8-floris, floribus radii papposis distincta.

Fruticulus intricato-ramosus, usque ad 25 cm. altus; ramuli numerosi, dense foliati, adpresse pubescentes. *Folia* alterna, spiraliter torta, 2–3 mm. longa, subacicularia, mucronata, supra demum glabra, infra adpresse lanata. *Capitula* solitaria vel glomerata, sessilia, radiata. *Involucrum* cylindricum, 4–5 mm. longum; bracteae brunneae, circiter 4-seriatae, glabrae, exterioribus ovato-lanceolatis subobtusis leviter carinatis interioribus oblongis circiter 5 mm. longis basin versus subhyalinis. *Flores* radii plerumque 2–3, rosei; corollae tubus anguste cylindricus, limbo elliptico apice irregulariter 2–3-dentato; achenia glabra; pappi setae circiter 12, basi connatae, superne plumosae. *Flores* disci 3–5, purpurei; achenia et pappi setae ut in floribus radii.

SOUTH AFRICA. Uniondale Div.; hills near Avontuur, 2800 ft., Oct., Fourcade 1663.

This beautiful little plant is clearly related to a species described by Bolus as *Amphiglossa Kolbei*. Both species have a pappus which is plumose in the upper half, a character belonging to *Disparago* and not to *Amphiglossa*, wherein the pappus bristles are markedly plumose right to the base. In general habit also these two species most resemble *Disparago* in that the flower-heads tend to become clustered at the ends of the shoots. They might be regarded as rather primitive species because some of the heads are solitary and the achenes of both sexes are provided with a pappus. Following this view it is necessary to transfer Bolus' species as **Disparago Kolbei** Hutch., comb. nov.

Scilla violacea Hutch. sp. nov. [Liliaceae], inter species austro-africanas caulibus bene evolutis, foliis lanceolatis infra purpurascens et nitidis supra cinereis viridi irregulariter notatis, filamentis violaceis distincta.

Caules usque ad 8 cm. longi, rubro-purpurei, glabri, 3–5-foliati. *Folia* lanceolata vel oblongo-lanceolata, basi longe vaginata, apice submucronata, 7–10 cm. longa, 2–2.3 cm. lata, tenuiter carnosae, glabra, supra cinerea, viridi irregulariter notata, infra purpurea et nitida. *Racemi* axillares et terminales, suberecti; pedunculi circiter 10 cm. longi, fusco-virides, 2 mm. crassi, circiter 20-flori; pedicelli nutantes, albi, superne violaceo tincti, 8 mm. longi. *Perianthii* segmenta 2-seriata, oblonga, obtusa, 3.5–4 mm. longa, 2 mm. lata, viridia, marginem versus pallidiora. *Stamina* segmentis aequilonga; filamenta inferne pallida, superne intense violacea; antherae flavae. *Ovarium* depresso-globosum, viride, profunde 6-lobatum, glabrum, 2.5 mm. diametro; stylus 3 mm. longus, pallidus, apice violaceo tinctus.

SOUTH AFRICA. Uitenhage Div.: Klein River, near Hankey; cultivated at Kew from bulbs collected by J. Hutchinson and F. R. Long in September 1930.

Encephalartos kosiensis *Hutch.* sp. nov. [Cycadaceae], acaulis, foliolis confertis et leviter imbricatis lobo terminali haud conspicuo valde distincta.

Planta acaulis vel fere acaulis. *Folia* probabiliter circiter 1 m. longa; rachis supra anguste canaliculata, glabra; foliola circiter 20-juga? conferta et leviter imbricata, oblongo-elliptica, sessilia, basi latissima et utrinque plus minusve rotundata, apice 3-5-lobata, lobis late triangularibus pungentibus, marginibus dentibus 2-4 lateralibus minoribus armatis, 8-15 cm. longa, 3-5 cm. lata, nervis parallelis satis tenuibus circiter 25. *Strobili* non visi.

SOUTH AFRICA. Zululand: behind sand-dune bush near Kosi Lake, East Ingwavuma district, *Aitken & Gale* 63. Kosi Bay, *Col. Lugge* in *Natal Herb.* 16507. Cultivated by *Col. G. Molyneux* at the "Old Fort," Durban, July 1930.

I have seen only two leaves of this apparently distinct species, and further material, including a photograph, is very desirable for the Kew Herbarium. It is no doubt allied to *E. ferox* Bertol. from Mozambique, which I have not seen, but which is described as having a stem about 2½ ft. high and 1 ft. in diameter, and narrower leaflets.

LXIX.—MISCELLANEOUS NOTES.

THE DIRECTOR has been elected an Honorary Fellow of King's College, Cambridge.

Principles of Soil Microbiology.—We regret that in the review of the second edition of this work, which appeared in *K.B.* 1932, 413, the increase in price over the first edition was commented on with surprise. This increase is, of course, due to the fall in value of the pound which has taken place since the first edition appeared, and which has increased the price of all American publications.

BULLETIN OF MISCELLANEOUS INFORMATION Appendix I 1932 ROYAL BOTANIC GARDENS, KEW

REVIEW OF THE WORK OF THE ROYAL BOTANIC GARDENS, KEW, DURING 1931.

General.

STAFF.—The year 1931 has been a particularly sad one for Kew owing to the lamented death on June 28th of Major Thomas Ford Chipp, M.C., D.Sc., Assistant Director since August 1st, 1922, (*K.B.* 1931, pp. 397, 433).

Mr. J. S. L. Gilmour was appointed to fill the vacant post of Assistant Director (*K.B.* 1931, p. 459), and took up his duties on October 21st.

Mr. R. A. Dyer has been appointed Assistant for South Africa in the Herbarium by the Government of the Union of South Africa, in succession to Mr. C. A. Smith.

Mr. G. W. Robinson was appointed Assistant Curator in charge of the Herbaceous and Rock Garden Department (*K.B.* 1931, p. 105), to fill the vacancy caused by the resignation of Mr. A. E. Edwards.

We record with pleasure the award of the V.M.H. to Mr. W. Dallimore and of the Associateship of Honour to Mr. T. W. Taylor by the Council of the Royal Horticultural Society.

INTERCHANGE OF OFFICERS.—The very valuable interchange arrangement between Kew and the Queensland Department of Agriculture terminated early in the year and Mr. W. D. Francis and Mr. C. E. Hubbard resumed their duties in their respective institutions in the spring.

OFFICIAL VISITS.—THE DIRECTOR, as recorded in last year's Review, was in South and East Africa during the winter months of 1930-31. Thanks to the kindness of the Government of the Union of South Africa and to the admirable arrangements made by Dr. I. B. Pole Evans, C.M.G., for a comprehensive tour in the Cape Province, Natal, the Free State and the Transvaal, and to Professor R. H. Compton for his hospitality at Kirstenbosch and for arranging the programme for the time spent around Cape Town, a most interesting tour was made and a report* has been sent to the Prime Minister of the Union. An extensive tour was made in the Cape Province,

* Extracts from this report have been published in the *Journal of the Botanical Society of South Africa*, part xvii, p. 6, 1931.

including a stay at Kirstenbosch and Whitehill, and visits were paid to the Bolus, South African and Marloth Herbaria; Table Mountain was explored with Dr. Marloth, and Stellenbosch University, the Rhodes Farms and other centres of agricultural and botanical interest near Cape Town were visited.

Travelling by car by way of Mossel Bay, George, Knysna and the Zitzikama Forest to Port Elizabeth, in the company of Mr. F. S. Laughton, Forest Officer, many historic plant localities were examined and collections of seed for Kew were made. From Port Elizabeth onwards, when Mr. R. A. Dyer was in charge of the arrangements, fine groves of *Encephalartos* were visited and also the Sunday's River plantations. A visit was paid to Grahamstown and to the Fauresmith Experiment Station near Bloemfontein with Dr. Pole Evans, and the very interesting research work that is being carried on there by Dr. Henrici in connection with over-grazing problems was carefully studied. Visits were paid to the Gardens and Experimental Plantations in Natal, in and around Pietermaritzburg and Durban and some time was spent in examining the research work of the University Colleges and of the Union Agricultural Department at Durban. Opportunities were afforded, thanks to Professor Bews, Mr. McClean, Colonel Molyneux and many others, of seeing many interesting features of the native vegetation near Durban and collections of seeds were made for Kew.

The visit to the Union concluded with a stay of some days at Pretoria. During this time the very interesting and important series of varieties and species of the Woolly-finger Grass (*Digitaria*) and other experiments with grazing plants at Prinshof were carefully studied under the guidance of Dr. Pole Evans. The Herbarium and Research Department of the Department of Agriculture were fully inspected and visits were paid to Onderstepoort with Dr. du Toit, and to other institutions in and around Pretoria and Johannesburg. The Gardens around the Union Buildings with their collection of Aloes, Cycads, etc., were also examined and a visit was paid to Fountains, a very beautiful park, where it is hoped to establish a Botanic Garden for Pretoria in which a representative display of plants native to the Transvaal could be assembled, together with a collection of allied exotic plants.

Proceeding to Southern Rhodesia, the Director visited the Rhodesian Museum with Dr. Arnold and saw the small historic Herbarium collection; the Matopo Agricultural School with Dr. Haylett, the Principal, and the Matopos Park under the able guidance of Mr. Bertram Woods, the Curator. Many interesting plants were in flower and some collections were made. It was obvious that the whole Matopos area is worthy of a careful Botanical Survey.

A visit was paid to the Victoria Falls where the Director was kindly met by Mr. Pardy, Forest Officer, whose knowledge of the botany of the district added greatly to the value of his visit. Some

collections of dried specimens and seeds were made; Efwatakala grass (*Melinis*), was noticed in the vicinity of the Falls and Aloes, *Sansevierias*, *Stapelias* and *Ceropegias* were noticed growing either on the vertical rocks of the Fall itself or in the shade of bushes in the damp soil of Cataract Island at the edge of the Falls.

On the journey to Beira a stay was made at Salisbury, where the Director was the guest of His Excellency the Governor, and full opportunity was afforded him of inspecting the many valuable activities of the Agricultural Department. It was especially gratifying to note the growth of the Botanical Department and the Herbarium, and to see the useful work being done at the Experimental Station with pasture grasses and fodder crops. From Beira the Director took ship to Zanzibar and thence to Mombasa. At Zanzibar he was met by Mr. Kirkham, then Director of Agriculture, and was most kindly entertained by His Excellency the Resident during his stay in the Island. Thanks to the kindness of Mr. Kirkham, the Director was able to visit several Clove plantations and Coconut groves and to see the other activities of the Agricultural Department. He also had the honour of an interview with H.H. the Sultan and visited the Shamba da Balotzi, Mbweni, the historic old home and garden of Sir John Kirk when he was Consul-General.

In Kenya the Director was the guest of Dr. and Lady Muriel Jex-Blake. He was conducted over the Scott Laboratories and the grounds of the Agricultural Department by Mr. Alex Holm and members of his staff, and saw all the various activities of the Department, in particular the valuable wheat-breeding work which is being carried on and the many difficult problems which have arisen in connection with rusts and rust-resistance. The work of the Forestry Department was studied under the guidance of Mr. H. M. Gardner, Conservator of Forests, and with him an excursion was made to the Juniper and Podocarpus forests on the slopes of Mount Kenya; here some living plants and seeds were collected for Kew. The interesting Arboretum and Forestry Herbarium at Nairobi were carefully studied, and a visit was paid to the Coryndon Museum where the admirable collections were examined with great interest. The Herbarium, under the charge of Miss Napier, and the botanical work in progress at the Museum should prove of great value to the Colony.

Uganda was reached on January 12th and the Director was then joined by Mr. Stockdale, Agricultural Adviser, Colonial Office. During their stay at Entebbe they were the guests of His Excellency the Governor. They were present at the opening of the Jinja Bridge over the Nile close to the Ripon Falls by His Excellency on January 14th, 1931, and travelled in the first train to cross the Bridge, His Excellency driving the engine.

The Director and Mr. Stockdale were then taken by Mr. Tothill, Director of Agriculture, for an extensive tour of some days through Bugishu, Teso, Lango, Bunyoro and the Buganda Territory. The

Agricultural Stations were carefully inspected at Bukalasa, Bugusege, Budadiri—at the foot of Mt. Elgon—Serere, Arungo, Lira, Ngetta, Massindi—where the new Tobacco drying sheds were inspected—Mr. Stafford's Coffee and Rubber plantations near Hoima and various native Coffee shambas. At the Experiment Stations particular attention was paid to the important work being done on Cotton, Coffee, Cassava, Sugar Cane, and Bananas. The tour covered some 1000 miles in Uganda and collections of living and dried plants and seeds were made and brought back to Kew. The Laboratories, Herbarium and Experiment Grounds at Kampala were examined, and a visit was paid to Makerere College, which is doing very valuable educational work in the Protectorate; the agricultural educational work was also inspected. While at Entebbe, the Director paid several visits to the Botanic Garden, which is beautifully situated on the Lake shore and planted with a very interesting collection of native trees, ferns and shrubs. He was able to put forward some suggestions for its further development and improvement, which it is hoped may be carried out.

After a further short stay at Nairobi, the Director with Mr. Stockdale, Mr. Tothill and Mr. Holm proceeded, by way of Voi and Moshi—where a large Coffee Estate was visited on the slopes of Mt. Kilimanjaro—to the Amani Research Station, Tanganyika Territory. Here, at the request of the Secretary of State, he attended the Conference of East African Directors of Agriculture. This occupied the first week in February, and the Report of the Conference has now been published. Ample opportunities were afforded of seeing the work in progress in the Herbarium and Library, both of which were in excellent order, the Pathological, Chemical, Physiological and Genetical Departments. In all the Departments important long range research was in progress and some valuable results were being obtained, especially with regard to the yellows-disease of Tea and shade problems relating to Coffee. The plantations, the very useful vegetable garden and the nurseries were carefully studied and the important work in progress on Sisal, Cinchona and other economic crops was examined.

During the visit to Amani, something was seen of the beautiful country around the Station and its interesting flora, and excursions were made with the Botanist and other members of the staff. To the Director and staff of the Research Station the Director is deeply grateful for all their help and kindness during his memorable stay at Amani. He was particularly impressed with the work which had been done by the Superintendent of Plantations, who, in addition to his horticultural work, had been responsible for the construction of the road from Sigi to Amani, and many other constructional works at the Station.

The Director left Tanga on February 10th, and after a three days' stop at Kilindini (Mombasa), during which a visit was paid to Kalifi

and Gede, Kew was reached via Marseilles and Calais on the evening of March 7th.

THE DIRECTOR also attended the celebration of the Bicentenary of the foundation of the Royal Dublin Society on June 25th and presented an address (*K.B.* 1931, p. 461).

In response to a request to obtain for Kew propagating material of the Cavendish Banana from the Canary Islands, Mr. J. Wardle of Messrs. Yeoward Brothers very generously provided Mr. H. C. SAMPSON, Economic Botanist, with a return passage on one of their ships to Teneriffe and Grand Canary and further rendered him all possible help in selecting the planting material which was required and in studying the cultivation of Bananas in those islands. Mr. Sampson also had an opportunity of seeing something of the Tomato industry in Grand Canary.

The planting material thus obtained is being propagated in the banana quarantine house at Kew. Suckers from this material are being despatched to the Imperial College of Tropical Agriculture, Trinidad, as they become available.

In connection with Resolution No. 7 of the Fifth International Botanical Congress the KEEPER OF THE HERBARIUM paid a visit to Berlin in August. An informal meeting was held at Dahlem and methods of dealing with urgent taxonomic needs and of obtaining the necessary financial assistance were discussed. Advantage of the opportunity was taken to compare a number of specimens in the Herbarium and to discuss various problems with members of the staff. A brief call was also paid to the Jardin Botanique de L'Etat at Brussels for the same purpose, and the return journey was made via Copenhagen and Lund in order to consult the Agardh Herbarium on matters concerning marine algae.

MISS M. L. GREEN, Assistant for the Index Kewensis, paid a short visit to Sweden during June, in order to make a search in certain libraries for periodicals and separate works containing names and descriptions of new genera and species not accessible in this country. The Institutions concerned were the Bergianska Trädgården, Riksmuseum, Academy of Sciences at Stockholm and the Library of the University and the Botanic Garden at Uppsala. As a result of this visit many additional names were obtained for the Index Kewensis and several valuable gifts were received for Kew (see pp. 40 and 51).

MR. N. Y. SANDWITH paid two short visits to the Muséum d'Histoire naturelle at Paris in order to study type specimens of Guiana species in connection with his studies on the Flora of British Guiana.

MR. C. E. HUBBARD returned to duty at Kew on June 5th after the completion of his year's stay in Queensland, where he had been

attached to the Department of Agriculture and Stock, in exchange with Mr. W. D. Francis (*see K.B. Appendix I, 1931, pp. 1 and 2*).

He arrived in Brisbane on April 3rd, 1930. During the first nine months he was engaged in revising and classifying the large collection of grasses in the Queensland Herbarium. Throughout this period Mr. C. T. White, the Government Botanist, very kindly arranged numerous collecting trips to all parts of the Moreton District. Several visits were made to the Glass House Mountains, where many rare plants were obtained. The Queensland Field Naturalists Club kindly permitted him to join several of their excursions, the most important being to Stradbroke Island in Moreton Bay. Other places visited were the Macpherson Range, Main Range near Toowoomba, Mistake Range, Tambourine Mountain, Albert River and Bribie Island.

A week was spent on Fraser Island with the Australasian Ornithological Union; here over 250 different species were collected. Mr. Hubbard was enabled to join a surveyor's camp for a few days in the country near Miles, in the western part of Darling Downs District, which was badly infested with "Prickly Pear" (*Opuntia* spp.). Many of the more interesting plants collected on this trip were obtained from the Dividing Range, between Wandoan and Miles.

On the approach of summer, Mr. C. T. White was able to arrange extensive expeditions into the main grassland belts of Queensland. Mr. Hubbard was fortunate in being often accompanied by Mr. C. Winders, of Brisbane University, who rendered very great assistance in drying the plants collected. Early in January they left Brisbane for Mungallala, Charleville and Cunnamulla. Important collections were made and several species not previously recorded for Queensland were gathered. The return journey was broken at Mitchell, Amby, Miles, Chinchilla and Macalister. Unfortunately, owing to lack of rain, many areas were in too poor a condition to be visited. The main collecting expedition to Northern and Central Queensland occupied nearly two months. The most important areas investigated were Sarina, Bowen, Townsville, Charters Towers, Torrens Creek, Prairie, Hughenden, Nonda, Cloncurry, Duchess, Mount Isa, Cairns and Chillagoe. At the last place many of the species collected by Dr. Domin in 1910 were found, and nearly 60 different grasses were gathered. Whilst at Hughenden they were taken through the basalt country to Chudleigh Park, where the grasslands were in excellent condition. The return journey to Brisbane was made via Winton and Longreach, through the Mitchell-grass country. In Central Queensland collections were made at Jericho, Alpha, Emerald and Rockhampton. The third and last expedition was made to Dirranbandi, the granite belt around Stanthorpe and to various localities in the Darling Downs. During these trips over 75 per cent. of the known species of Queensland grasses were collected and several new species discovered.

Throughout his stay in Queensland Mr. Hubbard received valuable aid from officers of the Agricultural Department, the State Railways and many others.

On the return journey home visits were paid to the Herbaria at Sydney, Melbourne, Adelaide and Perth. Whilst in New South Wales a large collection of grasses was made at Glen Innis and between Sydney and the Blue Mountains. The Directors and Staff of the Botanic Gardens and Herbaria, as well as other botanists, rendered valuable help in each centre.

Through the courtesy of the Commonwealth Railway officials, the journey on the Trans-Australian Railway across the Nullarbor Plain was broken at Barton, Hughes and Forrest, where many rare plants were obtained.

THE KEEPER OF THE MUSEUMS attended the Annual General Meeting of the Royal English Forestry Society at Shrewsbury from August 29th to September 3rd.

MR. J. H. HOLLAND attended the Conference of the Museums Association at Plymouth from July 6th to 11th.

The following two expeditions were rendered possible thanks to the grant received from the Empire Marketing Board for overseas missions and collecting purposes.

During 1931 MR. J. H. L. WATERHOUSE continued to collect in the Solomon Islands group and worked entirely on the Island of Bougainville. With the very damp atmospheric conditions drying was carried out under great difficulty, but notwithstanding this Mr. Waterhouse was able to send home numerous parcels of specimens amounting in all to 550 numbers (with several sets of duplicates). The material was well prepared and arrived in better condition than any previous instalments received from the Solomon Islands. Mr. Waterhouse was also able to obtain seed of Banana varieties and material of other economic plants for Professor Cheesman at Trinidad.

MR. B. D. BURTT paid a visit of two months duration in December 1930, and January 1931, to the Virunga Range of mountains on the frontier of the Belgian Congo and the Belgian Mandated area of former German East Africa. Though visited by several scientific expeditions, the area had been little explored botanically, with the exception of one German expedition 23 years ago. He was successful in collecting on all the eight mountains of the range and reaching the summit of all except Mt. Mikenko, a feat which, it is understood, no previous explorer had succeeded in accomplishing. Rain and driving clouds somewhat hindered collecting, but he brought home a collection of 490 numbers (with several sets of duplicates). Collections were also made between Lake Bunyoni and the eastern wall of the Rift Valley, and on the recent lava fields of the 1905 outbreak of Mt. Namlagira. As is the case in other volcanic areas, the flora was

not rich in species and few novelties were found. The collection, however, is an exceedingly interesting and valuable one from the general scientific point of view.

TUNG OIL (*Aleurites Fordii*).—Two years ago a grant was made by the Empire Marketing Board for the investigation of this tree. Interest is being maintained in its cultivation and information is being accumulated regarding its behaviour in different parts of the Empire. In very few countries, however, have the trees yet developed sufficiently to form fruit and it will be some time before this information will be sufficiently complete to be of value. In the drier parts of Assam it is reported that trees of this species have made remarkable growth and are already beginning to fruit. The tree shows much variation both in its branching habit and in the flowering habit. It is monoecious and normally appears to form only one female flower at the apex of an inflorescence of otherwise male flowers, but in the case of some trees, female flowers are formed at the apex of several of the branches of the inflorescence. Knowledge on these and similar points, which is being collected, may have an important bearing on the development of this industry.

The sale-distribution of seed, which in the past has been effected from Kew, has now been discontinued. Technical officers in different parts of the Empire, who have taken a prominent part in co-operating with Kew in seed distribution and in arranging for trials of this tree, have, however, been informed of reliable sources from which seed can be obtained, so that local arrangements can be made to procure further supplies of seed should they be required.

***Aleurites montana*.** A further consignment of this seed has been obtained from China and has been distributed to several parts of the Empire, more especially to those parts where conditions appear to be too tropical for the successful cultivation of *A. Fordii*. Though the seed received had already commenced to germinate by the time it reached Kew, by careful attention to packing and by making special arrangements with shipping companies for its transit, it has been possible to get this species established in several of the places to which seed was sent. The condition of the seed was such, however, that it was considered inadvisable to send any to places where the seed would be a long time in transit, and it is hoped that further supplies, which are now on order, will arrive in suitable condition to supply these areas.

BANANA RESEARCH.—Kew has been able to render further assistance to Professor Cheesman in connection with his Banana breeding work which he is conducting at the Imperial College of Tropical Agriculture at Trinidad and requests for seed of seeding species of *Musa*, many of which have since been complied with, have been sent to British North Borneo, Sarawak, Malaya, Samoa, Seychelles, New Guinea, Queensland and India. Mons. A. Chevalier has kindly promised to endeavour to obtain seed from the French W.

Pacific Islands and Mr. Waterhouse has succeeded in obtaining seed of more than one species in the British Solomon Islands.

The Banana quarantine house, since it has been altered and reconditioned, has been freshly stocked. Much of this consists of material representing the forms of *M. Cavendishii*, obtained from the East as well as from countries where this has been imported and is being now cultivated. Material has been obtained from the Canaries, through the good offices of Messrs. Yeoward Bros. and Messrs. Elder and Fyffe, from Brazil through the British Banana Company, as well as from Burma through the Director of Agriculture. Unfortunately material obtained from the Department of Agriculture, Malaya, did not survive the journey and further supplies are being obtained. Suckers have already been propagated from the Canary Island consignments and have been despatched to Prof. Cheesman at Trinidad.

OTHER ACTIVITIES.—The Director was elected President of the School Nature Study Union for the year.

DIRECTOR'S OFFICE.—During the autumn the Director's Office has been enlarged and the work is now nearing completion. Two new rooms have been added, the front door has been moved from the west to the south side and suitable accommodation for visitors, filing of documents, and for the clerical Staff has now been provided.

The fine old Wistaria was carefully detached from the building and fixed to poles before operations commenced and has now been replaced unharmed on the new portion of the building.

As in the case of the other new buildings (*see* pp. 12 and 28) the plans were designed by Mr. J. H. Markham, H.M. Office of Works.

PUBLICATIONS.—During the year ten numbers and only two, instead of the usual three, Appendices of the *Kew Bulletin* were published. This was due to the decision to discontinue the publication of the "List of Staffs" (Appendix II), owing to the recent appearance of similar lists covering the same ground (*K.B.* 1931, p. 502).

The new edition of the Handlist of Tender Dicotyledons and Gnetales appeared in June (*K.B.* 1931, pp. 417-20).

A new edition of the Popular Official Guide was also published.

The first part of vol. II of the Flora of West Tropical Africa (part III of the complete work), was published in March. It contains all the Gamopetalae, nearly half of which are represented by Rubiaceae and Compositae. The families had not been revised as a whole since 1877.

A paper on the Herbal of Leonhart Fuchs (*Journ. Linn. Soc. Bot.* xlviii, pp. 545-642 : 1931) was published in October.

The International Address Book of Botanists, the compilation of which was undertaken by an international committee with Major Chipp as British member, was published in December (*K.B.* 1931,

p. 502). A large part of the actual work of publication was carried out by Major Chipp before his death and was subsequently finished by Miss Verbrugge under the supervision of the Director.

The Gardens.

VISITORS.—The number of visitors to the Gardens in 1931 was 1,389,184, a decrease of 155,028 compared with the figures for 1930.

The falling off was most marked in the week-end attendances, particularly Sundays, for which the total figures were 109,129 less than those in the previous year. This is not surprising and is due to the monotonous sequence of wet week-ends during the earlier months of the year.

The greatest monthly attendance was in May with 345,525, the lowest in December with 10,449. The highest daily attendance was 96,859 on Whit-Monday, May 25th; this figure exceeded the previous record (Whit-Monday, June 9th, 1930) by 4,355. The lowest attendance was 7 on January 23rd.

On Monday, October 5th, 1931, the admission charge of one penny, abolished on August 5th, 1929, was reimposed with the concession of free admission (excepting perambulators) on Bank Holidays, and the waiving of charges for school parties on the penny days. The charge of sixpence on Students' Days (Tuesdays and Fridays) remains unchanged.

PLANT HOUSES, EXTENSIONS AND ALTERATIONS.—In the Annual Review for 1929 (Appx. I, 1930, p. 15), the generous gift by Mrs. Sherman Hoyt of the Collection of Cacti which she exhibited at the Chelsea Show is recorded (see also *K.B.* 1929, p. 239). In order that this collection, together with the large scenic picture of the Mohave desert which she also presented, and which formed the striking background of her Chelsea exhibit, might be fittingly displayed at Kew, Mrs. Sherman Hoyt has most generously provided the funds for the erection of a new Cactus House. The building, designed by Mr. J. H. Markham, H.M. Office of Works, was completed towards the close of the year and has been built at right angles to the T range, at the North end. The House, which will be called "The Sherman Hoyt Cactus House," bears the following inscription on a lead plaque. "This House together with the Scenic Background and many of the Plants was presented to the Royal Botanic Gardens, Kew, by Mrs. Sherman Hoyt of Pasadena, California. House erected 1931." It faces due South and consists of a central apse with a high North wall and two wings. The picture has been mounted on the wall of the apsidal central portion and the foreground will be built up of old red sandstone rock from Dunster, Somerset, which closely resembles the red rock depicted in the scenic background. The apse is roofed with ground glass to prevent the shadows of the woodwork falling on the painting in bright sunlight. Recently, through the continued kindness of Mrs. Hoyt, two large specimens of *Carnegiea*

gigantea (*Cereus giganteus*), 5½ ft. and 10 ft. in height respectively, have arrived, and will occupy prominent positions in this house.

In order to be able to grow consignments of Bananas and other plants received from different places overseas for transmission to the Colonies and insure that they are free from insect or fungus pests, the Banana house has been divided into three independent compartments and the ventilators have been screened with fine gauze. Three quarantine frames have also been fitted up, where consignments of new plants can be placed on arrival and inspected before they are put out in the Quarantine House, and thus reduce to a minimum the risk of infection through fresh importations of dangerous pests.

The central portion of the interior of the Palm House was repainted. Painting has been done to the outside of the Succulent House (no. 5) also houses no. 6 and 6a, the interior iron work being scraped, repainted and repaired where necessary.

In the "Melon Yard" the hot water pipes in several of the smaller houses have been overhauled and rearranged in the hope that a more efficient and regular service may be obtained.

A new sectional boiler has been installed in the T range stoke-hole, taking the place of two old saddle boilers. The installation of new sectional boilers in the Palm House stokehole during 1930 has resulted in a great improvement, the temperature of the house being more easily and regularly maintained.

ROCK GARDEN.—The portion recently extended now presents a well furnished appearance. The old bog, near the south end of the original section, has been cleaned out, the soil being replaced with fresh compost; advantage has been taken at the same time to effect some improvement in the surrounding rock-work.

Some further alterations have been made to the beds in the Iris Garden, the bulk of the collection now being arranged in a more or less definite colour scheme, which should add greatly to the general effect when the plants are in flower. A red-flowered Horse Chestnut tree has been removed from the east end of the garden; the beds in the immediate vicinity will thus gain more light, air and sun.

A considerable number of new and interesting plants flowered in the Rock Garden and Alpine House during the past year, the most interesting being *Primula sonchifolia*, which was specially collected on Hpimaw and sent home frozen solid in bamboo pots. Kew is indebted to Mr. T. Hay, M.V.O., V.M.H., Superintendent of Hyde Park, for this rare *Primula* and for a share of a large consignment of seeds presented by the Maharaja of Nepal to H.M. the King, amongst which may be mentioned *Meconopsis regia*, *M. auriculata*, *M. nepalensis* and *M. paniculata*, also for such rare *Primulas* as *P. Wollastonii*, *P. didyma*, *P. cardiophylla* and *P. muliensis*.

Among the large number of *Gentians* which flowered in 1931 were *G. ornata*, *G. rigescens*, *G. Macauleyi* and *G. hexa-Farreri*. Other

plants worthy of notice which bore flowers were *Ranunculus Lyallii*, *Primula Reinii*, *Cypridedium cordigerum*, *Swertia cordata*, *S. punicea*, *Codonopsis khasiana* and *C. tubulosa*.

TEMPERATE HOUSE.—The replanting which was carried out during the spring of 1930 in the south wing has proved a great success, the bulk of the plants having made good growth. This should give an increased display of flowers in the future.

The large and comprehensive collection of tender conifers, built up gradually over a long term of years, was exhibited at the Conifer Conference held in the Royal Horticultural Society's Hall in October, 1931. The collection now forms a permanent feature in the North Octagon, the large orange trees having been moved to the South Octagon, where under somewhat warmer conditions it is hoped they may improve in health. The Rhododendrons in the new annexe have made good progress: many of them flowered during the past season, including the following:—*Rhododendron Scottianum*, *R. Jenestierianum*, *R. laxiflorum*, *R. sino-Nuttallii*, *R. leucaspis*, *R. eriogynum*, *R. stamineum* and *R. supranubium*.

ARBORETUM.—The wet and sunless conditions which prevailed during the greater portion of the year entailed much extra labour in lawn mowing and grass cutting. This, however, was counter-balanced by the fact that little or no watering was necessary.

A portion of the conifer collection has been replanted, greater space being given to individual plants, whilst at the same time they were cleared thoroughly of dead wood.

Meliosma Veitchiorum, native of W. China, flowered for the first time at Kew.

FLOWER GARDEN. On each flank of the steps on the north west side of the pond, a portion of the banks has been cleared of overgrown bushes, the cleared spaces being turfed almost to the water's edge.

Viewed from the opposite side of the pond, the alterations have a more pleasing effect than formerly, as the newly turfed portion appears to merge into the lawns beyond. The margin has been planted with Siberian Iris.

The extensions to the Director's office, now proceeding, have necessitated a considerable amount of ground work in the matter of alterations to the line of the old, and the construction of new, paths. It has also involved altering, re-making and planting new beds and borders.

The building of the new Cactus House has also entailed a considerable amount of ground work around the house.

HAND-LIST OF TENDER DICOTYLEDONS.—During the year the second edition of this Hand-list was published, taking the place of the first edition which made its appearance so long ago as 1899. The limited sale of this Hand-list compared with the other Kew Hand-lists affords a criterion of the changed tastes in horticulture. For many years little interest has been taken in collections of choice indoor

plants, in striking contrast to the increasing popularity of flowering shrubs and trees, herbaceous and rock garden plants.

BIRDS.—During the past year the Storks built a nest at the top of a beech tree some 30 ft. high, near the Azalea garden. Two eggs were laid, but were unfortunately eaten by Carrion Crows. Later in the year the female Stork was found drowned in the Lake. A pair of young Storks have been imported from the Continent and it is hoped that they will breed at Kew as Storks have done in the past. The general collection of Ducks and Geese has been well maintained, and the stock of Mandarins, Blue-winged Teal, Carolinas, Cinnamon Teal, Pintails and Shovellers, has been increased.

RAINFALL RECORD.

Rainfall recorded at the Royal Botanic Gardens, Kew, during 1931:

		Inches.			Inches.
January	...	0.95	July	...	2.89
February	...	1.66	August	...	5.33
March	...	0.21	September	...	2.27
April	...	3.22	October	...	0.64
May	...	2.38	November	...	2.03
June	...	1.45	December	...	0.58

Total 23.61 inches.

The total for 1930 was 24.99 inches.

STUDENT GARDENERS: CHANGES IN PERSONNEL.—Seventeen men completed their training; two others went to Mr. Cecil Hanbury's garden at La Mortola for a year, whilst the gardeners sent here for study in 1930, by H.M. the King of the Belgians and the Director of the Charles University Botanic Gardens, Prague, respectively, returned to their own countries.

Eighteen Student Gardeners were admitted for training; one man returned from La Mortola to complete his service, whilst two Students came from Malta, and one from Siam.

Of the seventeen men who finished their course, ten have secured appointments at home (Parks Departments six; private gardens or nurseries three; arterial roads for tree-planting one); whilst two others entered Reading University with scholarships awarded by the Ministry of Agriculture and Fisheries. Three men proceeded overseas:—one to Khartoum; one to Kimberley and one to Rhodesia. A German Student Gardener returned to Berlin in order to enter the Horticultural College in that city, and a Swiss student resumed duty in a nursery in his own country.

Seventeen of the new Student Gardeners are from Great Britain—(private gardens or nurseries eight; Royal Gardens, Windsor, one; Cheadle Royal Hospital Gardens, one; Parks Departments, four; Cambridge Botanic Gardens, one; John Innes Horticultural Institution, one; and Royal Horticultural Society's Gardens, Wisley, one). The Student Gardener from overseas is a native of Sweden and had worked in Germany and France before coming to Kew.

CONTRIBUTIONS TO THE GARDENS, 1931.—During the year 986 consignments of living plants, seeds, etc., were contributed to the Gardens. This number is the highest ever recorded, and is an increase of 36 on the previous year. The more important donations were as follows :—

Public Institutions :—

Amani, East African Agricultural Research Station.—A collection of plants, including some of economic value.
 Berlin, Botanic Gardens.—Seeds: 88 packets, and a collection of Rhododendrons, Ericas, etc.
 Bermuda, Department of Agriculture.—A collection of seeds, and a consignment of bulbs of *Lilium Harrisii*.
 Bremen, Botanic Garden.—141 packets of seeds.
 Bucharest, Botanic Gardens.—36 packets of seeds.
 Buitenzorg, Botanic Gardens.—Seeds of economic plants.
 Calcutta, Royal Botanic Gardens.—Seeds of *Musa* sp., and *Taraktogenos Kurzii*.
 Cambridge, Botanic Garden.—Seeds, and plants of *Gloxinia maxima*.
 Cambridge, Mass., Arnold Arboretum.—Seeds, plants and cuttings of hardy trees and shrubs.
 Chelsea Physic Garden, London.—Seeds, and plants, including *Cycas circinalis*, *Ipomoea Purga*, and a collection of herbaceous plants.
 Coimbra, Botanic Garden.—20 packets of seeds.
 Copenhagen, Botanic Garden.—Plants of *Pellaea Smithii*, *Cyrtomium falcatum*, and miscellaneous seeds.
 Cyprus, Department of Agriculture.—100 Corms of *Gladiolus segetum* and miscellaneous seeds.
 Darjeeling, Lloyd Botanic Gardens.—197 packets of seeds.
 Dehra Dun, Forest Research Institute.—Seeds of economic plants.
 Dominica, Botanical Gardens.—A collection of tropical plants, including some of economic value.
 Dunedin, Botanic Gardens.—270 packets of seeds.
 Edinburgh, Royal Botanic Garden.—Seeds, including a share from the collections of Mr. George Forrest and Mr. Clarence Elliott; plants of *Ranunculus Lyallii*, *Primula sonchifolia*, *Vancouveria hexandra*, etc.
 Formosa, University Botanic Garden.—33 packets of seeds.
 Glasgow, Botanic Garden.—18 packets of seeds.
 Glasnevin, Botanic Gardens.—Seeds and plants, including *Begonia barbata*, *Sarracenia* spp., etc.
 Gothenburg, Botanic Gardens.—34 packets of seeds.
 Kirstenbosch, National Botanic Garden.—Collections of seeds, bulbs and succulents.
 Kuala Lumpur, Department of Agriculture.—Suckers of *Musas* in variety.
 London, British Museum (Department of Botany).—Seedlings of *Nelumbium speciosum* from Manchurian peat.

London, Hyde Park.—Collections of seeds, including 313 packets from Nepal, bedding and greenhouse plants in great variety, together with rare plants of special interest such as *Primula sonchifolia*, *Meconopsis regia*, etc.
 Merton, John Innes Horticultural Institution.—Plants and seeds including *Scolopendrium Delavayi*.
 Ottawa, Central Experimental Farm.—45 packets of seeds, and bulbs of *Lilium* spp.
 Oxford, Botanic Garden.—84 packets of seeds, and plants of *Dombeya Wallichii*.
 Paris, Museum d'Histoire Naturelle.—33 packets of seeds.
 Peradeniya, Department of Agriculture.—Seeds of *Eugenia aromatica*.
 Reading University, Horticultural Department.—A collection of Lachenalias.
 Singapore, Botanic Gardens.—Plants of *Borassodendron Machadonis*.
 Simla, Viceregal Gardens.—Miscellaneous seeds, and bulbs of *Lilium Thomsonianum*.
 Stellenbosch, University Botanic Garden.—81 packets of seeds.
 Stockholm, Botanic Garden.—Plant of *Reichsteineria macropoda*.
 Sydney, Botanic Gardens.—Seeds, including *Telopea speciosissima*.
 Tiflis, Botanic Garden.—46 packets of seeds.
 Trinidad and Tobago, Department of Agriculture.—Plants of *Neomammillaria mammillaris*.
 Washington, U.S. Department of Agriculture.—A collection of Azaleas, economic plants, etc.
 Wisley, Royal Horticultural Society's Gardens.—Seeds and plants, including *Viola orbelica* and *Helianthus* spp.
 Zanzibar, Department of Agriculture.—Seeds of *Eugenia aromatica*

Private Donors :—

Mr. S. C. Atchley, Athens, Greece.—Collections of bulbs and seeds.
 Mr. G. P. Baker, Sevenoaks.—Plants and seeds, including *Iris cretica*.
 Mr. J. C. van Balen, Pretoria, Union of South Africa.—Seeds and a collection of *Aloe* spp.
 Mr. F. R. S. Balfour, Dawyck.—274 packets of seeds, collected by Mr. George Forrest.
 Miss Winsome Barker, Cape Town.—Collections of *Oxalis* spp., miscellaneous bulbs and seeds.
 Mr. A. C. Bartholomew, Reading.—39 packets of seeds.
 British Banana Co., Ltd., London.—Plants of *Musas* in variety.
 Mr. N. E. Brown, Kew.—Plants and seeds of succulents.
 Mr. E. G. Bryant, Prieska, Union of South Africa.—Seeds of *Welwitschia mirabilis*; plants, bulbs and seeds of South African plants.
 Mr. A. A. Cavanagh, Argentine.—A large collection of seeds.

Lady Rosamond A. Christie, Instow.—A fine specimen plant of *Platycerium alcicorne*.
 Sir Jeremiah Colman, Bt., Gatton Park.—Plants of *Peristeria elata*.
 Mr. W. A. Constable, Paddock Wood.—Bulbs of *Liliums*, including *L. Jankae*.
 Mr. W. Cradwick, Mandeville, Jamaica, B.W.I.—A collection of orchids.
 Mr. C. H. Curtis, London.—Seeds of *Aloe* spp. from Transvaal.
 Mr. G. H. Dalrymple, Southampton.—A collection of Freesias.
 Mrs. A. Desborough, Broadstone, Dorset.—Plant of *Kniphofia Nelsoni*.
 Messrs. Duncan and Davies Ltd., New Plymouth, N.Z.—A small collection of endemic New Zealand plants.
 Messrs. Elders & Fyffes, Ltd., London.—Varieties of *Musa Cavendishii*.
 Mr. T. M. Endean, Laindon.—Succulents.
 Mr. W. C. Fishlock, Reading.—Plants of *Coffea erecta* and orchids collected on the Gold Coast.
 Mr. R. C. Bruce Gardner, Northwood.—Seeds of *Quercus* spp.
 Mr. A. Gibbs, Cardiff.—Plants of *Mesembryanthemum Bolusii*.
 Hon. Vicary Gibbs, Aldenham.—A collection of hardy trees and shrubs.
 Messrs. R. Gill & Son, Falmouth.—Plants of *Primula Winteri*, and hardy shrubs.
 Lady Godley, Gibraltar.—Seeds of *Quercus* spp., and a collection of bulbs, including *Narcissus serotinus*.
 Mr. G. Grout, Fort Jameson.—Plants of *Angraecum* sp.
 Dr. P. L. Giuseppi, Felixstowe.—68 packets of seeds.
 Mr. Cecil Hanbury, La Mortola.—61 packets of seeds, cuttings of *Citrus* spp., and Pelargoniums.
 Mr. F. J. Hanbury, East Grinstead.—A collection of *Dendrobium* spp.
 The Marquess of Headfort, Kells, Co. Meath.—Hardy trees and shrubs, including *Libocedrus tetragona*.
 Sir A. W. Hill, Kew.—Seeds and plants, including *Platycerium angolense*, *Huernia keniensis*, *Notonia Grantii*, etc., from Uganda and Kenya, and seeds of several species of *Pelargonium* and *Mesembryanthemum* from S. Africa.
 Messrs. Hillier & Sons, Winchester.—Hardy trees and shrubs, including *Prunus prostratus*.
 Miss D. C. Hopton, Bartestree.—41 packets of seeds of South African plants.
 Major F. O. Howes, Natal.—Seeds of *Jubaeopsis caffra*.
 Mrs. Sherman Hoyt, California.—2 large specimen plants of *Carnegiea (Cereus) gigantea*.
 Mr. C. E. Hubbard, Kew.—A large collection of seeds from Australia.
 Dr. H. H. Hu, Peiping, China.—Seeds of *Sinojackia Rehderiana*.

Capt. H. A. Johnstone, Sao Paulo.—A collection of Palm seeds.
 Dr. A. F. G. Kerr, Bangkok.—Tubers of *Amorphophallus* spp.
 Mr. R. J. Kidston, Reading.—Seeds collected on North Baffin Island.
 Mr. C. H. Lankester, Costa Rica.—Orchids and stove plants.
 Mr. H. W. Lawton, Wellington.—A collection of New Zealand Veronicas, seeds, etc.
 Lady Leconfield, Petworth Park.—Nerines.
 Mr. G. W. E. Loder, Ardingly.—Hardy trees and shrubs, including *Magnolia globosa*.
 Mr. F. R. Long, Port Elizabeth, Union of South Africa.—40 packets of seeds.
 Messrs. Mansell & Hatcher, Leeds.—A collection of Orchids and bulbs of *Lilium sulphureum*.
 Mr. B. P. Mansfield, Napier, N.Z.—Seeds of New Zealand plants.
 Mr. W. J. Marchant, Staplehill, Wimborne.—Plants, including *Rhus succedana*.
 Lt. Col. L. C. R. Messel, Handcross.—Plants of *Libocedrus chilensis*.
 Mr. F. W. Millard, East Grinstead.—A collection of Alpines.
 Col. G. Molyneux, Durban.—Plant of *Encephalartos latifrons*.
 Mr. C. T. Musgrave, Godalming.—Alpine and herbaceous plants.
 Lieut. C. Narangajavana, Siam.—A collection of Orchids.
 Mr. Oliver, Belize, British Honduras.—A collection of Orchids.
 Messrs. Oliver & Hunter, Moniaive.—A collection of Herbaceous plants.
 Major A. Pam, Broxbourne.—A collection of un-named tuberous plants from British Somaliland.
 Mr. N. S. Pillans, Cape Province.—Bulbs, plants and seeds from the Cape.
 Mr. W. Robinson, East Grinstead.—Hardy trees and shrubs.
 Major Lionel de Rothschild, Exbury.—183 packets of seeds collected by Mr. George Forrest.
 Hon. Mrs. E. Ryder, Beaulieu.—Seedling *Mesembryanthemums*, miscellaneous plants and seeds.
 Messrs. Sanders, St. Albans.—Orchids, including *Calanthe cardiloglossis* and *Coelogyne elata*.
 Mr. S. G. Saul, Beckenham.—Plants and seeds from New Zealand.
 Mr. T. Sharp, Westbury.—Succulents.
 Mr. F. S. Sillitoe, Malta.—Plants of *Montanoa Schottii*.
 Mr. F. L. Skinner, Manitoba.—Seeds of North American plants.
 Mr. F. W. Smith, Cap d'Antibes, France.—Cuttings of *Pelargonium capitatum*.
 Lady Beatrix Stanley, Madras.—Bulbs and seeds of *Lilium neilgherrense*.
 The Earl of Stair, Lochinch Castle.—Bulbs of *Lilium formosanum*.
 Major F. C. Stern, Goring-by-Sea.—Seeds, including collections made by Capt. Kingdon Ward, plants, and bulbs of *Lilium giganteum* var. *yunnanense*.

Lord Stonehaven, Ury, Stonehaven, N.B.—A collection of seeds of Australian plants.

Mr. G. M. Taylor, Portobello, N.B.—Seeds of *Lilium* spp., and plants of the old English Rose "Seven Sisters."

Mr. G. Thornecroft, Barberton, Transvaal.—Seeds of *Streptocarpus Dunnii* and a plant of *Euphorbia Evansii*.

Lt. Col. E. E. Todd, Gibraltar.—Plants of *Iris scorpioides*, and seeds collected in Gibraltar.

Dr. W. B. Turrill, Kew.—44 packets of seeds collected in the higher Alps.

Messrs. Vilmorin-Andrieux et Cie, Paris.—Seeds.

Sir Oscar Warburg, Epsom.—Hardy trees and shrubs.

Mr. J. C. Watt, Aberdeen.—Seeds of *Rubus bogotensis* and plants of *Primula Calderiana* and *Rhododendron Wightii* var. *leucochorum*.

Miss E. Willmott, Warley Place.—Seeds, and cuttings of *Salix Meyeriana*.

Messrs. K. Yashiroda Ltd., Japan.—Seeds of Japanese plants.

Mr. W. B. Yates, Mold.—Seeds collected in the Amazon district.

DISTRIBUTION OF PLANTS AND SEEDS.—In connection with the annual exchange of seeds, 177 consignments comprising 9,605 packets (hardy trees and shrubs 3,689; herbaceous plants 5,916) were despatched from Kew in the early part of the year. The work of distributing seeds of Tung Oil was again undertaken, and involved considerable time and labour in arranging for despatch, packing and shipping.

Amongst the seeds specially distributed were:—*Fraxinus australis*, *Caesalpinia spinosa*, *Alysicarpus rugosus*, *Streptocarpus Dunnii*, ? new species of *Cephalostachyum* from Lower Burma, *Aesculus indica*, *Sorghum margaretiferum*, *Ilex paraguariensis* var. *miniata*, and a large collection of Leguminosae from Malta.

Extensive shipments of plants raised at Kew, necessitating in many instances the use of Wardian cases, took place during the year, the following being a brief summary of the places to which they were despatched.

Botanic Gardens:—Ootacamund and Singapore.

Government House, Kaduna, Northern Provinces, Nigeria; and Government House, Lagos, Nigeria.

Departments of Agriculture:—Gold Coast; Bermuda; British Guiana; British Honduras; Dominica; Tanganyika Territory; Ceylon; Trinidad; also to the East African Agricultural Research Station, Amani, Tanganyika Territory.

Advantage was taken of the Air Mail to East Africa in connection with the despatch of a small number of plants of *Pelargonium radula* var. *rosea*, to Nairobi, a larger number being sent later by sea.

Assistance was also given in the matter of receiving, caring for, and re-packing and despatching plants en route from one part of the world to another. These consignments included:—grafted walnut plants from France to Bhutan, India; a Wardian case of plants of

Derris malaccensis from Kuala Lumpur to St. Clair Experiment Station, Trinidad; plants of *Zizyphus Jujuba* bearing colonies of Lac insects to Ibadan, Nigeria; a Wardian case of tropical plants from Peradeniya to Sierra Leone; a Wardian case of plants of Julie and Sandersha mangos from Trinidad to Nairobi, also Japanese mint roots from the United States Department of Agriculture, Washington, to Nairobi. It is of interest to note that the plants of *Zizyphus*, referred to above, came from Ibadan, whilst the brood Lac, which was established on them at Kew, came by Air Mail from the Indian Lac Research Institute, Ranchi.

Other recipients of plants, etc., from Kew, included the following:—

Angora, British Embassy.—Shrubs and herbaceous plants.

Baarn, Holland, Phytopathologisch Laboratorium.—Grafts of species and varieties of *Ulmus*.

Bangor, University College of North Wales.—Plants and cuttings of succulents.

Berlin, Botanic Gardens.—Plants; collection of Rhododendrons.

Biggin Hill, Royal Engineers.—Collection of trees and shrubs for grounds adjoining new buildings.

Cambridge, Botanic Garden.—Plant and seeds, including plants of *Macrozamia Dennisonii* and *Bowenia serrulata*.

Chelsea Physic Garden.—Stove and greenhouse plants.

Chesterfield, Parks and Cemeteries Department.—Collection of economic plants

Copenhagen, Botanical Museum.—Plants, including collections of Begonias and Rhododendrons.

Edinburgh, Royal Botanic Garden.—Plants and seeds.

Farnborough, Kent, Downe House.—Collection of shrubs.

Fiji, Director of Agriculture.—Seeds of economic plants.

Glasnevin, Botanic Gardens.—Collection of plants and seeds.

Isle of Man, Government Secretary.—Collection of cuttings of basket willows.

Kornik, Poland, Gardens and Arboretum.—Grafts of *Prunus*, *Pyrus*, *Populus* spp., etc.

London, Hyde Park.—Plants.

Madras, Agri-Horticultural Society.—Tubers of *Nymphaea* spp. and seeds of *Nelumbium speciosum*.

Merton, John Innes Horticultural Institution.—Plants.

New York Botanical Garden, U.S.A.—Plants of *Drosera* spp.; cuttings and seeds of *Begonia* spp.

Ottawa, Central Experimental Farm.—Seeds of *Lilium* spp.

Oxford, Botanic Garden.—Plant of *Selaginella laevigata* var. *Lyallii*.

Paris, Museum d'Histoire Naturelle.—Collection of aquatic and economic plants, also cuttings of *Pyrus* spp.

Prague, Charles University Botanic Garden.—Collection of plants.

Pretoria, Department of Agriculture, Division of Plant Industry.—

Cuttings of *Salix caerulea alba* and seeds of *Aesculus indica*.

Princes Risborough, Forest Products Research Laboratory.—Collection of shrubs and creepers.
 Reading University, Horticultural Department.—Plants of *Lachenalia* spp.
 Seychelles, Department of Agriculture.—Fruits of *Raphia vinifera* received from Sierra Leone.
 Slough, Admiralty Compass Observatory.—Collection of trees and shrubs.
 St. Helena, the Horticultural Officer.—A collection of succulents, and of seeds of *Lilium* spp.
 Teddington, National Physical Laboratory.—Collection of trees and shrubs.
 Tenerife, Canary Islands (Jardin de Aclimatacion).—Plants, cuttings and seeds.
 Washington, U.S. Department of Agriculture.—Grafts of *Corylus* spp.
 Mr. G. P. Baker, Sevenoaks.—Plants, including *Metrosideros scandens* and *Ozothamnus obcordatus*.
 Mr. W. Cradwick, Mandeville, Jamaica, B.W.I.—Plants, bulbs and corms.
 Dartington Hall Ltd., Totnes, Devon.—Collection of plants, cuttings and seeds.
 Mr. C. S. Garnett, Derby.—Plants—*Bomarea Carderi*, *Aristolochia grandiflora* var. *Sturtevantii*.
 Hon. Vicary Gibbs, Aldenham.—Collection of trees and shrubs.
 Mr. Cecil Hanbury, La Mortola.—Plants and seeds.
 The Marquess of Headfort, Kells, Co. Meath.—Collection of plants, including conifers.
 Messrs. Mansell & Hatcher Ltd., Leeds.—Collection of plants—orchids, etc.
 Mr. W. J. Marchant, Staplehill, Wimborne.—Plants—*Lomatia fraxinifolia*, *Correa speciosa* var. *ventricosa*, *Lyonothamnus floribundus*, etc.
 Orange County Fern Growers Association, Florida, U.S.A.—Plants of 12 spp. of *Sansevieria*.
 Hon. Mrs. E. Ryder, Beaulieu.—Seedlings of *Lilium Brownii*; plants of *Berberis lologensis*, and species of *Erica*, *Calluna* and *Rhododendron*.
 Major H. F. Ward, Nairobi.—Plants—including *Mussaenda erythrophylla*, *Turnera ulmifolia* var. *elegans*, and seeds of *Rhodochiton volubile*.
 Messrs. F. Gomer Waterer's Knap Hill Nursery Ltd., Woking.—Plants, cuttings and seeds.

National Pinetum at Bedgebury.

The general condition of the young Conifers in the Bedgebury Pinetum throughout 1931 was satisfactory, although in some instances insect pests and fungus diseases were troublesome and a few plants were killed by them.

As the growing season was delayed by a cold spring, young shoots escaped injury from late frosts, which, in conjunction with the abnormally wet summer, resulted in healthy and vigorous growth, many of the stronger-growing species adding two feet or more to their height. Even in September growth was active, and, as there was a distinct tendency for the terminal buds of many species to break into new growth about the end of the month, it was feared that the wood would not become sufficiently ripened to withstand winter cold. However, the sunnier and drier weather of October, with several frosty nights, had a salutary effect, and although 18 and 19 degrees of frost were registered on successive nights serious injury to young shoots has not been noticed, although the younger leaves of *Rhododendron ponticum* and a few other species were discoloured.

Early in the summer several vigorous young trees lost their leading shoots, presumably through birds alighting upon them while they were soft. The worst sufferers were species of *Abies* and *Picea*. These trees will probably form new leaders but a year or two's growth will be lost. Some of the trees are far enough advanced for the removal of a number of the lower branches. In certain genera the object in view is to encourage the development of a definite length of trunk free from branches; in other cases pruning will be restricted to the correction of unequal development and to keeping leading shoots free from rivals.

As in the last two years, the most troublesome insect pests were green aphid on spruce and species of *Dreyfusia* on *Abies*. The former insect seems to breed throughout the year and, despite periodical spraying, new broods constantly appear, the source of infection being large trees in the vicinity that cannot be sprayed. A curious fact has been noticed in connection with *Picea sitchensis*, for, whereas planted trees are peculiarly susceptible to infestation by *Aphis abietina*, natural seedlings of the same species have either not been attacked, or the attack has been so slight as to escape notice.

Pine weevils and pine beetles which were so troublesome a few years ago have mostly disappeared, and although a few colonies of pine sawfly have been found, the early destruction of the caterpillars has kept the pest in check. Pine-shoot tortrix moth is still found, but hand-picking of affected shoots has prevented widespread trouble. Larvae of the moth *Dichomeris marginella* have been found in large numbers on various species of juniper. Their presence is noticeable by the matting together of clusters of leaves. As this moth attacks wild plants of *Juniperus communis*, it is likely to be a recurring pest. The larch shoot moth *Argyresthia laevigatella* was not so abundant as in previous years although its presence is still noticeable.

The most serious fungus diseases were honey fungus (*Armillaria mellea*), and Weymouth pine rust (*Cronartium ribicola*), and it is difficult to counteract their attacks, for in the one case there are hundreds of rotting tree stumps in the ground in which honey fungus is rampant, and in the other case it is impossible to eradicate currant

bushes from what is essentially part of the fruit producing district of Kent. Amongst trees lost through honey fungus was a very vigorous young tree of *Pinus Coulteri* 6 feet high, whereas several five-leaved pines have succumbed to Weymouth pine rust.

As various areas in the pinetum lend themselves to wild gardening effects at little more than the cost of planting, the Committee have arranged for grouping suitable plants on an extensive scale, keeping in mind the more attractive plants that are natural to the place. Already there are large areas of bluebells, foxgloves, violets, bugle, ladies' smock, ling and other plants. These are being encouraged and coarse weeds checked. By encouraging the development of ling during the last three years one of the avenues and some of the banks are now well covered, and the encouragement of primroses on a long grassy bank has also been attended by happy results. On the mud banks in Marshall's Lake masses of *Iris sibirica*, *I. Pseudacorus*, *I. orientalis*, *Primula japonica*, *P. pulverulenta*, *Senecio clivorum*, and *Mimulus luteus* have been planted, whilst in other places species of *Hemerocallis*, *Funkia*, and *Spiraea Aruncus* have been grouped. In a small plantation of oak left for purposes of shelter, it is hoped to establish a ground covering of lily of the valley. Amongst shrubby vegetation, masses of evergreen and deciduous rhododendrons, and mountain pines are being planted. These plants are either surplus stock from Kew or they have been given by interested people. It is hoped that the more vigorous exotic species will smother coarse weeds, be less susceptible to fire, and no more costly to control than strong grasses and other natural vegetation, whereas at intervals effective floral displays will be forthcoming.

In addition to the ordinary upkeep work of the past season the old and dangerous wooden bridge at the end of Marshall's Lake has been rebuilt, and 150 pipes have been laid in ditches crossing avenues as a commencement towards making the avenues more convenient for visitors.

During the year numerous people have been given permission to inspect the pinetum and a party of members attending the Annual Meeting of the British Association visited the place on September 26th. This party, consisting of botanists and foresters, expressed great satisfaction with what they saw. A party of Student Gardeners from Kew was taken to Bedgebury in April in connection with the course of lectures on arboriculture and forestry.

The Museums.

The volume of routine work, such as correspondence and the identification of specimens, maintained the high standard of the last few years, whilst there was an increase of visitors calling at the Museums for information upon the economic products of plants and other matters. Reciprocal work was also conducted between the Museums and the Forestry Commission, the Imperial Forestry

Institute, the Forest Products Research Laboratory and the Imperial Institute.

The overhaul of the specimens in Museum No. 1, begun in 1930, was completed. During this work the opportunity was taken of discarding duplicate specimens and of replacing some of the others by fresh material. It is hoped to replace the old dried specimens of drug plants by new samples during 1932.

A good deal of work was carried out in connection with the Arboretum Herbarium which is now included in the Museums Department. Several hundreds of new specimens were added and considerable progress was made in completing specimens where flowers or fruits were missing. A beginning was also made in building up a collection of dried specimens of Conifers for transmission to the National Pinetum at Bedgebury at some future date.

Considerable progress was made in indexing articles on plant products which have appeared over a number of years in various periodicals. Easy references to such articles is very necessary when abstruse questions from distant countries are under consideration.

During the year the following articles by members of the Museum staff appeared in the *Kew Bulletin*:—Keeper, The National Pinetum at Bedgebury, First Quinquennial Report; Mr. J. H. Holland, Introduction of Cinchona into India; Mr. F. N. Howes, The Loofah Industry; Mr. J. H. Holland also prepared an account of Ledger Bark and Red Bark which will be published in the same journal.

By permission of the Director a good deal of technical assistance was given to the Royal Horticultural Society in the preparatory work connected with the Conifer Conference held by the Society in November, and a paper was read at the Conference by the Keeper on the Economic Uses of the Coniferae. At the close of the Conference a large number of specimens was acquired for incorporation in the Herbarium Collections at Kew. By permission of the Director the Keeper responded to an invitation by the Council for the Preservation of Rural England to give an address upon "The Care of Trees on the Sides of Public Roads" at their Annual Meeting at Bath. The address was afterwards widely distributed by the Council. The Keeper has continued to act as Executive Officer for the Pinetum at Bedgebury.

Three hundred duplicate specimens were distributed to various schools and institutions and numerous specimens were acquired.

PRESENTATIONS TO MUSEUMS.—Among the numerous presentations the following are deserving of special notice:—

Chief Conservator of Forests, Gold Coast.—Case of 98 named hand specimens of Gold Coast Woods.

Director, Department of Agriculture, S. Rhodesia.—Seeds of five cultivated forms of *Phaseolus* spp.

Miss E. T. Masters, 9, Mount Avenue, Ealing, W.5.—Portrait of the late Dr. Maxwell T. Masters.

Mr. James Newton, 11 Perry Hill, Catford, S.E.6.—Four Show-cards of Commercial Plant Products as mounted for teaching purposes.

Mr. R. Barclay Fox, Penjerrick, Falmouth.—Four logs of wood of rare trees grown at Penjerrick.

Director, Imperial Institute.—Oil distilled from wood of *Fokienia Hodginsii* supplied from Kew.

Mr. S. L. M. Avery, Greystones, Longford Avenue, Southall.—Section of an oak beam taken from a building in Cheapside during alterations in 1929, the premises being part of a block of property that escaped the Great Fire of 1666.

Director, Botanic Garden, Singapore.—Sixteen hand specimens of timber.

Dr. I. B. Pole-Evans, Division of Plant Industry, Pretoria.—Set of photographs of *Welwitschia*.

Messrs. Wm. Hunt & Sons (The Brades Ltd.), Brades Steel Works, Nr. Birmingham.—Set of Forestry Tools to replace the former set in Museum No. 4.

The Director, Forest Products Research Laboratory, Princes Risborough.—Hand specimens of wood of three species of *Entandrophragma*.

Lt.-Col. Sir David Prain, The Well Farm, Warlingham.—Eight photographs of twisted trees.

Mr. F. S. Collier, Conservator of Forests, Victoria, Cameroons, W. Africa.—Seven specimens of wood.

Mr. R. E. Holtum, Singapore Botanic Gardens.—Twenty hand specimens of wood.

Messrs. Courtaulds Ltd., 16 St. Martin's le Grand, London, E.C.1.—Specimens of Rayon yarns and textiles made from Spruce wood.

The President and Council, Royal Horticultural Society.—Cut specimens of Conifers exhibited at the Conifer Conference.

Major V. B. D. Cooper, 22, Buckingham Gate, S.W.1.—Plant, dry stem and fibre of *Erbifex*.

Mrs. Hartshorne, 48, Fitzjohn's Avenue, N.W.3.—Twenty-eight drawings of Conifers and one photograph, originals of illustrations which appear in the *Pinetum Britannicum* edited by Edward Ravenscroft.

The Marquess of Headfort, Kells, Co. Meath.—Thirty photographs of Conifers growing at Kells.

The Jodrell Laboratory.

A collection of miscellaneous material, consisting chiefly of timbers, fibres, barks, and parts of plants used for medicinal purposes, has been examined with a view to identifying it from a study of its anatomy. Recently much valuable assistance in this work has been afforded by Mr. L. A. Boodle, the late assistant keeper of the

Laboratory. His long experience and unusually wide knowledge of anatomy have been of the greatest possible help.

A good example of the errors that may be avoided by the use of anatomical methods in the identification of timber is afforded by the following instance. It had been suggested that Columbian Red Cedar (*Thuja gigantea*), owing to its heat- and moisture-resisting properties, should be used to construct new staging in part of the Orchid House. During construction it was suspected that the Columbian Red Cedar supplied for the purpose was not all alike. Samples of it were accordingly examined and it was found that a certain proportion of the timber supplied was Douglas Fir, an unsuitable timber for the purpose.

It is evident that routine work could be considerably simplified by forming a collection of permanent microscopical preparations of authentically named specimens of the various woods, roots, barks, seeds, etc., for comparison with the material received for identification. Such a collection has been started, special attention having been devoted to timbers. This has been made possible by the use of the newly acquired apparatus mentioned in the report for 1930. A collection of microtome sections has been prepared, comprising mostly coniferous woods but including also many of the Meliaceae and a collection of Burmese and other miscellaneous woods. Slides of over 400 species from about 55 families, have been filed in special holders in a card-index cabinet, the families being arranged according to the "Genera plantarum," and the genera within the families in alphabetical order. A few of the slides have been acquired from the Forest Products Research Laboratory, Princes Risborough, and from the Imperial Forestry Institute, Oxford, with both of which institutions exchanges of slides have been effected. The wide scope of the enquiries received at the laboratory has necessitated the preparation of a card-index, in which papers which will be of use are filed, usually under the heading of both author and subject. It is hoped that this embryonic index may in time grow to be of considerable value in the work of the laboratory.

A visit was paid by the Assistant Keeper to the "Congrès International du Bois et de la Sylviculture" held in Paris from July 1st-6th, which was of especial interest as the occasion of the formation of an International Association of Wood Anatomists.

Investigations are in progress on the structure and taxonomy of little-known scented woods, chiefly from Bangkok, East Africa and India, and the comparative anatomy of the stem in the genus *Veronica*.

The following have worked at the laboratory during 1931:—Miss M. E. Odell completed her work on the cuticles of some modern and fossilized plants.

Mr. Garrett-Jones, general botanical studies.

Mr. F. M. T. Norstad worked on the embryology of the Campanulaceae.

Mr. C. V. B. Marquand studied the liverwort *Exormothea megastomata* Marquand.

Miss E. M. Wakefield has used the laboratory for the growth and examination of fungi in pure culture.

The Herbarium.

The year 1931 was chiefly occupied with an attempt to keep pace with the routine work of naming current collections and the completion of matters outstanding from the International Botanical Congress of 1930. Except for a few weeks before and after the Centenary Meeting in London of the British Association for the Advancement of Science, there were decidedly fewer visitors than usual, and this gave more opportunity to proceed with the work of naming very large collections recently acquired, chiefly through the assistance provided for travel by the Empire Marketing Board.

The congested state of the Herbarium and the urgent need of increased accommodation for the great number of accessions of specimens from all parts of the Empire was brought to the notice of the Royal Commission on Museums and Galleries in 1927 (*see Report of Oral Evidence*, p. 7). The Commissioners, fully realising the importance of the need of a new building, referred to the urgency of the matter in their Final Report (*see Final Report*, part II, p. 90). In view of the opinions expressed by the Commissioners, the Director set out the need in a minute to the Ministry and recommended that a new West wing should be added to the existing Herbarium building at right angles to the South wing, which was erected in the years 1901-3 under the Directorship of Sir William Thiselton-Dyer. Sanction was given to the proposal by the Treasury in 1930 and plans were drawn up for the new wing by Mr. J. H. Markham, H.M. Office of Works, in consultation with the Director.

Work was started on the new building early in 1931, Messrs. A. Roberts & Co., Ltd., of Kensington, being the Builders and Contractors. The actual building was completed towards the close of the year and certain internal fittings, such as heating apparatus, the electric light wiring and balustradings were installed. The completion of the interior and the installation of the other fittings will be carried out during the course of 1932, and it is hoped that the new wing may be ready for occupation during the summer.

The new West wing consists of four floors, instead of three as in the two existing wings, but the total height of the building is approximately the same. The cabinets will reach from floor to ceiling along the galleries surrounding the large well, which is provided with top lights. The passages around the galleries have been arranged on the outside of the supporting pillars, so that the bays, each of which has its own window, will be completely walled on either side by the cabinets. On each floor at the south end a private room has been provided. Access to the new wing will be from the west end of the South wing.

A further addition has been the provision of new lavatories on the ground and first floors, at the back of the Library corridor leading from the old East wing to the South wing. The stokehold also has been enlarged and rebuilt and a new heating apparatus installed.

EUROPE, NORTH AFRICA, AND THE ORIENT.

Over 12,000 sheets were mounted, poisoned, and incorporated in the Herbarium.

Considerable advance has to be recorded in rearranging genera in the General Herbarium. The following genera, amongst others, have been written up during the year according to recent monographs, standard lists, or floras:—*Ajuga*, *Carthamus*, *Centaureum*, *Echinops*, *Erigeron*, *Filago*, *Globularia*, *Hyacinthus*, *Lactuca*, *Lamium*, *Lythrum*, *Ornithogalum*, *Parietaria*, *Phlomis*, *Scilla*, *Scorzonera*, *Scutellaria*, *Sedum*, *Sideritis*, *Tragopogon*, and *Teucrium*.

The Balkan Peninsula again figures largely amongst the areas from which collections have been received. From Greece many valuable parcels have been received from Mr. S. C. Atchley, and Dr. P. L. Giuseppi presented his plants from Crete and Euboea. The Hon. H. G. Chick has commenced collecting in Greek Macedonia, and his activities have already enriched the Herbarium by species previously unrepresented. Mr. B. Gilliat-Smith has sent 300 sheets of Bosnian plants, and Mr. H. Griffith Tedd continues to explore with increasing interest and success the coastal and mountain areas of Thrace. Prof. Stoyanoff and Messrs. Stefanoff and Jordanoff have contributed rare Bulgarian plants.

Other important collections, apart from those purchased or obtained in exchange, were several useful consignments from the Island of Cyprus, to which special attention has been paid during recent years. Mr. C. H. Wyatt's Corsican collection included many endemics of rare occurrence, which were poorly represented in the old exsiccata. His specimens of *Crepis* afforded an opportunity for reduction of two supposed species, in which reduction Prof. Babcock concurs. From areas hitherto unexplored in Iraq the Rev. F. A. Rogers sent numerous parcels of plants which, moreover, were little represented in any herbarium. With his help and that of Mr. Evan Guest, of the Rustam Experimental Farm, a collection should be built up which will be most valuable when the time comes for the publication of a flora of this region. The Majorcan collections have been greatly enriched by the good specimens of Miss M. E. Edmonds and Mrs. N. E. Parry. An interesting collection from Jan Mayen was also received (*see p. 35*). From Algeria Colonel R. Meinertzhagen sent a collection of carefully prepared specimens of considerable interest from a little known district. A further well prepared collection by Mr. A. W. Trethewy from Morocco, coming as it does from a different area from his 1930 collection, included additional and interesting species, and does much to augment the Moroccan section of the North African flora in the Herbarium.

Miss E. Willmott presented to the Herbarium a collection of 840 specimens, made in the Pyrenees by Baron Philippe Picot La Peyrouse and given to her by M. Maurice Barbey de Bude. La Peyrouse (1744-1818) described many new species from this interesting region, and probably many of these specimens are syntypes.

The Government Botanist of Queensland, Mr. C. T. White, has presented a set of George Don's *Herbarium Britannicum*, fascicles I-VIII, containing altogether 200 sheets of specimens. Each fascicle comprises 25 sheets and was issued in book form with printed title-pages, the first dated 1804 and the last 1806. It appears from Dr. G. Claridge Druce's articles on George Don's life and work, published in the *Scottish Naturalist*, vols. vii and viii (1883-85), that a ninth fascicle of the *Herbarium Britannicum* was issued. Among the more interesting plants in the collection are *Eriocaulon septangulare*, from the Isle of Skye, *Eriophorum alpinum*, from near Forfar, long since extinct, the remarkable *Stellaria scapigera*, and *Potentilla opaca*, the last named being the only one of "G. Don's reputed discoveries" mentioned in the Appendix to Hooker's *Student's Flora*.

Research and Publications.—"Rorippa pyrenaica and closely allied species" (Bull. Soc. bot. Bulg. iv. 48: 1931).

"Vegetation of the Balkan Peninsula" (Journ. Ecol. xix. 217: 1931).

"Notes on new or rare Hyperica" (K.B. 1931, 29).

"On the Flora of the Nearer East, X." (K.B. 1931, 453).

"Climatic factors governing the distribution of plants" (Gard. Chron. xc. 313, 331: 1931). A paper read to Section K. of the British Association Centenary Meeting, London, 1931.

ASIA.

CHINA AND NORTHERN ASIA.—The rearrangement of the Chinese material of more than a dozen genera has been carried out, and several important genera have been written up from monographs. The routine work of the year has been marked by the large number of living specimens belonging to critical genera which have been received for identification, in addition to dried material forwarded from China. Many specimens have been sent on loan to various botanical establishments and have been returned with the monographer's observations. The extraction and return of this material entails much time, which is compensated for by the value of the identifications received, especially in the case of a flora such as that of China. Further progress has been made with the naming of Captain Kingdon Ward's collection from Upper Burma. In the course of identification of his plants it has been necessary to make detailed critical investigations of a number of genera, especially *Aconitum*, *Dentella* and *Leycesteria*.

Research and Publications.—Further research has been carried out on the Gentianaceae, and a systematic paper on all the cultivated

species is almost ready for publication. The following papers appeared during the year:—

"New Asiatic Gentians" (K.B. 1931, p. 68).

"*Allia praesertim Sinensia nova vel minus cognita*" (Notes Roy. Bot. Gard. Edinb. xvi. 135: 1931).

"The Botanical Name of the Japanese 'Old Woman' Lily" (K.B. 1931, p. 159).

INDO-MALAYA.—Owing to continued pressure on space, the bulk of the specimens from the Malay Archipelago and the Philippine Islands referred to in last year's Review still remain in the Store. Most of the current collections, however, have been incorporated in the Herbarium.

Important contributions were received from the Botanic Gardens, Singapore, the Forest Department of the Federated Malay States, the Forestry Department in British North Borneo, the Forest Botanist, Burma, and the Government Systematic Botanist, Madras. A collection made in the South Lushai Hills of Assam was presented by the Rev. W. J. L. Wenger.

Research and Publications.—Part IX. of the Flora of the Presidency of Madras, comprising the families *Commelinaceae* to *Cyperaceae*, was published early in the year. The preparation of the last family, the *Gramineae*, is well in hand. The review of the collection of plants sent by Koenig to Retzius, referred to last year, has been completed; it is hoped to publish the results early in 1932.

The following publications prepared wholly or in part at the Kew Herbarium have appeared during the year:—

"Dioscorea: section Stenocorea," by D. Prain and I. H. Burkill (K.B. 1931, p. 88).

"Dioscoreae Novae Asiaticae," by D. Prain and I. H. Burkill (K.B. 1931, p. 245).

"Additions to the Flora of Borneo and Other Malay Islands: II," by H. N. Ridley (K.B. 1931, p. 33).

"Contributions to the Flora of Siam," by W. G. Craib and E. T. Geddes, Additamenta XXX., XXXI., and XXXII. (K.B. 1931, pp. 206, 275 and 441).

"Introduction of Cinchona to India" (K.B. 1931, p. 113).

"Contributions to the Flora of Burma: IX." (K.B. 1931, p. 26).

"Plants new to Assam: III." (K.B. 1931, p. 281).

AFRICA.

As is usually the case the African staff has been mainly engaged in naming current collections, of which there have been large and very numerous consignments during the year. Nearly 10,000 specimens have been received for determination from Tropical Africa, mainly from East Africa.

Considerable progress has been made towards the completion of Vol. IX., Part V. of the Flora of Tropical Africa and it is hoped that this will be ready for the press early in 1932. The last Part of the

Flora of West Tropical Africa has been proceeded with, and now only the Cyperaceae and Gramineae remain to be worked out. Advantage was taken of a visit by Mr. George Rattray, of East London, Cape Province, whose field-knowledge of South African Cycads is well known, to secure his collaboration with Mr. J. Hutchinson in preparing an account of this family as a Supplement to the Flora Capensis. The Government of the Union of South Africa has kindly consented to assist financially in the publication of this supplemental volume.

WEST TROPICAL AFRICA.—Now that the publication of the Dicotyledons in the Flora of West Tropical Africa has been completed, determinations of collections from this area have been greatly facilitated. Some important additional species from remote districts have been received, however, which will be included in the Addenda at the end of the work. These include the late Major Chipp's collection from the Hoggar Mountains, Central Sahara, and that of Colonel R. Meinertzhagen from the same region. They add a fairly considerable Mediterranean element to the Flora, and require very critical examination.

Messrs. F. C. Deighton and R. R. Glanville have, as before, contributed important collections from Sierra Leone, including economic and cultivated plants for determination. Gold Coast plants have been received from Mr. T. Lloyd Williams, Mr. A. S. Thomas and Dr. F. R. Irvine, but the bulk have come through the Imperial Forestry Institute, Oxford. Mr. H. V. Lely continues to add species to the Flora from the Bauchi Plateau, and all his recent collections will need to be worked out critically for the Addenda of the West African Flora, since they approach the eastern boundary. The same treatment will be accorded to Mr. T. D. Maitland's large collections from the British Cameroons, whence additional species may be expected for a long time to come. From Nigeria Mr. J. D. Kennedy and Mr. F. H. Espley have contributed small collections from the forest region, whence good specimens are much to be desired.

CAMEROONS AND CONGO.—Whilst fairly good collections of plants exist from the Cameroons, the Congo flora is still very poorly represented in the Herbarium. Collections are particularly needed from the regions of the Congo bordering on the great lakes and the Rift Valley and from Katanga. The incorporation of Kässner's plants during the year has filled some blanks, but many more specimens are needed. A consignment of 94 Compositae from various localities near the western shore of Lake Tanganyika was received from the Musée du Congo Belge, Tervueren, Belgium. These are well prepared specimens and have proved to be of considerable interest, largely supplementing Kässner's collection.

NORTH-EAST TROPICAL AFRICA.—From the Sudan, Major G. Aylmer has sent over a hundred plants requiring critical determination, and in the southern area Mr. G. O. Whitehead made a small

collection. Mr. N. D. Simpson has added nearly 200 specimens from his investigation of the flora of the Nile Basin.

EAST TROPICAL AFRICA.—The East African Mountains continue to interest travellers and botanists. On Mt. Elgon Major E. J. Lugard made a very large and representative collection, which will be particularly valuable for the contemplated Flora of East Tropical Africa. Specimens of about 700 numbers were gathered, and it has been possible to make two duplicate sets. It is expected that a number of novelties will be present in this collection. Messrs. G. W. L. Fishlock and G. L. R. Hancock collected a valuable series of specimens from the higher altitudes of Ruwenzori, paying special attention to the arborescent Senecios. Miss E. R. Napier has continued to send consignments from Kenya Colony forwarded on behalf of various collectors. The number of specimens from the Forestry Department has decreased considerably, since the forest flora is now so much better known.

Valuable specimens from Uganda were received from Mr. J. D. Snowden before his retirement, and later from Mr. C. G. Hansford.

The largest collections from Tanganyika Territory were made by Mr. B. D. Burtt in the Shinyanga district, in addition to a fine series from the little explored Virunga Mountains, on which he collected with the assistance of a grant from the Empire Marketing Board. Mr. A. E. Harper and Mr. P. J. Greenway continued to send large series of rare or critical species, the latter including a selection of old material from the Amani herbarium. An important contribution of about 1000 sheets from the islands of Pemba and Zanzibar was received from Mr. J. H. Vaughan. These and Mr. Greenway's plants from the same islands will be included in the Flora of Zanzibar, which it is proposed to publish from the Amani Institute.

SOUTH TROPICAL AFRICA.—The determination of the Rhodesian plants collected by Mr. E. Milne-Redhead and by Mr. J. Hutchinson has been proceeded with, together with that of those collected by Dr. I. B. Pole-Evans during General Smuts' expedition in 1930 (see *K.B. Annual Review* 1930, p. 3). Advantage has been taken of the study of these large collections to revise critically much of the Rhodesian material already incorporated in the herbarium, and to determine a number of small collections awaiting identification in the Stores.

Several new collections were also received from Rhodesia during the year. From a distributional standpoint, a consignment of plants made by Señor A. F. de Gomes e Sousa near the Portuguese border of Swaziland proved of considerable interest. Mr. J. Gossweiler contributed a fine collection of about 350 specimens from Angola.

Research and Publications.—A revision of the East African species of *Canthium* has been prepared, and the following papers were published :—

"Flora of the Libyan Desert" (*K.B.* 1931, 161).

"General Smuts' Botanical Expedition to Northern Rhodesia" (K.B. 1931, 225).

"The Genus *Kraussia*" (K.B. 1931, 254).

"Tropical African Plants: VIII" (K.B. 1931, p. 270).

"The Arborescent *Senecios* of the Virunga Mts." (K.B. 1931, p. 289).

"The Genus *Haplocoelum*" (K.B. 1931, p. 353).

"African Orchids: II" (K.B. 1931, p. 378).

"North Eastern British Somaliland" (K.B. 1931, p. 401).

"The Genera *Tinnea* and *Renschia*" (K.B. 1931, p. 455).

SOUTH AFRICA.—Mr. E. E. Galpin continues to take an active interest in botanical collecting, and about 400 of his specimens have been received from the National Herbarium, Pretoria. An equal number has been presented by Dr. H. G. Fourcade, of Witte Els Bosch. Through Miss W. Barker, attached to the Bolus Herbarium in the service of Kew, by the aid of the Bentham Trustees, the Herbarium has benefited to the extent of about 400 beautifully dried plants, mostly of rare species grown at Kirstenbosch and raised from wild seed or bulbs. Amongst these was a large number of Monocotyledons with fugitive flowers difficult to dry properly in the field. Rare plants, including syntype specimens, have been sent by Mrs. F. Bolus, Mrs. M. R. Levyns, Mr. T. P. Stokoe and Mr. G. Thorncroft. Stimulated by the visits of various botanists, especially from Kew, Mr. F. R. Long, in charge of the Public Parks and Municipal Lands at Port Elizabeth, has commenced a local herbarium, from which Kew has received over 400 well dried specimens, which are of interest since they come from the transitional floral belt between the western and eastern regions of South Africa. A particularly valuable set of South African *Oxalis* was received from Captain T. M. Salter, consisting of some 165 beautifully dried specimens, including many rarities and some undescribed species.

Research and Publications.—Some progress has been made by the Assistant for South Africa, Mr. R. A. Dyer, with a Flora of the Albany and Bathurst Divisions of the Eastern Cape Province, during the time available from the naming of critical specimens and other routine work.

"Further Notes on *Lachnopylis*" (K.B. 1931, p. 39).

"A new *Harveya* from the Transvaal Highveld" (K.B. 1931, p. 65).

"*Palmstruckia* of the Flora Capensis" (K.B. 1931, p. 154).

"Notes upon South African Plants" (K.B. 1931, p. 191).

"Suggested Conservation of *Pollichia*" (K.B. 1931, p. 198).

AMERICA.

During the past year nearly 11,000 specimens have been mounted, and about 8000 sheets have been incorporated in the Herbarium. A number of valuable accessions have been made to the tropical

American collections, the more important being a series of duplicates from the Amazons, collected by Dr. A. Ducke, received in exchange from the Jardim Botânico, Rio de Janeiro; from Surinam, received from the Rijks Universiteit, Utrecht; from Cuba, collected by Dr. E. Ekman, contributed by the Riksmuseum, Stockholm; from various parts of tropical America, presented by the Field Museum, Chicago; and from North America, presented in exchange by the Missouri Botanical Garden. In addition further interesting parcels of plants were received from Mr. R. O. Williams from Trinidad; and from British Guiana, some collected by the Government Botanist and others by officers of the Department of Forestry. The purchase of nearly 750 specimens collected in Haiti by Mr. E. C. Leonard greatly improved the representation of the flora of that island; while other useful purchases were those from Schipp (British Honduras) and from Mr. J. W. Thompson (Olympic Mts., Washington).

The determination of the collection made in British Guiana in 1929 by the Oxford Expedition has been practically completed, this being the main piece of work accomplished during the year. The naming of the *Bignoniaceae* was attended with special difficulty, as this family is perhaps the least known of any in tropical America. Other collections from British Guiana have also been identified and incorporated. The residuum of important old collections made in tropical America, such as those of Ule, Tonduz, and Langlassé, has now been named and laid in. No time was available for the naming of plants from temperate America, owing to the more urgent need for the revision of tropical material already in the Herbarium, and for the incorporation of outstanding tropical collections. A very large number of undetermined *Rubiaceae* from East Tropical America were determined by Dr. Paul C. Standley, of the Field Museum, Chicago, to whom they had been sent on loan.

A particularly valuable set of specimens was received from Miss L. A. Boyd after her 1931 expedition to North-east Greenland. The collection consisted of a series of flowering plants in very fine condition from Franz Josef Fjord and also a small series from the island of Jan Mayen. The main collection is preserved at the California Academy of Sciences, San Francisco, and a practically complete set of duplicates was presented to Kew.

Research and Publications.—The series of papers dealing with the botanical results of the Oxford University Expedition to British Guiana has been continued as follows: "The Baromallis of British Guiana" (K.B. 1931, p. 46); "Saprophytes collected by the Oxford University Expedition to British Guiana, 1929" (K.B. 1931, p. 54); "New and Noteworthy species from British Guiana, Dilleniaceae-Connaraceae" (K.B. 1931, p. 170); "New and Noteworthy Leguminosae and Rosaceae from British Guiana" (including a key to the British Guiana species of *Eperua*) (K.B. 1931, p. 357). An investigation into the taxonomic limits, synonymy and geographical

distribution of the "Tara" tree of Peru, the pods of which are employed in tanning, appeared under the title "The Botanical Name of 'Tara'" (K.B. 1931, p. 91).

AUSTRALIA AND OCEANIA.

During the year various large miscellaneous collections have been received, totalling over 14,000 numbers in all, needing accurate determination.

The most outstanding of these collections was that made by Mr. C. E. Hubbard during his year's visit to Australia. This comprises over 6600 numbers, and about 75,000 specimens, most of which were gathered in Queensland. In addition Mr. Hubbard was kindly permitted by the Government Botanist (Mr. C. T. White) to extract duplicates of grasses from the Brisbane Herbarium, the total number so received being 1800. Since then, Kew has received from Mr. C. T. White many further collections of grasses, from various parts of Queensland, including a considerable number collected by Mr. L. J. Brass on the Gilbert River, and from other regions little known botanically.

Another important collection presented was the Herbarium of Mr. H. A. Longman, Director of the Queensland Museum, Brisbane. This includes over 1300 gatherings from Queensland and New South Wales and is a welcome and valuable gift.

Mr. C. T. White has further contributed an extremely valuable set of duplicates of types of Australian and Papuan species described by himself and Mr. W. D. Francis, most of which were previously unrepresented in the Kew Herbarium.

Other collections of Queensland plants were presented by Mrs. E. Thompson and by Mr. G. K. Jackson, while a particularly interesting set of duplicates of N. Queensland plants collected by Mr. S. F. Kajewski was received in exchange from the Arnold Arboretum.

Dr. F. A. Rodway of Nowra has continued to send useful consignments of New South Wales plants, while other collections from this State include specimens of grasses from the New England district by the Rev. E. N. McKie, and others presented by the Director of the National Herbarium, Sydney. A valuable series of New South Wales grasses, mostly from the vicinity of Sydney and the Blue Mountains, was presented for determination by Miss J. Vickery.

Victorian plants are represented among a large collection of duplicates from Dr. C. S. Sutton's herbarium, together with other plants from Tasmania and a smaller number from elsewhere. Further instalments of Tasmanian plants have also been purchased from the Tasmanian Museum.

One of the most interesting collections received during the year is the remainder of the plants, about 300 numbers, collected on the Mackay Exploring Expedition in northern South Australia and Central Australia by Dr. H. Basedow and presented by him. Many

of these were collected in areas previously unexplored botanically. Dr. Basedow also presented the specimens collected by him on the South Australian Medical Relief Expedition to the Aborigines in 1919. Dr. J. B. Cleland again generously presented about 600 duplicates of specimens from Central and South Australia, the majority of these being grasses.

Collections of South Australian plants were also received from Messrs. J. M. Black, E. H. Ising, J. F. Bailey, T. B. Paltridge and Dr. R. H. Pulleine, many of these being either very rare species or coming from localities of which the flora is very poorly known. Mr. Hubbard on his return journey made collections at different places along the Transcontinental Railway, particularly interesting plants being obtained at Barton, Hughes and Forrest.

Altogether, the Australian collections received represent a considerable addition to the Herbarium, not only as to the number of species, but also as extending the representation of their distribution.

From New Guinea a considerable collection, made by Mr. Gregory Bateson on the Sepik River during his anthropological studies, was received and named.

Publications.—"The Buttresses of Rain Forest Trees" (K.B. 1931, p. 24).

"A Raining or Weeping Tree in Australia" (K.B. 1931, p. 156).

"Two New Rutaceae from Queensland and New Guinea" (K.B. 1931, p. 188).

"Eucalyptus patellaris" (K.B. 1931, p. 285).

"The habitat of *Patersonia macrantha*" (K.B. 1931, p. 285).

"Notes on some Australian Monimiaceae" (K.B. 1931, p. 457).

OCEANIA.—The specimens of *Ficus* collected in the New Hebrides on behalf of the Arnold Arboretum have now been nearly worked out, and it is hoped to publish an account in the near future. A number of new species has been detected.

An important collection of Tongan plants was received from Prof. W. A. Setchell, and has been for the most part named. It is intended to work up the Tongan species of *Ficus* when those of the New Hebrides are completed, and Dr. Setchell has kindly sent on loan for this purpose all the material in the Californian Herbarium. Collections have also been received from the New Hebrides (Miss L. E. Cheesman) and from New Britain (Mr. G. Bateson).

Additional instalments of plants from Bougainville Island have been received from Mr. J. H. L. Waterhouse, who for some years has been collecting with the aid of a grant from the Empire Marketing Board. This collection now contains over 550 numbers, and is an important contribution from a flora which is very imperfectly known.

Further valuable collections of Fijian plants have been received from Mr. W. Greenwood and from Mrs. C. J. Parham, the latter from Vanua Levu, which is little known botanically.

PTERIDOPHYTA, THALLOPHYTA.

PTERIDOPHYTA.—There have been few large additions to the fern collection during the year, though several hundreds of specimens in small lots have been received. Two Jamaican collections were presented, one of 276 specimens by Mr. C. R. Orcutt, and another of 200 by Mr. Barclay Brown, through Toc H. Another smaller West Indian collection of 76 specimens was received from Miss E. M. Wakefield, who collected mainly in Trinidad and Dominica.

Mr. R. C. Ching prolonged his stay at Kew until May and continued his study of the Chinese Pteridophyta. At the same time he was able to revise the bulk of the Chinese fern herbarium of the Edinburgh Botanic Garden, which was forwarded to Kew for that purpose.

Over 2000 sheets were laid in during the year, the remainder of the material awaiting incorporation being housed in a special cabinet in alphabetical sequence of genera. No further re-arranging of the collections in accordance with Christensen's Index Filicum has been carried out this year.

FUNGI.—During the early part of the year considerable time was spent in rearranging certain groups of Ascomycetes in the Herbarium. In the old Saccardo arrangement the genera of comparatively recently distinguished families, such as the Microthyriaceae, were found scattered amongst the Perisporiaceae, Dothideaceae and Hysteriaceae. These have now been brought together and arranged on the basis of the latest Ascomycete Supplement (Vol. XXIV. of Saccardo's Sylloge). At the same time the genera still remaining in the Perisporiaceae were put in order, and certain small groups of Discomycetes, such as the Myriangiaceae, were also brought together. Although no attempt has been made to rearrange species, the genera included in these families will now be more easily available for consultation.

A considerable amount of material has again been added to the collections in the course of the year. Mr. E. J. H. Corner has continued to send Singapore Polyporaceae. The specimens are well chosen to illustrate variations in each species and are accompanied by valuable notes taken from the fresh specimens. Other important collections have been received from Uganda (Mr. C. G. Hansford), Rhodesia (Mr. J. C. F. Hopkins), Cameroons (Mr. T. D. Maitland), and India (Professor S. R. Bose, and Messrs. J. C. Sengupta and R. N. Parker), and Mr. R. N. Nattrass has made a beginning with the fungi of Cyprus. British fungi collected during forays have been added, in particular several interesting species collected during the foray of the British Mycological Society at Belfast.

Miscellaneous queries dealt with during the year were of the usual varied type, and much time has been spent in providing assistance to research workers at home and abroad by the examination of type specimens, and by loans of herbarium material, as well as by assistance in the naming of critical species. Among the more interesting

questions which were raised was one concerning a fungus, found in the gut of mosquito larvae, which was submitted by the Mosquito Control Institute at Hayling Island. This fungus has been submitted to experts in entomogenous fungi but was not recognised. It appears to be entirely new to Science and probably represents a new genus.

Work has been continued at intervals on the British Guiana fungi collected in 1929 by the Oxford University expedition, which have been supplemented during the year by interesting species sent by Mr. E. B. Martyn, the Mycologist for British Guiana.

BIOLOGICAL AND GENETICAL HERBARIA.

About 1500 specimens have been added to these collections during the year. These include: (1) further series illustrating the vegetation of Richmond Park and of the land-slide on the south coast of the Isle of Wight, (2) fine series from Mr. Edgar Thurston illustrating the life-histories of Cornish plants, (3) specimens of *Anthyllis*, *Silene*, *Centaurea*, *Saxifraga*, *Ranunculus*, and *Digitalis*, recording breeding and field studies.

SUMMARY.

The routine work, apart from naming, accomplished by the regular staff and by the special Store Staff during 1931 is summarised as follows:—

Mounted	...	...	...	...	50,000 (approx.)
Incorporated	...	...	...	...	40,829
Duplicates distributed	...	...	...	...	5370
Specimens received on loan	...	...	...	...	7390
Specimens sent out on loan	...	...	...	...	7451
Specimens presented or purchased	...	...	...	...	141,945

ILLUSTRATIONS AND PHOTOGRAPHS.

The Artist has been occupied chiefly with the preparation of plates from dried specimens for publication in the *Icones Plantarum*, Vol. II., part iii., which will be published early in 1932. In addition, drawings in colour and in monochrome have been made for the Herbarium collection.

About 250 herbarium sheets (mostly of type specimens borrowed from Continental and other herbaria) have been photographed for the Kew Collection, and approximately 700 Kew sheets have been photographed for other Institutions. A commencement has been made with the arrangement and indexing of photographic negatives in the Jodrell Laboratory.

In the course of private investigations the Artist has developed a method of photographing dried specimens on a smaller scale than is usual and of making positives by enlarged projection-printing. When suitable apparatus can be purchased, the introduction of this system will result in a considerable saving of cost in production of photographs of herbarium sheets.

The part-time services of Miss S. Ross-Craig have been enlisted by the Bentham Trustees to prepare some of the drawings for the *Icones Plantarum*, the *Kew Bulletin*, and the *Flora of West Tropical Africa*.

The drawings and photographs of plants received during the year include 70 original coloured drawings prepared for the *Botanical Magazine*, and 23 photographs, presented by the Royal Horticultural Society; 33 photographs of trees in the Adelaide Botanic Garden, from Mr. J. F. Bailey; 41 photographs mostly of type specimens of species of *Cordia* and *Pilea* from the Smithsonian Institution, Washington; 30 coloured plates from the *Flowering Plants of South Africa*, from Dr. I. B. Pole Evans; 16 proof plates of species of *Dioscorea*, prepared for the *Annals of the Royal Botanic Garden, Calcutta*, vol. xiv., from Mr. I. H. Burkill. Nineteen stereo-negatives of Australian Orchids have been purchased from Mr. T. Green, and 61 photographs of type and other specimens of *Aegiphila*, from Mr. H. L. Moldenke, and others from various sources.

The incorporation in the collection of the very numerous drawings and photographs received annually has been for a long time in arrears owing to pressure of other work. Thanks to the Bentham Trustees, Miss S. Wilson is now engaged on the work of mounting and arranging the drawings and it is hoped it will be possible to put the whole collection in working order.

The Kew collection of portraits of botanists has been enriched by the presentation, by Prof. R. E. Fries, of over 150 duplicates from the fine collection of portraits at the Bergielund Botanic Garden, Stockholm. Among them are several of Linnaeus and a number of old prints of some of the early herbalists. Swedish botanists are well represented in the collection and include J. G. Agardh, A. G. Nathorst, C. F. O. Nordstedt, Th. M. Fries, Th. C. E. Fries, and the donor, of whom there is an excellent photograph. Many of the portraits are taken from the third volume of the *Acta Horti Bergiani*. Other portraits received are of Dr. G. Claridge Druce and Mr. J. F. Bailey; and a coloured photograph, autographed and framed, of Samuel Curtis, at one time proprietor of Curtis's *Botanical Magazine*, together with a framed photograph of the "Trade Card" of William Curtis, which was probably used by him as a bookplate, have been presented by Dr. Henry Curtis, F.R.C.S.

A collection of 99 portraits, many of which have been reproduced from portraits at Kew, has just been published for the Royal Horticultural Society by Messrs. Quaritch in a volume entitled "*Curtis's Botanical Magazine Dedications, 1827-1927: Portraits and Biographical Notes*," compiled by Ernest Nelmes and William Cuthbertson. The volume opens with a portrait and biographical notice of William Curtis, the founder of the *Magazine*. The conception of this interesting volume, of which a copy has been received from the Royal Horticultural Society, is due to Mr. Cuthbertson, and the biographies have been prepared by Mr. Nelmes.

NOMENCLATURE AND BIBLIOGRAPHY.

Many enquiries concerning questions of nomenclature, received from correspondents both at home and abroad, have been dealt with, and references to the places of publication of numerous obscure names have been traced and supplied.

At the request of the Empire Forestry Association the scientific names in the List of Trade Names of Empire Timbers published in the *Empire Forestry Handbook*, 1931, were checked, and various amendments were suggested.

A copy of the proofs of the late Dr. Briquet's Report of the Nomenclature Proceedings of the Fifth International Botanical Congress was read for the press by Dr. Sprague. This Report will form the basis of the Third Edition of the International Rules.

The preparation of a list of well-known generic names which are later homonyms has been commenced. At the Cambridge Congress it was agreed to reject later homonyms on the definite understanding that any well-known generic names which would consequently be invalidated under this rule should be conserved.

Publications.—A paper dealing with the History and the Rules of Nomenclature appeared in the *Empire Forestry Journal*, x. No. I. pp. 54-72 (1931).

Under the heading "Additions to the *Index Kewensis*: XI." an account of Griffith's *Itinerary Notes* (Posthumous Papers, ii. ed. J. McClelland, 1848) was given in *K.B.* 1931, pp. 199-201.

INDEX KEWENSIS.

Throughout the year the work of compiling the *Index Kewensis*, Supplement VIII, has continued steadily. The present number of entries reaches about 28,000, and it is hoped that the preparation of the manuscript for the Press will be started early in 1932.

It may be noted that during the quinquennium covered (1926-30), an unusual number of new periodicals has appeared, such as: *Cavanillesia* (1928); *Journal of the Cactus and Succulent Society of America* (1929); *Bulletin de la Société Botanique de Bulgarie* (1926), and *Archives de Botanique, Caen* (1927). Although the number of new names contained in these periodicals may not be great, the time taken in going through them is considerable. About one month's work has been done in the Library of the British Museum (Natural History), where numerous periodicals not received at Kew have been searched.

The duplicating of the Card Catalogue has been commenced and will be completed early in 1932. For this work the Clarendon Press are generously making a grant in aid.

EXPERIMENTAL WORK.

The work at Potterne has been continued satisfactorily despite the unfavourable weather conditions. Research on *Ranunculus*

Ficaria is being extended by Mr. Marsden-Jones to include pollination studies. Back-cross and other generations involving *Saxifraga potternensis* were scored and large generations of seedlings have been raised for investigation in 1932.

Research on *Centaurea* was concentrated on floral characters of an intraspecific nature, including corolla-development and sex. New crossings and selfings were made, and many hundreds of plants were scored. *Ranunculus* sex-studies are awaiting cytological interpretation.

Large generations of *Silene*, both of bred and immediate wild origin, were scored and new crossings and selfings were made. Mr. Marsden-Jones studied a wild population of *S. vulgaris* in Berkshire, and Dr. Turrill spent three weeks in the French Alps investigating the occurrence of the Alpine varieties of *Silene* and their altitudinal and ecological distribution. As a result, large collections of herbarium specimens and of seed for raising fresh stocks have been received at Kew.

In the Herbarium Ground many plants from Persia and the Balkan Peninsula have been grown, in addition to material connected with the Potterne experiments. Two groups (each of 100 plants), of *Plantago maritima* have been grown for Dr. J. W. Gregor, of the Corstorphine Plant Breeding Station, with interesting results.

Publications.—"Researches on *Silene maritima* and *S. vulgaris*: V." *K.B.* 1931, 118; VI. *K.B.* 1931, 345; VII. *K.B.* 1931, 391.

"Biological races in seed-bearing plants and their significance in evolution" (*Ann. Appl. Biol.* xviii. 442: 1931).

"Flower mutations in the primrose" (*New Phyt.* xxx. 284: 1931).

"Species studies in plants" (*Rep. Bot. Exch. Club* 1930, 416: 1931).

TRANSPLANT EXPERIMENTS.

The second of the biennial series of reports has been prepared for publication in a forthcoming number of the *Journal of Ecology*. The 1931 results have been of exceptional interest on account of the number of factors recorded and the study of death-rates and their causes.

A plant of *Fragaria* has been cloned for transplanting early in 1932 and the Transplant Committee has also decided to experiment with material of diploid and hexaploid *Phleum pratense*.

VISITORS.

The number of signatures in the Visitors' book for 1931 was 5154. The following were amongst the most noteworthy or frequent visitors to the Herbarium:—

Mr. W. E. Bassett, late of Victoria Botanic Gardens, Cameroons, Mr. E. G. Baker, Mr. W. J. Bean, Mr. L. A. Boodle, Dr. F. Boergesen, Botanical Museum, Copenhagen, Mr. N. E. Brown, Prof. A. H. R. Buller, University of Manitoba, Winnipeg, Mr. I. H. Burkill, Dr. J. Burt Davy, Imperial Forestry Institute, Oxford, Dr. E. J. Butler, Imperial Mycological Institute, Kew.

Miss M. E. J. Chandler, Mr. R. C. Ching, Academia Sinica, Nanking, China, Prof. W. Y. Chun, Botanical Institute, Sun Yat-Sen University, Canton, Chaplain and Mrs. J. Clemens, Prof. W. G. Craib, Cruickshank Botanic Garden, Old Aberdeen, Mrs. J. W. Coombs, Botanical Garden, Bronx Park, New York.

Dr. J. M. Dalziel, Dr. and Mrs. B. H. Danser, University of Groningen, Holland, Mr. G. D. Darker, University of Toronto, Mr. H. N. Dixon, Dr. and Mrs. G. Du Rietz, The Royal University, Uppsala.

Dr. H. G. Fourcade, Prof. R. E. Fries, Bergianska Trädgården, Stockholm.

Mr. P. J. Greenway, East African Agricultural Research Station, Amani, Mr. W. B. Grove, Prof. T. H. Goodspeed, University of California.

M. Liou Ho, Saigon, Cochin China, Dr. D. Hooper, Mr. A. C. Hoyle, Imperial Forestry Institute, Oxford, Mr. R. E. Hunter, Imperial College of Tropical Agriculture, Trinidad.

Prof. M. O. P. Iyengar, Presidency College, Madras.

Miss M. C. Karsten, Gelderland.

Mrs. M. R. Levyns, The University, Cape Town, Dr. R. Lloyd Praeger, Dublin, Mr. T. Lloyd Williams, Department of Agriculture, Gold Coast.

Mr. E. W. Mason, Imperial Mycological Institute, Kew, Dr. A. Meebold, Heidenheim, Württemberg, Col. R. Meinertzhagen, Dr. Franklin P. Metcalfe, Lingnan University, Canton, Dr. P. A. Munz, Pomona College, Claremont, California.

Mr. C. Norman.

Miss M. W. Parke, Marine Biological Station, Port Erin, Mr. R. Paulson, Mr. T. Petch, Mr. W. R. Price, Mr. H. W. Pugsley.

Mr. George Rattray, East London, S. Africa, Mrs. E. M. Reid, Mr. P. W. Richards, Botany School, Cambridge, Mr. H. N. Ridley, Prof. W. Robyns, Jardin Botanique de l'Etat, Brussels, Mr. N. V. Rounce, Department of Agriculture, Tanganyika Territory.

Capt. T. M. Salter, Cape Town, Dr. G. Samuelsson, Naturhistoriska Riksmuseet, Stockholm, Mr. A. C. Smith, New York Botanical Garden, Prof. N. J. G. Smith, Rhodes University College, Grahamstown, Mr. J. D. Snowden, late of Agricultural Department, Uganda. Dr. O. Stapf and staff for Index Londinensis and Botanical Magazine.

Mr. C. G. Trapnell.

Dr. G. B. Wallace, Department of Agriculture, Tanganyika Territory. Dr. T. Wiśniewski, University, Warsaw, Lt.-Col. A. H. Wolley-Dod.

ADDITIONS TO HERBARIUM.

The total number of specimens received during 1931 was about 142,000, of which 2830 were purchased. The chief sources from which they were obtained are given below.

EUROPE.—*Presented*: Great Britain, by Messrs. F. Ballard, A. J. Crosfield, F. Druce, T. A. Dymes, G. H. Gooder, A. R. Horwood, J. E. Little, E. M. Marsden-Jones, R. Melville, E. Milne-Redhead, E. Nelmès, W. E. Nicholson, N. Y. Sandwith, H. K. A. Shaw, E. Thurston, C. H. Wright, Rev. F. A. Rogers (Algae), Dr. G. C. Druce, Dr. T. A. Sprague, Dr. W. B. Turrill, Lady Douie, Miss Ida M. Hayward (per Dr. G. C. Druce), Mrs. C. Sandwith, Miss E. M. Wakefield (fungi), the Botanic Museum and Herbarium, Brisbane, per Mr. C. T. White (Herbarium Britannicum, by G. Don), East Malling Plant Research Station, and by the Watson Botanical Exchange Club (per Mr. E. C. Wallace); Balearic Islands, by Miss M. E. Edmonds, the Gray Herbarium, Harvard University (coll. Mrs. Sinclair Kennedy), and by Mrs. N. E. Parry; Bulgaria, by Mr. B. Stefanoff, and by Prof. N. Stoyanoff, Flora Bulgarica Exsiccata; Caucasus, by Leningrad Botanic Museum (coll. E. and N. Busch); Corsica, by Mr. C. H. Wyatt; Crete, by Dr. P. L. Giuseppi; Czechoslovakia, by Dr. K. Domin, Flora Českoslovenica Exsiccata, Century II., and by Dr. J. Podpera, Flora Exsiccata Republicae Bohemicae Slovenicae, Century VI.; France, by Mr. C. H. Wyatt; Greece, by Mr. S. C. Atchley, the Hon. H. G. Chick, Dr. P. L. Giuseppi, and by Mr. H. Griffith Tedd; Iceland, by Col. R. Meinertzhagen (coll. Theresa Clay); Italy, by Mrs. Macalister Hall; Malta, by Prof. J. Borg; Norway, by Dr. W. Leach; Rumania, by the Botanic Garden and Museum, University of Cluj, Flora Romaniae Exsiccata, Century X.; Spain, by Mr. C. V. B. Marquand, and by Miss E. Willmott, Reliquiae Lapeirousianae; Sweden, by Dr. G. Samuelsson (coll. G. Samuelsson and E. Kohler); Switzerland, by Mr. J. W. Wyatt; U.S.S.R., by the State Sub-tropical Institute, Tiflis; Yugoslavia, by Mr. B. Gilliat-Smith, and by Mrs. A. P. Thompson; various, by Mrs. A. Henry (Conifer seeds), and by Dr. G. Samuelsson.

Purchased: Mr. J. Wagner, Tiliae exsiccatae criticae, Fascicle I.; Mr. Fr. Verdoorn, Hepaticae Selectae et Criticae, Series II, numbers 51-100.

ORIENT.—*Presented*: Cyprus, by Dr. G. C. Druce, Mrs. I. Tracey, and by the Agricultural Department (coll. C. B. Ussher); Egypt, by the Horticultural Section, Ministry of Agriculture; Iraq, by the Rev. F. A. Rogers; Palestine, by the Department of Agriculture (coll. Miss R. Gabrielith); Sinai, by Dr. F. Chodat (coll. A. Kaiser).

ATLANTIC ISLANDS.—*Presented*: Canary Islands, by Mr. A. H. Maude, and by Madame C. C. V. de Perez.

CHINA AND JAPAN.—*Presented*: by the Arnold Arboretum, Harvard University, the Royal Botanic Garden, Edinburgh, and by the Metropolitan Museum of Natural History, Nanking (coll. Y. Tsiang).

Purchased: Prof. W. Y. Chun, Flora of Kwangtung.

INDIA AND CEYLON.—*Presented*: Bengal, by Prof. S. R. Bose (fungi); Burma, by Mr. R. N. Parker, and by Mr. C. E. Parkinson; Ceylon, by the Department of Agriculture; Lushai Hills, by the Rev. W. J. L. Wenger; Madras, by the Royal Botanic Gardens, Calcutta, the Agricultural College and Research Institute, Coimbatore, and by the Department of Agriculture; United Provinces, by Mr. R. N. Parker, and by the University of California, Los Angeles (coll. Umbrao Singh).

MALAY PENINSULA.—*Presented*: by the Forest Research Institute, Kepong, the Agricultural Department, Kuala Lumpur, and by the Botanic Gardens Department, Singapore.

INDO-CHINA.—*Presented*: Siam, by Dr. F. W. Foxworthy, Mr. H. B. Garrett, and by Dr. A. F. G. Kerr (coll. A. F. G. Kerr, Noi Put, and M. C. Lakshnakara).

MALAY ISLANDS.—*Presented*: British North Borneo, by the Forestry Department; various, by the Director, Botanic Garden, Buitenzorg.

Purchased: Sarawak plants (coll. J. and M. S. Clemens).

NEW GUINEA.—*Presented*: by Mr. G. Bateson, and by the Botanic Museum and Herbarium, Brisbane.

AUSTRALIA.—*Presented*: New South Wales, by the Rev. E. N. McKie, Dr. F. A. Rodway, Miss J. W. Vickery, the Director, Botanic Gardens, Sydney, and by the Department of Agriculture; Queensland, by Mr. M. A. Cameron, Mr. F. F. Coleman, Mr. G. K. Jackson, Mrs. Estelle Thomson, the Arnold Arboretum, Harvard University (coll. S. F. Kajewski), and by the Botanic Museum and Herbarium, Brisbane; Northern Australia, by Dr. H. Basedow; Western Australia, by Mrs. A. Elder, Mr. C. B. Palmer, and by the Director, Botanic Garden, Adelaide (coll. Mr. Pearce); South Australia, by Dr. H. Basedow, Mr. J. M. Black, Dr. J. B. Cleland, Mr. E. H. Ising, and by the Director, Botanic Garden, Adelaide; various by Dr. J. B. Cleland, Dr. A. Meebold, Dr. R. H. Pulleine, Dr. C. S. Sutton, and by the Royal Botanic Garden, Edinburgh (coll. A. Morrison); Tasmania, by Dr. F. A. Rodway.

Collected: various localities, by Mr. C. E. Hubbard.

Purchased: Tasmanian plants (the Tasmanian Museum and Art Gallery, Hobart).

NEW ZEALAND.—*Presented*: by Mr. H. W. Lawton.

OCEANIA.—*Presented*: Fiji, by Mr. W. Greenwood, Mrs. C. J. Parham, the University of California, Berkeley (coll. H. E. Parks), and by the Department of Agriculture, Suva; New Caledonia, by the Royal Botanic Garden, Edinburgh (coll. Franc); New Hebrides, by Miss L. E. Cheesman, and by the Royal Botanic Garden, Edinburgh (coll. A. Morrison); Solomon Islands, by Miss B. Blackwood; Tonga, by the University of California, Berkeley (coll. H. E. Parks and W. A. Setchell).

Collected: Bougainville Island, by Mr. J. H. L. Waterhouse.

WEST TROPICAL AFRICA.—*Presented*: Angola, by Mr. J. Gossweiler; Belgian Congo, by Prof. E. de Wildeman, and by Prof. W. Robyns; Cameroons, by the Botanic Gardens, Victoria (coll. T. D. Maitland), and by Dr. J. Mildbraed; Gold Coast, by Dr. F. R. Irvine, and by the Department of Agriculture (coll. J. E. Symond, A. S. Thomas, and T. Lloyd Williams); Nigeria, by Dr. C. Christensen (coll. O. Hagerup), Mr. Ivan D. Hepburn, the Forestry Department (coll. H. V. Lely, F. H. Espley and A. S. Thornewill), and by the Department of Agriculture (coll. J. West, E. H. G. Smith and F. D. Golding); Sierra Leone, by the Agricultural Department (coll. F. C. Deighton, R. R. Glanville, J. W. D. Fisher, and G. M. Roadan); various, by Dr. J. Burt Davy.

NORTH AND NORTH-EAST AFRICA.—*Presented*: Algeria and Ahaggar Mountains, by Col. R. Meinertzhagen; Morocco, by Mr. A. W. Trethewy; Sudan, by the Department of Agriculture and Forests.

EAST AND SOUTH TROPICAL AFRICA.—*Presented*: Kenya, by Dr. R. E. Fries (coll. R. E. and T. C. E. Fries), Sir A. W. Hill, Major E. J. Lugard (coll. E. J. Lugard, Mrs. Cyril Lugard, and T. H. E. Jackson), the Forestry Department, Nairobi (coll. J. McDonald, C. A. Thorold, R. H. Le Pelley, D. C. Edwards, I. R. Dale, and H. M. Gardner), and by the Coryndon Memorial Museum (coll. by Miss E. R. Napier, Mrs. Broadhurst-Hill and Miss C. Harvey); Nyasaland, by Dr. J. Burt Davy, the Royal Botanic Gardens, Edinburgh (coll. G. Adamson), and by the Department of Agriculture; Portuguese East Africa, by Senhor A. F. de Gomes e Sousa; Rhodesia, by Dr. J. Burt Davy, Mr. R. P. Bush, Mr. F. Eyles, Sir A. W. Hill, Mr. D. Stevenson, the Division of Plant Industry, Pretoria (coll. I. B. Pole Evans), and by the Department of Agriculture, Salisbury (coll. J. M. Rattray, T. C. Moore, and J. C. Hopkins); S. Sudan, by Mr. N. Douglas Simpson, and by Mr. G. O. Whitehead; Tanganyika Territory, by the Agricultural Department (coll. F. R. Sanders and A. E. Haarer), the Forestry Department (coll. W. A. Robertson), the Department of Tsetse Research (coll. B. D. Burt and G. W. St. Clair Thompson), the East African Agricultural Research Station, Amani (coll. P. J. Greenway, H. Musk, and others), and by the Coryndon Memorial Museum (coll. R. L. Harger); Uganda, by Sir A. W. Hill, Prof. Dr. H. Humbert, the Agricultural Department, Kampala (coll. J. D. Snowden, L. C. C. Liebenberg, C. G. Hansford, C. W. L. Fishlock and others), and by the Forestry Department, Entebbe (coll. N. V. Brasnett, C. M. Harris, and J. Wright Hill); Zanzibar, by Mr. P. J. Greenway, and by Mr. J. H. Vaughan; various by Dr. J. Burt Davy.

Collected: Virunga Mountains, by Mr. B. D. Burt.

MASCARENE ISLANDS.—*Presented*: Mauritius, by Mr. R. E. Vaughan.

CHAGOS ARCHIPELAGO.—*Presented*: by Prof. J. Stanley Gardiner (coll. J. C. Willis and J. S. Gardiner).

SOUTH AFRICA.—*Presented*: Cape Province, by Dr. H. G. Fourcade, Mrs. M. R. Levyns, Mr. F. R. Long, Dr. A. Meebold, and by Dr. J. Muir; Natal, by the Natal Herbarium; Transvaal, Mr. G. Thorncroft, and by the Transvaal Museum; various, by Dr. J. Burt Davy, Sir A. W. Hill, Mr. T. P. Stokoe, the Rev. F. A. Rogers, Captain T. M. Salter, the Bolus Herbarium, and by the Division of Plant Industry, Pretoria.

Purchased: Mr. E. G. Bryant, Karroo plants.

NORTH AMERICA.—*Presented*: Baffin Land, by the Rev. H. A. Turner; Greenland, by Miss Louise A. Boyd and by the Rev. F. A. Rogers; Canada, by Mr. J. C. Bennett; United States, the Royal Botanic Garden, Edinburgh (coll. Drummond), the Gray Herbarium, Harvard University, the Arnold Arboretum, Harvard University, the University of California, Berkeley (coll. Victor Duran, H. E. Parks, E. B. Copeland and others), the University of California, Los Angeles (coll. Carl Epling and L. Ellison), the California Academy of Sciences, San Francisco (coll. J. T. Howell), and by the U.S. Department of Agriculture (coll. G. C. Hedgcock).

Purchased: Mr. J. W. Thompson, Washington plants.

CENTRAL AMERICA.—*Presented*: various, by the Field Museum, Chicago.

Purchased: Mr. W. A. Schipp, British Honduras plants.

WEST INDIES.—*Presented*: Cuba, by the Arnold Arboretum, Harvard University, and by Riksmuseum, Stockholm (coll. E. L. Ekman); Jamaica, by the University of California, Berkeley (coll. E. R. Orcutt) and by Mr. Barclay Brown (coll. Mrs. Budd); Trinidad and Tobago, by the Department of Agriculture (coll. R. O. Williams and R. C. Marshall); various, by Miss E. M. Wakefield (ferns).

Purchased: Mr. W. E. Broadway, Trinidad plants; Mr. E. J. Valeur, Dominican Republic plants; Mr. R. Ciferri, Mycoflora Domingensis Exsiccata; the Smithsonian Institution, Haiti plants.

EAST TROPICAL SOUTH AMERICA.—*Presented*: Brazil, by the U.S. Department of Agriculture (coll. Mrs. Chase), the Director, Botanic Garden, Rio de Janeiro (coll. A. Ducke), and by the Gray Herbarium, Harvard University (coll. L. B. Smith); British Guiana, by the Forestry Department (coll. J. B. Aitken and others), the Department of Agriculture (coll. E. B. Martyn, A. A. Abraham, and T. Bone), and by the Field Museum, Chicago (coll. A. C. Persaud).

WEST TROPICAL SOUTH AMERICA.—*Presented*: Peru, by the Field Museum, Chicago; various, by the U.S. National Museum (coll. E. P. Killip and A. C. Smith).

TEMPERATE SOUTH AMERICA.—*Presented*: Argentina, by Prof. L. R. Parodi and Dr. Angel L. Cabrera; Chile, by Mrs. D. Carson Roberts and by Mr. A. H. Hunter.

DISTRIBUTION OF DUPLICATES.

The following were the principal institutions to which duplicates were distributed:—

Great Britain and Irish Free State.—Aberdeen, Cruickshank Botanic Garden; Dublin, Trinity College; Edinburgh, Royal Botanic Garden; London, Natural History Museum; Oxford, Imperial Forestry Institute.

Europe and Orient.—Berlin, Botanic Gardens and Museum; Brussels, Botanic Garden; Copenhagen, University Botanic Museum; Jerusalem, The Hebrew University; Karlovy, The University; Paris, Natural History Museum; Riga, Botanical Institute; Stockholm, Botanical Museum; Tervueren, Belgian Congo Museum; Utrecht, University Botanic Museum and Herbarium.

Africa.—Amani, East African Agricultural Research Station; Grahamstown, Albany Museum; Nairobi, Coryndon Memorial Museum; Pretoria, Division of Plant Industry; Salisbury, Department of Agriculture, Southern Rhodesia.

Asia.—Buitenzorg, Botanic Gardens; Hong Kong, Botanical and Forestry Department; Canton, Sun Yat-Sen University; Nanking, National South Eastern University.

America.—Cambridge, Mass., Botanical Museum; New York, Botanical Garden; Washington, D.C., U.S. Department of Agriculture; U.S. National Museum; Rio de Janeiro, Botanic Garden; Georgetown, Demerara, Forestry Department.

The Library.

The more important presentations received during the year are as follows:—

The Bentham Trustees have presented a copy of the late Sir Frank Crisp's *Mediaeval Gardens*, which was edited after his death by his daughter, Mrs. Catherine Childs Paterson, and published in two volumes in 1924. Other books presented by the Trustees are:—S. Dale, *Pharmacologia*, ed. 3, London, 1737; P. Dioscorides, *De medicinali materia libri quinque . . . Joanne Ruellio interprete*, Paris, 1516; J. J. Fillassier, *Dictionnaire du jardinier françois*, Paris, 1791, 2 vols.; A. Haller, *De Allii genere naturali libellus*, Gottingae, [1745]; C. von Linné, *Philosophia botanica, editio secunda . . . curante J. G. Gleditsch*, Berolini, 1780; H. W. Wollenweber, *Fusaria autographice delineata, tabulae 660-1100*, Berolini, 1930, and *Fusarium-Monographie*, in *Zeitschr. f. Parasitenkunde*, Bd. 3, Heft 3, Berolini, 1931; and Miss S. A. Young's *Studies of trees, with and without foliage*, 12 plates, Edinburgh, 1834; also the continuation of several periodicals received in exchange for *Hooker's Icones Plantarum*.

The *Index Londinensis*, the new edition of G. A. Pritzel's *Iconum botanicarum index*, which has been prepared under the auspices of the Royal Horticultural Society by Dr. Otto Stapf at the Royal Botanic

Gardens, Kew, and published by the Clarendon Press, Oxford, is now completed. The final two volumes, 5 and 6, issued during the year, have been presented by the Royal Horticultural Society, and a second copy by Miss R. Chichester of Arlington Court, near Barnstaple. The work includes references to figures of plants published up to the end of 1920. A supplement to cover the years 1921 to 1935 is now in progress.

Lieut.-Col. Sir David Prain has presented the continuation of several periodicals, including the *Bulletin de la Société Botanique de France*, *Berichte der Deutschen Botanischen Gesellschaft*, *The Quarterly Journal of Pharmacy*, and *Proceedings of the American Philosophical Society*. He has also presented about a hundred botanical papers and a number of volumes among which are A. Engler's *Monographie der Gattung Saxifraga L.*, 1872, and A. H. Church's *Types of floral mechanism*, part 1, 1908.

The following books have been received from their publishers for review in the Kew Bulletin:—J. Adams, *A student's illustrated Irish flora* (from Messrs. L. Reeve & Co.); J. Britten & G. S. Boulger, *A biographical index of deceased British and Irish botanists*, ed. 2, revised and completed by A. B. Rendle (from Messrs. Benn); Francis; L. J. Cook, *Perpetual carnations* (from Messrs. Benn); W. Dallimore & A. Bruce Jackson, *A handbook of Coniferae including Ginkgoaceae*, ed. 2 (from Messrs. E. Arnold & Co.); R. Fisher, *Flowers of grass: how to know the names of British grasses* (from Messrs. Wheldon & Wesley); and A. C. Seward, *Plant life through the ages* (from the Cambridge University Press). All were issued in 1931.

Books received from the Editor of *Nature*. The more important are:—E. B. Copeland, *The coconut*, ed. 3; A. Engler & K. Prantl, *Die natürlichen Pflanzenfamilien*, zweite Auflage, Bd. 19a and 19c (bound); A. J. Ewart, *Flora of Victoria*, 1930; O. Gessner, *Die Gift- und Arzneipflanzen von Mitteleuropa*; R. Grimwade, *An anthography of the Eucalypts*, ed. 2, 1930; A. M. Johnson, *Taxonomy of the flowering plants*; J. C. Liu, *Systematic botany of the flowering families in North China*; and E. Thurston, *British and foreign trees and shrubs in Cornwall*, 1930. Those of which the year is not stated were published in 1931.

Independent works and a few of the more important reprints from periodicals received include the following, which have been presented by their authors, unless otherwise stated:—*Anvers, Ve Congrès International d'Agriculture Tropicale*, 1930, *Rapports*, etc. (from the Secrétariat Général, Brussels); A. Barbey, *À travers les forêts de Pinsapo d'Andalousie*; H. M. L. Bolus, *Notes on Mesembrianthemum and allied genera*, pt. 2, pp. 225-308, 3 copies; H. Brenier, *Essai d'atlas statistique de l'Indochine*, 1914 (from Mr. H. C. Sampson); P. Brühl, *A census of Indian mosses*, in *Rec. Bot. Surv. India*, vol. xiii, no. 2; Cambridge, *Fifth International Botanical Congress, Report of Proceedings* (from the Executive Committee);

H. G. Champion & I. D. Mahendru, *Sylvicultural research manual for use in India*, vol. ii (from the Government of India); *Classified list of daffodil names* (from the Royal Horticultural Society); W. G. Craib, *Florae Siamensis enumeratio*, vol. i, pt. 4 (from the Siam Society, Bangkok); G. Delevoy, *La question forestière au Katanga*, 3 vols., 1928-29 (from the Comité Spécial du Katanga); É. De Wildeman, *Plantae Bequaertianae*, vol. v, fasc. 2 & 3; *Flora Sibiriæ i Dal'negho Vostoka* (*Flora Sibiriae et Orientis extremi a Museo Botanico Academiae Scientiarum edita*), pts. 5 & 6, Leningrad, 1930-31; R. Florin, *Untersuchungen zur Stammesgeschichte der Coniferales und Cordaitales*, Teil 1, in *K. Svenska Vet.-Akad. Handl.*, ser. 3, vol. x, no. 1; J. Fothergill, *The gardener's colour book*, 1927; H. Fröderström, *The genus Sedum L.*, pt. 2, in *Acta Horti Gothoburgensis*, vol. vi, app.; J. S. Gamble, *Flora of the Presidency of Madras*, pt. ix, *Commelinaceae to Cyperaceae*, by C. E. C. Fischer (from the Secretary of State for India); C. A. Gardner, *Enumeratio plantarum Australiae occidentalis*, 1930-31 (from Director, Department of Agriculture, Western Australia); H. Gilbert-Carter, *Our catkin-bearing plants*, 1930; *The Handbook of Tanganyika*, 1930 (from the Government of Tanganyika Territory); W. F. van Hell, *Onderzoekingen over ziekten van lelies*, Proefschrift; G. Herter, *Florula Uruguayensis*, 1930; H. H. Hu & R. C. Ching, *Icones filicum Sinicarum*, fasc. 1, 1930; E. Hultén, *Flora of Kamtschatka and the adjacent islands*, iv, in *K. Svenska Vet.-Akad. Handl.*, ser. 3, vol. viii, no. 2, 1930; J. B. Hurry, *The woad plant and its dye*, 1930 (from Mrs. Hurry); J. Hutchinson & J. M. Dalziel, *Flora of West Tropical Africa*, vol. ii, pt. 1, 5 copies (from the Crown Agents for the Colonies); H. A. Hyde, *Welsh timber trees native and introduced*, 2 copies (from author and National Museum of Wales); H. H. Janssonius, *Mikrographie des Holzes der auf Java vorkommenden Baumarten*, Liefg. 10, 1930; M. Jarry, *Manuel d'agriculture tropicale*, 1917 (from Mr. Alfred J. Large); R. Keller, *Synopsis rosarum spontaneorum Europae mediae*, in *Denkschr. Schweiz. Naturforsch. Ges.*, Bd. lxxv (from Prof. Hans Schinz); G. Koidzumi, *Florae symbolae Orientali-Asiaticae*, 1930; V. L. Komarov, *Flora peninsulae Kamtschatka*, iii, 1930 (from the Academy of Sciences, Leningrad); W. M. Kruseman, *De invloed van temperatuur en narcose op het transport der assimilaten*, Proefschrift; J. Lanjouw, *The Euphorbiaceae of Surinam*, Proefschrift; L. Lefébure, *Atlas botanique, ou clef du jardin de l'univers*, etc., 1817 (from Mr. J. S. L. Gilmour); A. Lemée, *Dictionnaire descriptif et synonymique des genres de plantes phanérogames*, tome iii; J. H. Maiden, *A critical revision of the genus Eucalyptus*, pt. 75 (from Director, Botanic Gardens, Sydney); Mildred E. Mathias, *Studies in the Umbelliferae*, iii, in *Ann. Missouri Bot. Gard.* vol. xvii, 1930; K. Miyabe & Y. Kudo, *Icones of the essential forest trees of Hokkaido*, fasc. 20-28, 1928-31, with plates 59-86, drawn by C. Suzuki (from the Hokkaido Government); T. Nakai, *Flora sylvatica Koreana*, pars xviii, 1930 (from the Forest Experiment Station, Government General of Chosen); E.

Nelmes & W. Cuthbertson, *Curtis's Botanical Magazine dedications, 1827-1927: portraits and biographical notes* (from the Royal Horticultural Society; there is a reference to this work in the note on Illustrations and Photographs); L. Newton, *A Handbook of the British Seaweeds* (from the Trustees of the British Museum); *North American Flora*, vol. xvii, pt. 4, and vol. xviii, pt. 1 (from Director-in-Chief, New York Botanical Garden); Emily H. Pelloe, *West Australian Orchids*, 1930 (from Sir Francis Newdegate); J. F. V. Phillips, *Forest-succession and ecology in the Knysna Region*, forming *Memoir of the Botanical Survey of South Africa*, no. 14 (from Dr. I. B. Pole Evans); *Proceedings of the celebration of the three hundredth anniversary of the first recognised use of Cinchona held at the Missouri Botanical Garden, St. Louis, October 31-November 1, 1930*; *Reports of the Great Barrier Reef Committee*, vols. i-iii, 1925-31 (from the Committee); S. Sasaki, *A catalogue of the Government Herbarium* (Government Research Institute, Taihoku, Formosa), issued as Report no. 9 of the Department of Forestry; K. Sawada, *List of fungi found in Formosa*; H. Seckt, *Flora Cordobensis*, in *Rev. Univ. Nac. Córdoba*, vols. xvi-xvii, 1929-30 (from Mr. S. Gaselee); N. M. Stelling-Dekker, *Die Sporogenen Hefen*, in *Verhandel. K. Akad. Amsterdam*, vol. xxviii, no. 1 (from Prof. Joanna Westerdijk); F. L. Stevens, *Fungi from Costa Rica and Panama*, in *Illinois Biol. Monogr.*, vol. xi, no. 2, 1927; R. P. Strong (Editor), *The African Republic of Liberia and the Belgian Congo, based on the observations made and material collected during the Harvard African Expedition, 1926-27*, 2 vols., 1930 (from the Editor); J. McLean Thompson, *Studies in advancing sterility*, pt. v, in *Publications of the Hartley Botanical Laboratories* (University of Liverpool), no. 7; H. Trimen, *A handbook to the flora of Ceylon*, pt. vi, Supplement, by A. H. G. Alston, 2 copies (from the Crown Agents for the Colonies); A. Wood, *A class-book of botany*, ed. 1, 1845, and the 1849 reprint of ed. 2—"tenth edition" (from the Gray Herbarium of Harvard University); and E. W. Wulff, *Flora Kruima (Flora Taurica)*, vol. i, fasc. 3, 1930. Those of which the year of publication is not stated were issued in 1931.

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1930; *British Association for the Advancement of Science, Report of the 98th meeting, 1930* (from Miss E. M. Wakefield); *The British Fern Gazette*, vol. vi, nos. 2-3 (from Mr. C. H. Wright); *Brittonia*, a series of botanical papers, published by the New York Botanical Garden, vol. 1, nos. 1-2; *Bulletin de l'Institut et du Jardin Botaniques de l'Université de Beograd*, vol. i, no. 3; *Bulletin du Jardin Botanique de Kieff*, livr. 11; *Bulletin of the Madras Government Museum*, new series, vol. iv, pt. 1 (from Mr. C. E. C. Fischer); *Bulletin of the Miyazaki College of Agriculture and Forestry*, no. 3; *Bulletin of the Rubber Growers' Association*, vol. xiii; *Bulletin de la Société Botanique de Bulgarie*, vol. iv.; *Bulletin de la Société Botanique de Genève*, 2^{me} série, vol. xxii; *Bulletin de la Société Dendrologique de France*, nos. 76-78 (from Mr. W. J. Bean); *Bulletin de la Société Royale de Botanique de Belgique*, vol. lxiii, fasc. 2; *Contributions from the Biological Laboratory of the Science Society of China, Nanking*, 15 numbers; *Contributions du Laboratoire de Botanique de l'Université de Montréal*, nos. 16-18; *The Empire Cotton Growing Review*, vol. viii; *Erdészeti Kísérletek (Forest Researches)*, Sopron, Hungary, vol. xxxii, pts. 2-4, and vol. xxxiii, pts. 1-2; *Forestry: the Journal of the Society of Foresters of Great Britain*, vol. iv, no. 2, and vol. v, nos. 1-2; *Hardy and Half-hardy Plants*, edited and published by A. W. Darnell, vol. i, and vol. ii, nos. 1-4 and 6; *Indian Forester*, vol. lvii; *Indian Tea Association, Quarterly Journal*, 1930, pt. 4, and 1931, pts. 1-3; *Japanese Journal of Botany*, published by the National Research Council of Japan, vol. v, nos. 3-4; *Journal of the Board of Greenkeeping Research*, vol. ii, nos. 4-5; *Journal of the Department of Agriculture, Kyushu Imperial University* (Fukuoka, Japan), vol. iii, nos. 2-5; *Journal of the Department of Agriculture of Victoria*, vol. xxx; *Journal of the Faculty of Science, Imperial University of Tokyo*, sect. 3, Botany, vol. iii, pts. 1-2; *Journal of the Federated Malay States Museums*, vols. xvi, pts. 1-4; *Journal of the Imperial Agricultural Experiment Station, Nishigahara* (Tokyo), vol. i, nos. 1-2; *Journal of the New Zealand Institute of Horticulture*, vol. ii, nos. 3-4, and vol. iii, no. 1; *Journal of Science of the Hiroshima University* (Japan), series B, div. 2 (Botany), vol. i, articles 1-3; *K. Svenska Vetenskapsakademiens Handlingar*, ser. 3, vol. viii, no. 2, vol. ix, nos. 1-6, and vol. x, no. 1; *Long Ashton Agricultural and Horticultural Research Station, Annual Report, 1930*; *Malayan Forest Records*, no. 9; *Memoirs of the American Academy of Arts and Sciences*, vol. xvi, pt. 1 (Contribution towards a monograph of the Laboulbeniaceae, by R. Thaxter, v); *Memoirs of the College of Agriculture, Kyoto Imperial University*, nos. 13-14; *Memorias do Instituto Oswaldo Cruz* (Rio de Janeiro), vol. xxiv, fasc. 3-4, and vol. xxv, fasc. 1-4; *Memorias da Sociedade Broteriana* (Coimbra), vol. i (Subsidios para o conhecimento da flora da Guiné portuguesa, por A. de Figueiredo Gomes e Sousa); *Mežsaimniecības rakstums krajums* (Sammlung forstwirtschaftlicher Schriften, herausgegeben vom Verbands lettlandischer Forstwirte), vol. viii; *Mykologia* (Orgán

Československého Klubu Mykologického v Praze), vols. v-vi; *Natural History Magazine*, published by the British Museum (Natural History), vol. iii, nos. 17-20; *Nederlandsche Dendrologische Vereeniging, Jaarboek, 1930*; *Nederlandsch Kruidekundig Archief, 1930*, Afl. 3, and 1931, Afl. 1; *Nigeria, Geological Survey, Bulletin*, no. 13 (from the Government of Nigeria); *Notes from the Royal Botanic Garden, Edinburgh*, nos. 78 and 79; *Nova Acta Regiae Societatis Scientiarum Upsaliensis*, ser. 4, vol. vi, fasc. 2, and vol. vii, fasc. 1; *The Orchid Review*, vol. xxxix; *Prestia* (Prague), vol. ix; *Proceedings of the Imperial Academy* (Japan), vol. vi, nos. 9-10, and vol. vii, nos. 1-8; *Proceedings of the Royal Irish Academy*, sect. B, vol. xxxix, nos. 26-28, and vol. xl, nos. 1-10; *Quarterly Journal of Forestry*, vol. xxv; *Queensland Agricultural Journal*, vols. xxxiv, pt. 5 to vol. xxxvi, pt. 4; *Records of the Botanical Survey of India*, vol. xiii, no. 2, 3 copies; *Recueil des Travaux Botaniques Néerlandais*, vol. xxvii, and vol. xxviii, livr. 1-2; *Research Studies of the State College of Washington*, vol. ii, nos. 3-4; *The Science Reports of the Tohoku Imperial University* (Sendai, Japan), ser. 2 (Geology), vol. xii, no. 2A, vol. xiv, no. 2A, and vol. xv, no. 1; ser. 4 (Biology), vol. v, no. 4, and vol. vi, nos. 1-3; *Scripta Horti Botanici Universitatis Vytauti Magni* (Kaunas, Lithuania), vol. i; *Sinensia* (Contributions from the Metropolitan Museum, Nanking), vol. i, nos. 8-12, vol. ii, no. 1, and Special Bulletin, no. 1; *Taihoku Botanic Garden* (Formosa), *Annual Reports*, vol. i; *The Tasmanian Journal of Agriculture*, vol. ii, nos. 1-4; *Transactions and Proceedings of the Botanical Society of Edinburgh*, vol. xxx, pt. 4; *Transactions and Proceedings of the New Zealand Institute*, vol. lxi, pts. 3-4, and vol. lxii, pts. 1-2; *Transactions of the Royal Society of Canada*, ser. 3, sect. 5, vol. xxiv, pt. 1, and vol. xxv; *Transactions of the Tottori Society of Agricultural Science* (Japan), vol. ii, no. 2, and vol. iii; *Travaux des Laboratoires de Matière Médicale et de Pharmacie Galénique de la Faculté de Pharmacie de Paris*, vol. xxi; *Tropical Woods* (Yale University School of Forestry), nos. 25-28; *Union of South Africa, Veterinary Services and Animal Industry, 17th Report of the Director*, pts. 1 and 2; *The University of Colorado Studies*, vol. xviii, nos. 2-3, *Watson Botanical Exchange Club, 47th Annual Report* (from Mr. H. Stuart Thompson); *Yale University School of Forestry, Bulletin*, nos. 26-31.

Numerous other publications have been received from the Empire Marketing Board, the Imperial Agricultural Bureaux, especially the Imperial Bureau of Soil Science, Rothamsted Experimental Station, the Imperial Bureaux of Plant Genetics at Cambridge and Aberystwyth, and the Imperial Bureau of Fruit Production, East Malling Research Station, the Botanical Laboratory of the University of Utrecht, the Botanical Museum of the University of Zurich, the Departments of Agriculture and Forestry in India, the Indian Lac Association for Research, including *A practical manual of lac cultivation*, by P. M. Glover, the Botanical Section of the Ministry of

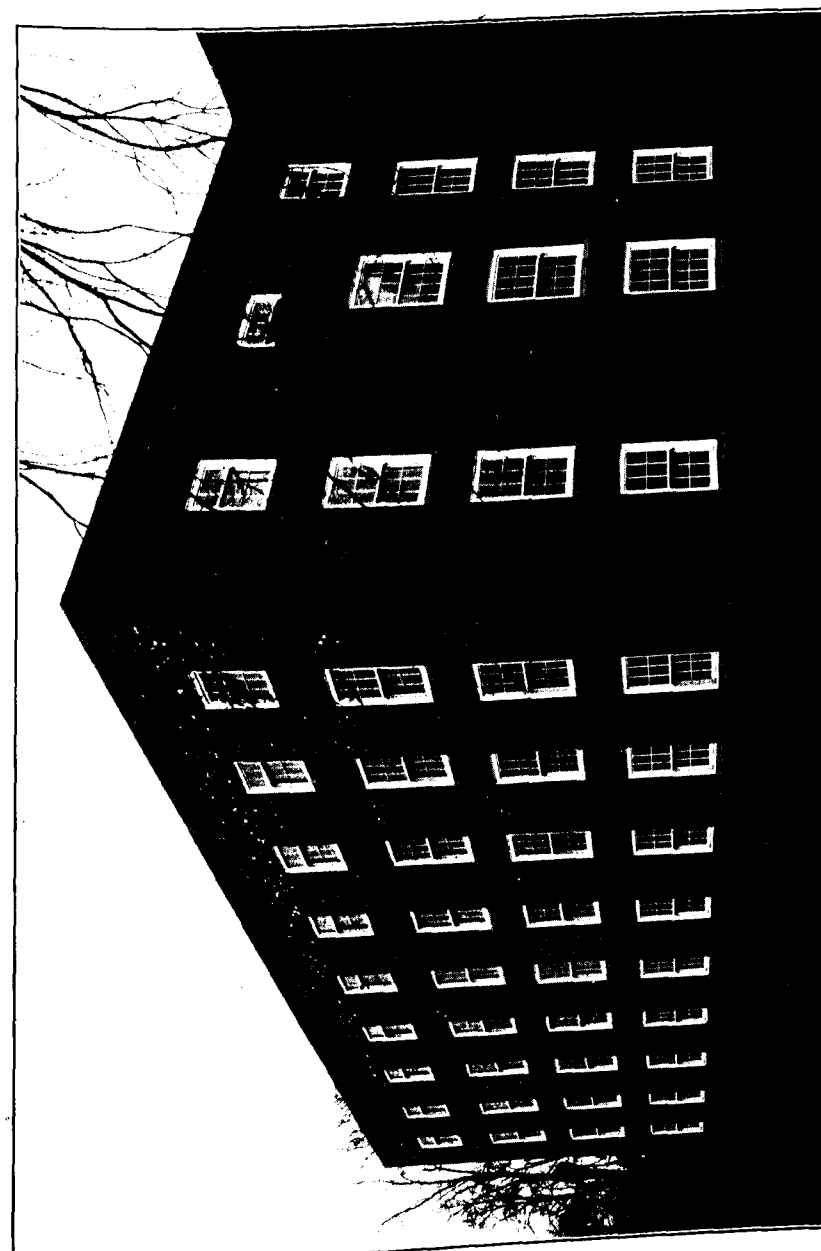
Commerce and Communications, Siam, the Department of Agriculture, Industry and Commerce in the Dutch East Indies, the Botanic Garden, Buitenzorg, the Bureaux of Science, Plant Industry and Forestry, Philippine Islands, the New York Botanical Garden, the Missouri Botanical Garden, St. Louis; the United States Department of Agriculture; and the Cornell University Agricultural Experiment Station.

A large number of papers, usually reprints from periodicals, have been received. Contributors of these include Dr. Agnes Arber, Dr. Kathleen B. Blackburn, Mrs. Frank Bolus, Prof. J. Bornmüller, Prof. K. Braun, Mr. B. F. Bush, Miss A. Camus, Prof. H. Chermeson, Prof. R. Chodat, Dr. P. Chouard, Dr. B. H. Danser, Prof. E. De Wildeman, Prof. L. Diels, Mr. H. N. Dixon, Dr. A. Ducke, Dr. G. Einar Du Rietz, Sir A. W. Hill, Prof. A. S. Hitchcock, Prof. R. Maire, Dr. F. P. Metcalf, Rev. Luis Mille, Prof. S. Murbeck, Dr. E. P. Phillips, Prof. K. Rouppert, Prof. G. Samuelsson, Dr. T. A. Sprague, Mr. H. Sydow, Mr. I. Thériot, and Prof. N. I. Vavilov.

Among the maps added to the collection are two of the Arctic Ocean and Greenland Sea showing route of the Louise A. Boyd Expedition, 1931, presented by Miss Boyd. A map of Rhodesia, in four sheets, compiled by R. T. Hockey, has been received from Mr. E. W. B. H. Milne-Redhead, and a map of Florida, prepared for the United States Department of Agriculture, from Mr. H. C. Sampson.

[*Kew Bulletin*, Appendix II, 1932.

PLATE XI



The new wing of the Herbarium viewed from the south-west.

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PLATE XII



The interior of the new wing of the Herbarium.

To face page 3].

BULLETIN OF MISCELLANEOUS INFORMATION Appendix II 1932 ROYAL BOTANIC GARDENS, KEW

REVIEW OF THE WORK OF THE ROYAL BOTANIC GARDENS, KEW, DURING 1932.

General.

STAFF.—Kew suffered a great loss by the death on March 4th of Mr. T. W. Taylor, who had been Curator since May, 1929 (*K.B.* 1932, 112, 156). Mr. J. Coutts, Assistant Curator in charge of the Decorative Department, was appointed to fill the vacant post (*K.B.* 1932, 155). Mr. A. S. Wilson was appointed Assistant Curator in succession to Mr. Coutts.

Mr. J. Aikman, the Director's Confidential Assistant, retired under the age-limit on October 8th, after nearly 44 years service at Kew (*K.B.* 1932, 459). Mr. S. F. Ormsby has been appointed Chief Clerical Officer in the Director's Office in succession to Mr. Aikman.

Mr. B. L. Burtt has been appointed an Assistant Botanist in the Director's Office.

OFFICIAL VISITS.—During April Mr. MILNE-REDHEAD visited Brussels, and spent a fortnight in the herbarium of the Jardin Botanique de l'État comparing specimens from Northern Rhodesia with type specimens of species from the Katanga Province of the Belgian Congo. As a result of this visit it has been possible to identify and record a number of species, previously known only from the Congo, as occurring also in Northern Rhodesia. In connection with research on Tropical African Compositae, Mr. B. L. BURTT spent five days at the Brussels herbarium in the early part of August. A large number of Kew specimens were identified and several doubtful questions settled.

In connection with the preparation of the final part of the Flora of West Tropical Africa, Mr. J. HUTCHINSON and Dr. J. M. DALZIEL paid a visit to Paris in November to study the collection of West African Monocotyledons in the herbarium of the Laboratoire d'Agronomie Coloniale, and certain types in the herbarium of the Muséum d'Histoire Naturelle. Both the Director of the Botanical Department, Prof. H. Humbert, and Prof. Chevalier gave every facility for the work and the latter also kindly supplied lists of vernacular names for inclusion in the Appendix to the Flora. He further forwarded on loan about 250 specimens, including grasses, for detailed study, collected during his latest journey into the Sahara.

Professor C. Houard, the Director of the Botanical Institution of the University of Strasbourg, having generously offered the National Herbarium at Pretoria a set of duplicate South African specimens collected by Ecklon, Zeyher and Drege, the Assistant for South Africa at Kew, Mr. R. A. DYER, spent some days at Strasbourg in May in order to select the specimens from the herbarium. As a result of this visit the Pretoria herbarium has been enriched by a valuable collection of 550 specimens, including many type numbers. On the return journey Mr. Dyer visited the herbarium at Leiden and the experimental garden of the University under the charge of Dr. W. A. Goddijn.

COLLECTING EXPEDITIONS.—The following expeditions were rendered possible thanks to the grant received from the Empire Marketing Board for overseas missions and collecting purposes.

In the early months of 1932, Mr. G. W. ST. CLAIR THOMPSON, late of the Tsetse Research Department, Shinyanga, Tanganyika Territory, carried out a collecting trip in Tanganyika and N. Rhodesia. After spending ten days in the Northern Province, collecting on Oldeani and neighbouring mountains, Mr. St. Clair Thompson proceeded south to Iringa Province, where he remained for six weeks, making extensive collections in the mountainous country between New Iringa and Abercorn on the N. Rhodesian boundary, especially on Mt. Rungwe and the Poroto Mountains.

In March, 1931, the Colonial Office, following on Mr. Collenette's work with the Anglo-Italian Boundary Commission in Somaliland in 1929/30 (*K.B.* 1931, 401), offered the Director the opportunity of attaching a botanist to the British Somaliland-Ethiopia Boundary Commission, which left England in November 1931. The Director was able to arrange for Mr. J. B. GILLET, Scholar of King's College, Cambridge, who has had previous collecting experience in Africa with General Smuts and Mr. J. Hutchinson, to join the Commission.

Owing to the botanically dull character of the opening stages of the work of the Commission, Mr. Gillett did not leave England until September, 1932. After collecting round Hargeisa, the temporary base camp of the Commission, Mr. Gillett made a trip south-eastwards along the boundary, and subsequently two journeys in the country north-west of Hargeisa. He hopes to spend some time collecting in the mountainous country around Harrar, in Abyssinia, an area which has been very little explored botanically. One case of dried specimens, seeds and tubers has already been received from Mr. Gillett, and he is also making an ecological survey of the vegetation.

TUNG OIL.

Aleurites Fordii.—A definite resting season appears to be essential for the proper development of this species. This can be effected either by a cold or by a dry season. Without such conditions the plant does not appear to be able to thrive. This

practically eliminates the humid tropics, and it is only at high elevations where definite dry seasons occur that there is any likelihood of this species thriving in these areas. Trees raised from seed are very variable both in habit and in their fruiting capacity. The size of the fruit and the size of the nut are also very variable. Hence, if this is to become an economic crop, it appears certain that vegetative methods of propagation will have to be adopted. American experience shows that there is little difficulty in using a system of patch budding and trials reported from Assam support this view. A sufficient number of seedling trees has now been established in those countries where the crop is likely to succeed and where the maturity of the trees is sufficiently advanced. The selection of "mother" trees which will supply bud wood is being made and methods of budding are being investigated.

Samples of fruits from Empire sources are being collected as they become available and these are being examined and reported on to the Imperial Institute Sub-Committee for Tung Oil by the Director of the Paint Research Station of the British Paint, Colour and Varnish Manufacturers Association.

Aleurites montana.—This species has now been satisfactorily established in several parts of the Empire. It is a more tropical species and reports received indicate that it is likely to thrive in many countries where the climate is too tropical for *A. Fordii*. Trees which were raised from seed supplied in 1927 to the East African Agricultural Research Station at Amani have this year flowered freely. So far, however, the trees have only formed female flowers. Examinations made of the oil of this species show that it differs slightly from that of *A. Fordii*, and, though it does not come up to existing standard specifications for Tung oil, the oil is eminently suitable for the manufacture of paints and varnishes.

BANANA RESEARCH.—The collections of types of *Musa Cavendishii* from the Canaries and from Brazil which have been grown in the Banana Quarantine House have been propagated and suckers have been despatched to Professor Cheesman at the Imperial College of Tropical Agriculture at Trinidad. There still remains a variety of this species of *Musa* which was obtained from Burma and it is expected that suckers from this will be sufficiently mature for despatch in the summer.

It is hoped this next season to obtain collections of banana varieties from the east and from the west coasts of Peninsular India and the Directors of Agriculture in Madras and Bombay have been asked to assist in procuring planting material. Efforts are also being made to obtain planting material of *Musa nana* from French Indo-China.

PLANT AND SEED INTRODUCTION.—At the Conference of Colonial Directors of Agriculture, which was held at the Colonial Office in July, 1931, a resolution was adopted in which recommendations

were made "that steps should be taken to facilitate the dissemination of information in connexion with the introduction of economic crops and varieties thereof, and also in regard to their sources of supply." It further recommended that the Royal Botanic Gardens, Kew, should be asked to undertake this work in co-operation with Colonial Departments of Agriculture.

In response to this resolution a list of cultivated crop plants (other than those confined to temperate regions) was prepared, and this has been circulated with a questionnaire not only to Colonial Departments of Agriculture, but also to India, the Sudan and to those Dominions which control tropical and sub-tropical regions. In this way an inventory of tropical and sub-tropical crops throughout the Empire can be prepared, which will in the future enable more detailed work on particular crops to be undertaken. Already replies to this questionnaire have been received from most of the Colonies and from some of the Dominions and the information has been indexed. This is the first time that an inventory of the economic crops of the Empire has been attempted, and, even in its present incomplete form, it has been of considerable use in dealing with enquiries from the Colonies.

DIRECTOR'S OFFICE.—The alterations which were described in the Annual Review, 1931, II, were completed in March of this year.

The Registry, which is accommodated in the room formerly used by the Director, is being reorganised, and a clerical officer has been appointed as Registry Clerk.

PUBLICATIONS.—During the year ten numbers of the *Kew Bulletin* were published and only one Appendix, instead of two. This was due to the omission of the "List of Seeds," which is being published as a separate pamphlet (*K.B.* 1932, 352). The present "Review" will form Appendix II, 1932, and will be bound in the volume for that year. In future there will be only one Appendix, namely the "Review" for the current year (*K.B. loc. cit.*)

A new edition of the "Popular Illustrated Guide" was published in July.

The revision of the "Hand-list of Rock Garden Plants" has been commenced, the nomenclature being revised throughout. The new hand-list will include both Monocotyledons and Dicotyledons, and a list of woody plants suitable for growing in rock gardens will be appended.

The "Hand List of Trees and Shrubs" is also under revision.

The Gardens.

VISITORS.—The number of visitors to the Gardens in 1932 was 1,068,395, a decrease of 320,789 as compared with the figures for 1931.

This serious falling off appears to have been fairly general throughout the year, with the exception of the months of March

and December, and was no doubt due to some extent to general economic conditions. The Sunday figures were 120,571, and the week-day figures 200,218 less than those in the previous year.

The greatest monthly attendance was in May with 224,677 and the lowest in December with 12,886. The highest daily attendance was 33,416 on Sunday, 12th June; the lowest was 12 on November 22nd.

The penny charge for admission, which was reimposed on October 5th, 1931, and the charge of sixpence on Students' Days (Tuesdays and Fridays) remained unchanged.

FLOWER GARDEN.—The removal of the clipped golden yews in the formal Rose Garden, with the exception of two at either end of the cross-paths, has necessitated setting back the end yews in line with the pyramidal hollies at the ends of the vistas. Two rose beds have also been set back and two new ones made to match the pair at the end of the Sion Vista. The removal of the clipped yews adds greatly to the appearance of spaciousness in this section of the Gardens.

New or noteworthy plants that have flowered for the first time at Kew are: *Isotoma anethifolia*, *Mutisia subulata* and *Crindonna Memoria-Corsii*.

ROCK GARDEN.—A portion of the south end of the Rock Garden has been reconstructed, the old soil being removed and replaced with fresh compost. This has resulted in a marked improvement in the health and vigour of the Primulas and other plants cultivated at this end of the garden.

One of the most interesting plants which flowered was *Primula Wollastonii*. This choice Primula and a share of a large consignment of seeds were presented by the Maharaja of Nepal to H.M. The King, for the embellishment of the Royal Parks and Gardens.

The interesting experiment of Capt. Kingdon Ward in bringing back living mat plants from his expedition in N. Burma gave fairly successful results and the following species were identified: *Salix* sp. near *S. Lindleyana*, *Nepeta lamiopsis*, *Hoeckia Aschersoniana*, *Epilobium* sp. probably *E. Wattianum*, *Juncus* sp. probably *J. elegans*, *Polygonum viviparum*, *P. Forresti*, *Fagopyrum cymosum* and others.

TEMPERATE HOUSE.—The whole of the exterior of the Temperate House range and the interior of the Himalayan section have been repainted, and two new sectional boilers have been installed to replace worn out saddle boilers. The intention is to replace in this way—as opportunity occurs—all the old types. In the nursery a new frame has been constructed to replace the one that had to be demolished to make room for the new Arboretum pit.

The collection of Rhododendrons in the Himalayan and Chinese sections, which was becoming over-crowded, has been opened out

and re-arranged where necessary. The large specimen of *Talauma Hodgsonii* in the main building and the giant honeysuckle, *Lonicera Hildebrandiana*, have flowered freely. The latter, which has now attained a length of 70 feet, produced a number of green, globose fruits, 1-1½ inches in diameter. *Asparagus falcatus*, the largest species in cultivation, produced its primrose-coloured, deliciously fragrant flowers in wonderful profusion during July.

Amongst the newer Rhododendrons of note which have flowered during the year, mention may be made of *R. Taggianum*, *R. scopulorum*, and *R. sino-Nuttallii*, which first flowered at Kew in 1930.

A large plant of *Cytisus Battandieri*, native of the mountains of Morocco, growing outside in one of the bays on the south side of the Temperate House, produced its fragrant, golden yellow flowers in great profusion during May and June, and was perhaps the most outstanding plant of the year.

ARBORETUM.—Early in the year somewhat extensive alterations were commenced in the lay-out of the ground between the Main Gate and the end of the Broad Walk. The two old Chusan palms (*Trachycarpus excelsus*) in front of No. 1 House were removed and replanted with existing specimens in the shrubbery, and, in order to accentuate the formal lines of the house, the surrounding Irish yews were planted at the corners of the paths. The plot in front of the house was laid out in formal beds, in which a display of bedding Dahlias was made during the summer. The existing Rhododendrons, in several cases overgrown, were cleared, some of the plants being sent to the new Pinetum at Bedgebury. To conform with the general layout the beds have been re-made with straight sides and planted with a collection of Rhododendron (*Azalea*) species including *R. Vaseyi*, *R. viscosum*, *R. occidentale* and *R. luteum*. To prolong the flowering season a selection of the larger growing species of *Lilium* has been planted in the beds. The screen of trees and shrubs in this part of the garden is in process of being widened and re-planted with more choice subjects.

The collections of *Lonicera* and *Rhamnus*, which in the past have been scattered indiscriminately over a large area of lawn, have been planted in beds and gathered together into two compact areas. This has opened up several unexpected views and should give better cultural conditions for the individual plants. The general upkeep will also be greatly simplified.

A new and more direct path has been made to the Tea Pavilion. The road on its north side has been turfed over and the surrounding gravel tarred.

In the Arboretum nursery a new sunk pit has been built alongside the old propagating pit.

Meliosma Veitchiorum and *Styrax Veitchianum* have flowered this year, the latter for the first time at Kew.

TROPICAL DEPARTMENT.—The collection of Cycads at the south end of the Palm House has been rearranged and brought together into one group, the shrubs that were formerly growing with them having been moved elsewhere. This rearrangement has greatly improved the appearance of this unique collection.

A new electric motor for pumping rain-water has been installed in the Palm House stokehole, and the hot water pipes in the central portion of the house have been thoroughly overhauled.

The collection of Filmy Ferns, which for some years has been in an unsatisfactory condition, has been replanted in fresh compost. While it was empty the opportunity was taken to overhaul and repair the house.

In House No. 2 many of the hot water pipes have been replaced and a new sectional boiler has been installed in place of two old saddle boilers. In House No. 5 the plants in the centre bed at the north end have been rearranged, the Aloes and Euphorbias, as far as possible, being grouped together. On the staging at the south-west end a miniature rockery has been constructed to accommodate a collection of small South African succulents. In the Office Yard the hot water pipes have been overhauled in Houses Nos. 18B and C. Houses Nos. 1 and 2A, and Pits Nos. 6 and 6A, 10-15, and 17B have been painted externally.

Plants worthy of notice which have flowered are: *Dasyllirion quadrangulatum*, *Gurania malacophylla* and *Paphiopedilum Wardii*, a new species introduced by Captain Kingdon Ward from Upper Burma.

SHERMAN HOYT CACTUS HOUSE (See Annual Review, 1931, 12).—In the early months of the year the arrangement of the rock-work and planting were undertaken. The house was formally opened in the presence of the Minister of Agriculture and Fisheries, the Secretary of H.M. Office of Works, the President of the Royal Horticultural Society, and others, and was opened to the public on Easter Monday, March 21st, 1932. Three seats for the convenience of the public have been placed in the house.

WATERFOWL.—The collection of ornamental waterfowl has been maintained in good condition during the year. The chief additions were a pair of maned geese from Australia and a pair of white decoy ducks, the latter presented by Mr. R. N. N. Murray of Chiswick.

GREY SQUIRRELS.—Two pairs of grey squirrels were presented to Kew by the Duke of Bedford in 1907. They multiplied rapidly and the red squirrels which used to be seen in the Gardens disappeared. During the past few years many have been shot to keep the numbers in control, and during the past year they have been practically exterminated. Well over 1,000 have been shot in recent years.

RAINFALL RECORD.

Rainfall recorded at the Royal Botanic Gardens, Kew, during 1932 :

	Inches.		Inches.
January	1.63	July	1.85
February	0.20	August	1.09
March	1.34	September	2.15
April	2.07	October	4.84
May	3.90	November	1.29
June	1.02	December	0.46

Total 21.84 inches.

The total for 1931 was 23.61 inches.

STUDENT GARDENERS: CHANGES IN PERSONNEL.—Seventeen men completed their training, while one went to Mr. Cecil Hanbury's garden at La Mortola for a year. The Siamese student, and the two Maltese, having finished their courses, returned to their own countries. A Dutch student came to Kew for a period of two months before taking up an appointment at Cantonspark Botanic Garden, Baarn, Holland. A Swedish student returned to Stockholm, and an Australian went back to New South Wales to engage in a nursery business in that State.

Of the seventeen men who finished their courses, thirteen secured appointments at home (Parks Departments eight; private gardens or nurseries four; Botanic Garden one). Two men proceeded overseas to take up positions, one to Madras and one to Randfontein.

Sixteen Student Gardeners were admitted for training and in addition two men returned from La Mortola to complete their period of service.

Of the sixteen new entrants, twelve are from Great Britain (private gardens or nurseries eight, and Parks Departments four). The Student Gardeners from overseas include an Italian from La Mortola; one from Canada, where he was engaged in a large plant nursery; one from Prince Alfred Park, Port Elizabeth, Union of South Africa, and one from the Botanic Gardens, Dunedin, New Zealand.

CONTRIBUTIONS TO THE GARDENS, 1932.—During the year 1,054 separate consignments of living plants, seeds, etc., were received and added to the collections. This number represents an increase of 68 over last year and is the highest number recorded in the history of the Gardens. The more important donations were as follows:—

Public Institutions:—

Berlin, Botanic Gardens.—64 packets of seeds.

Bermuda, Department of Agriculture.—A consignment of bulbs of *Lilium Harrisii*.

Brooklyn, Botanic Garden.—35 packets of seeds.

Brussels, Botanic Gardens.—22 packets of seeds.

Buitenzorg, Botanic Gardens.—Seeds of economic plants.

Calcutta, Royal Botanic Gardens.—Seed of *Amorphophallus campanulatus*.

Chelsea Physic Garden, London.—36 packets of seeds, and plants of *Solanum citrullifolium*.

Coimbra, Botanic Garden.—45 packets of seeds.

Copenhagen, Botanic Garden.—A collection of *Begonia* spp.

Darjeeling, Lloyd Botanic Gardens.—72 packets of seeds.

Dehra Dun, Forest Research Institute.—Seeds, including *Arun-dinaria Pantlingii*.

Dunedin, Botanic Gardens.—267 packets of seeds and a collection of New Zealand plants.

Edinburgh, Royal Botanic Garden.—712 packets of seeds collected by the late Mr. G. Forrest; 183 packets of miscellaneous seeds, and plants of *Todea superba*, *Leptodermis pilosa*, etc.

Federated Malay States, Department of Agriculture.—Suckers of *Musas* in variety.

Fiji, Department of Agriculture.—Tubers of *Dioscorea* spp.

Geneva, Botanic Garden.—47 packets of seeds.

Glasgow, Botanic Garden.—46 packets of seeds.

Glasnevin, Botanic Gardens.—Seeds and plants.

Gothenburg, Botanic Gardens.—38 packets of seeds.

Hakgala, Botanic Gardens, Ceylon.—A collection of seeds and bulbs.

Hobart, Botanic Garden.—A collection of Tasmanian plants.

Jassy, Botanic Garden, Roumania.—37 packets of seeds.

Kaunas, Botanic Garden, Lithuania.—56 packets of seeds.

Kirstenbosch, National Botanic Garden.—77 packets of seeds; corms of *Watsonia Wordsworthiae* and a collection of *Pelargonium* spp.

Leningrad, Botanic Garden.—58 packets of seeds.

Lisbon, Botanic Garden.—37 packets of seeds.

London, Hyde Park.—A collection of 58 packets of seeds collected in Nepal; stove and greenhouse plants including *Eustoma Russellianum* and *Blumenbachia chuquitensis*; herbaceous and alpine plants and a collection of *Meconopsis* spp.

Malta, Department of Agriculture.—Seeds of *Vicia leucantha* and plants of *Centaurea crassifolia*.

Montpellier, Botanic Garden.—82 packets of seeds.

Munich, Botanic Garden.—A collection of ferns, stove plants, alpines and succulents.

New York, Botanic Garden.—61 packets of seeds, including *Cycas Wadei*.

New York State Agricultural Station, Geneva, N.Y.—Plants of *Prunus tomentosa* var.

Ottawa, Central Experimental Farm.—50 packets of seeds.

Oxford, Botanic Garden.—Seeds and plant of *Eichhornia azurea*.

Palermo, Botanic Garden.—35 packets of seeds.

Paris, Museum d'Histoire Naturelle.—54 packets of seeds.

Peradeniya, Royal Botanic Gardens.—A collection of palm seeds.
 Rostock, Botanic Garden, Germany.—A collection of aquatic plants.
 Seychelles, Department of Agriculture.—Seeds of *Sorindeia madagascariensis* and *Northea seychellana*.
 Simla, Viceregal Gardens.—Miscellaneous seeds, including *Lilium* spp.
 Singapore, Botanic Garden.—Seeds and plants including *Nepenthes Macfarlanei*.
 Stellenbosch, University Botanic Garden.—108 packets of seeds, and plants of *Drosera* spp.
 Sydney, Botanic Gardens.—Seeds of *Strelitzia* spp.
 Tokyo, Botanic Garden.—70 packets of seeds.
 Trinidad, Department of Agriculture.—A collection of orchids.
 Turin, Botanic Garden.—76 packets of seeds.
 Washington, U.S. Department of Agriculture.—Seeds and plants of economic value.
 Wisley, Royal Horticultural Society's Gardens.—Seeds and plants, including *Iris Kaempferi* and a collection of *Helianthemum* spp. and vars.

Private Donors :—
 Rev. J. Farnworth Anderson, Leicester.—Seeds of alpines.
 Mr. C. H. Armbruster, Mallorca.—Plants of *Cyclamen balearicum*.
 Mr. S. C. Atchley, Athens.—Seeds, plants and bulbs collected in Greece.
 Miss Winsome Barker, Bolus Herbarium, Kirstenbosch.—Extensive collections of South African succulents, corms, bulbs and seeds, including many of unusual interest.
 Mr. R. Beck, Dulwich.—A collection of New Zealand fern spores.
 Lady Muriel Jex-Blake, Nairobi.—Seeds collected in Kenya.
 Mr. G. W. Blathwayt, Porlock.—A collection of pompom chrysanthemums.
 Mr. A. J. H. Brown, Bexhill.—A collection of Mesembryanthemums.
 Dr. N. E. Brown, Kew.—A large collection of *Conophytum* spp., and other succulents.
 Mr. H. Bruins-Lich, St. Helena.—A collection of ferns and *Pelargonium* spp.
 Mr. E. G. Bryant, Prieska, South Africa.—Plants, tubers and seeds.
 Viscountess Byng of Vimy, Thorpe, Essex.—A collection of greenhouse plants.
 Mr. E. N. Carrothers, Belfast.—Plants of *Pinguicula lusitanica*.
 Dowager Countess Cawdor, Haslemere.—Red-berried mistletoe growing on olive.
 Mr. W. S. Chamberlain, Twickenham.—A collection of seeds from South Africa, and plants of *Primula* spp.
 Mr. W. Napier Church, Sandhurst.—A large collection of stove plants and ferns.
 H.R.H. Duke of Connaught, Bagshot Park.—Cuttings of Azaleas.

Messrs. Cooper, McDougall & Robertson, Ltd., Berkhamsted.—A collection of seeds of Australian plants.
 Mr. W. Cradwick, Mandeville, Jamaica.—A collection of ferns.
 Mr. C. H. Curtis, London.—Plant of *Vanda Bensoni*.
 Mr. J. E. Dalgliesh, Market Weighton.—A collection of *Populus* spp.
 The Donard Nursery Co., Newcastle, Co. Down.—Narcissus bulbs in variety, hardy shrubs, and plants of *Primula Winteri*.
 Messrs. C. Englemann, Saffron Walden.—A collection of border carnations.
 Prof. M. L. Fernald, New Brunswick.—Plants of *Sarracenia purpurea*, *Xyris montana*, *Habenaria clavellata*, and seeds of North American plants.
 Mr. K. A. Fotsch, Hunibach, Switzerland.—A collection of *Begonia* spp.
 Mr. A. V. Giblin, Hobart.—Seeds of Tasmanian plants.
 Mr. J. S. L. Gilmour, Kew.—Seeds of native plants.
 Lady Godley, Gibraltar.—Bulbs of *Narcissus* spp., and plants of *Viola arborescens*.
 Dame Alice Godman, Horsham.—Plants, including *Pelargonium Stapletonii*.
 Mr. J. Gossweiler, Angola.—A collection of succulents.
 Dr. T. Nakai, Director of the Botanic Gardens, Tokyo.—Plants of *Abeliophyllum distichum*, *Boniniella Ikenoi* and *Juniperus taxifolia*. (These were obtained through the good offices of Mr. F. C. Greatrex, H.M. Consul, Nagasaki.)
 Mr. Cecil Hanbury, La Mortola.—65 packets of seeds, plants of *Kalanchoe tubiflora* and other succulents.
 Mr. H. Harris, Putney.—A collection of succulents and Selaginellas.
 The Marquess of Headfort, Kells, Co. Meath.—Plants of *Rhododendron Taggianum*, *Primula muscarioides* var. *hirtescapa*, *P. szechuanica* and seeds of *Fraxinus Paxiana*.
 Messrs. Hillier & Sons, Winchester.—Hardy trees and shrubs.
 Mr. G. B. Hinton, Mexico.—A collection of orchids.
 Capt. Collingwood Ingram, Benenden, Kent.—Plants, including *Delphinium Welbyi*.
 Hon. Robert James, Richmond, Yorks.—Bulbs of *Lilium Wardii*, *L. Dalhansonii* and plant of *Clematis Sieboldii*.
 Capt. H. A. Johnstone, London.—Large collections of palm seeds.
 Dr. A. F. G. Kerr, Bangkok.—Seeds of *Primula siamensis*, etc., a collection of orchids and bulbs.
 Mr. C. H. Lankester, Costa Rica.—A collection of orchids.
 Mrs. A. C. Latter, Sevenoaks.—Plant of *Cycas revoluta*.
 Mr. H. W. Lawton, Wellington, New Zealand.—Seeds, including *Pittosporum lineare*.
 Lady Léconfield, Petworth Park.—Plants, including *Calanthes*.
 The Executors of the late Mr. W. E. Ledger, Wimbledon.—A large collection of succulents, bulbous plants and orchids.

Mr. H. Q. Levy, Jamaica.—Collections of Jamaican orchids in variety.

Mr. J. N. List, Rangoon.—Plants of *Tacca laevis*.

Mr. F. R. Long, Port Elizabeth, South Africa.—Seeds and plants of succulents.

Mr. J. W. MacGregor, Glasgow.—A collection of herbaceous plants.

Hon. H. D. McLaren, Bodnant, N. Wales.—Plants of *Primula* spp., and plants from Dr. G. N. Humphreys' Ruwenzori expedition.

Mr. E. L. Magnus, Gothenburg.—Plants of *Disa grandiflora*.

Sir John Stirling Maxwell, Pollok House, Glasgow.—A collection of Rhododendrons.

McGregor Memorial Museum, Kimberley.—Succulents, including *Stapelia* spp.

Mr. E. H. Mennell, King's Lynn.—Plants collected in St. Helena.

Lt.-Col. L. C. R. Messel, Handcross.—Plants of *Veronica nivea*.

Rev. Rollo Meyer, Watton-at-Stone, Herts.—Bulbs of *Iris reticulata*.

Mr. C. T. Musgrave, Godalming.—Seedling *Meconopsis* and plants, including *Neillia longiracemosa*.

Col. G. Napier, Horsham.—Bulbs of *Lilium Duchartrei* and *L. Martagon* var. *dalmaticum*.

Major A. Pam, Broxbourne.—Seeds and plants, including *Alstroemeria* spp., and *Crinum Moorei*.

Mr. J. E. M. Reid, Thornton Heath.—Seeds of *Lodoicea sechellarum*, and plant of *Vanda* sp.

Mr. P. Rosenheim, East Molesey.—Bulbs of *Lilium* spp.

Major Lionel de Rothschild, Exbury.—Seeds of hardy trees and shrubs.

Messrs. L. R. Russell, Ltd., Richmond.—Miscellaneous stove plants.

Hon. Mrs. E. Ryder, Beaulieu.—95 packets of seeds, plants of *Encephalartos* sp., succulents and greenhouse plants in variety.

Mr. F. S. Sandeman, Kingennie.—Plants of *Primula Winteri* and collection of *Primula* seeds.

Messrs. Sanders, St. Albans.—Orchids, including *Liparis plicata*, *Pholidota conchoidea*.

Mr. T. Sharp, Westbury.—Plants, seeds and cuttings of succulents.

Mr. J. K. Small, New York.—A collection of *Iris*.

Abbé H. Souillet, Milly, France.—A collection of *Lilium* spp.

Major F. C. Stern, Goring-by-Sea.—146 packets of seeds collected by Capt. Kingdon Ward; plants of *Primula* spp. and bulbs of *Lilium* sp.

Rev. F. H. Stock, London.—A collection of orchids and greenhouse plants.

Mr. J. E. H. Stooke, Hereford.—Seeds and bulbs of *Lilium* spp.

Mr. G. M. Taylor, Portobello, N.B.—Seeds of *Lilium occidentale* and bulbs of *Lilium tigrinum* var. *splendens*.

Mr. G. S. Thomas, Chobham.—A collection of alpinists.

Mr. G. Thorncroft, Barberton, Transvaal.—Seeds and bulbs of South African plants.

Messrs. W. Treseder, Ltd., Cardiff.—A collection of bedding Dahlias.

Messrs. Vilmorin-Andrieux et Cie, Paris.—59 packets of seeds.

Mr. K. Wada, Numazu-shi, Japan.—Seeds of rare Japanese plants.

Major F. H. Ward, Nairobi.—Seeds, and suckers of *Musa* sp.

Messrs. F. Gomer Waterer, Woking.—A collection of Rhododendrons; plant of *Magnolia taliensis*.

Mr. J. Cromar Watt, Aberdeen.—Seeds and plants, including *Primula Calderiana*, *Rubus bogotensis*.

Dr. A. H. Williams, Horsham.—A collection of seeds; plants including *Carmichaelia grandiflora*.

Mr. F. A. Weinthal, Roseville, N.S.W.—A collection of orchids.

Messrs. K. Yashiroda, Ltd., Kagawaken, Japan.—Seeds collected in Formosa.

Mr. K. Zwicky, Hunibach, Switzerland.—Plant of *Cereus flagelliformis*.

DISTRIBUTION OF PLANTS AND SEEDS.—174 consignments comprising 9791 packets of seeds (hardy trees and shrubs 3492; herbaceous plants 6299) were distributed from Kew during the early months of the year, an increase of 186 packets over the 1931 annual exchange distribution. The largest single consignment was sent to the New York Botanic Garden and comprised 506 packets of herbaceous plants and 82 of hardy trees and shrubs.

Amongst the most important seeds specially distributed were:—*Lupinus Termis*, *Pinus Gerardiana*, *Juglans cordiformis*, *Tectona grandis*, *Ceiba pentandra*, *Moultonia singularis*, *Glycine Max*, *Crotalaria juncea*, *Keteleeria Fortunei*, *Alysicarpus rugosus*, *Eleusine coracana* and *Arundinaria Panlingii*.

Wardian cases, containing varied collections of plants, were despatched to the following destinations overseas during the year:—Government Gardens, Khartoum, Sudan; Department of Agriculture, F.M.S. (2 cases); Public Works Department, Pretoria, South Africa; Mr. R. H. Rumsey, Dundas, New South Wales; Department of Agriculture, Trinidad; Munich Botanic Garden (2 consignments).

In addition, shipments of plants were undertaken to the following destinations:—

Mr. T. H. Everett, New York; Mr. C. H. Lankester, Costa Rica (2 consignments); Mr. H. Q. Levy, Jamaica; Department of Agriculture, Malta (2 consignments); Dr. R. H. Pulleine, Adelaide, Australia.

Three large cases of ginger roots (*Zingiber officinale*) were received at Kew from the Department of Agriculture, Trinidad, and repacked and despatched to the Chief Secretary to the Government, Lagos, Nigeria.

Plants of a seedless variety of pomegranate were distributed to the following, and in some cases the Air Mail postal service was made use of in order to expedite delivery :—Pretoria, Salisbury (S. Rhodesia), Khartoum, Jaffa, Cyprus and Madras.

Other recipients of plants, etc., from Kew, included the following :—

Amsterdam, Botanic Garden.—A plant of *Dicksonia arborescens*.
Admiralty Compass Laboratory, Slough.—A collection of hardy shrubs.

Aberdeen, North of Scotland College of Agriculture.—A collection of grasses.

Alipur, Agricultural & Horticultural Society of India.—Plants of *Hedychium* spp.

Berkeley, University of California.—Seeds of 35 *Lilium* spp. and vars.

Canberra, Forestry Bureau.—Cuttings of *Salix alba* var. *coerulea*.

Coimbra, Botanic Gardens.—Seed of *Typhonodorum Lindleyanum*.

Federated Malay States, Department of Agriculture.—A collection of economic plants.

Forestry Commission.—Hardy trees, including *Populus* spp., and conifers for the National Pinetum, Bedgebury.

Glasnevin, Botanic Gardens.—A collection of plants, including hardy trees and shrubs.

Hakgala, Botanic Gardens, Ceylon.—A collection of *Nymphaeas*.

John Innes Horticultural Institution, Merton.—Alpines and a large collection of shrubs and greenhouse plants.

Jericho, Government Horticultural Station.—Suckers of Musas.

Louvain, Secrétariat Général Boerenbond Belge.—A collection of genera representative of the family Marantaceae.

London, Hyde Park.—Herbaceous plants.

Malta, Department of Agriculture.—A collection of economic plants and Selaginellas.

Munich, Botanic Garden.—Miscellaneous collections of plants, including herbaceous and alpines.

Middlesex County Council (Roads Department).—Cuttings of hardy shrubs.

Nigeria, Department of Agriculture.—Seeds of *Phaseolus* spp.

Oxford, Imperial Forestry Institute.—Plants of *Davidia Vilmoriniana*.

Oxford, Botanic Garden.—Plants of *Primula floribunda*.

Pretoria, Department of Agriculture, Division of Plant Industry.—

A collection of seeds of *Sorghum* spp. and varieties for trial.

Queensland Forestry Service, Brisbane.—Cuttings of *Salix* spp.

Rotterdam, Botanic & Zoological Gardens.—Seeds of *Victoria regia*.

Rostock, Botanic Gardens, Germany.—Plants, including *Lagarosiphon muscoides*.

Richmond Park.—Hardy shrubs.

Sydney, Botanic Gardens.—Seeds of *Cupressus* spp.

Seychelles, Department of Agriculture.—Seeds of *Attalea cohune*.
Trinidad, Imperial College of Tropical Agriculture.—Seeds and plants of Musas.

Trinidad, Department of Agriculture.—A collection of *Piper nigrum* vars.

Timaru, Parks Department, New Zealand.—A collection of seeds of trees and shrubs and of *Kniphofia* spp.

U.S. Department of Agriculture, Washington.—Seeds of *Phoenix reclinata*.

Wisley, Royal Horticultural Society's Gardens.—A large collection of hard-wooded greenhouse and herbaceous plants.

Mr. H. Allander, Stockholm.—Seeds of European species of *Rubus*.

Mrs. M. C. Allison, Kakamega, Kenya.—A small collection of tulips.

Mr. H. F. Buxton, Durness by Lairg, N.B.—Rhododendrons for trial on magnesian limestone.

Dr. F. Boergesen, Copenhagen.—Hardy herbaceous plants.

Mr. G. W. Blathwayt, Porlock.—Plants and cuttings, including a collection of *Pelargoniums*.

Miss C. Buisman, Baarn, Holland.—Grafts of *Ulmus* spp.

It.-Col. F. R. S. Balfour, Dawyck.—Hybrid poplars and hardy trees and shrubs.

Hon. Lady Alicia Cecil, Poole.—Plants of *Enkianthus* spp. and *Acer pentapomicum*.

H.R.H. Duke of Connaught, Bagshot.—Plants of *Aesculus indica* and *Wistaria multijuga* var. *alba*.

Col. Stephenson Clarke, Haywards Heath.—Plant of *Taxus adpressa* var. *aurea*.

Mr. W. S. Chamberlain, Twickenham.—Plants, including *Mecynopsis grandis*.

Messrs. Dobbie & Co., Ltd., Edinburgh.—Seeds, including *Lilium* spp.

Dartington Hall, Gardens Department, Totnes.—Grafts, plants and cuttings of hardy trees and shrubs.

Donard Nursery Co., Newcastle, Co. Down.—A collection of seedling *Acer* spp.

Lady Thiselton-Dyer, Bere Alston.—A collection of trees and shrubs.

Messrs. C. Engelmann, Saffron Walden.—A collection of *Sempervivums*.

Mr. T. H. Everett, New York.—A collection of stove and greenhouse plants.

Mr. G. A. Frick, Los Angeles.—Plants and cuttings of *Euphorbia* spp.

Mr. K. A. Fotsch, Hunibach, Switzerland.—Plants of *Begonia* spp.

Mr. S. H. Griffin, Farnham.—Seeds of succulents.

Dr. P. L. Giuseppe, Felixstowe.—A collection of alpines.

Capt. R. H. Griffin, Merchant Seamen's Institution, Belvedere.—A large collection of trees and shrubs.
 Dame Alice Godman, Horsham.—Plants and seeds, including *Kniphofia Galpini* and *Meconopsis nepalensis*.
 Mr. B. Hurst, Prince Edward Island.—A collection of *Hedera Helix* vars.
 Lt.-Col. H. B. Holt, Military Headquarters, Burao, British Somaliland.—Seeds and plants of *Mesembryanthemum edule*, *M. deltoides* and *M. validum*, for growing as sand-binding plants (presented by Major A. Dorrien-Smith from Tresco Abbey).
 Messrs. Hillier & Sons, Winchester.—Hardy trees and shrubs.
 Marquess of Headfort, Kells, Co. Meath.—A collection of hardy trees and shrubs.
 Dr. W. A. Harrison, Burnie, Tasmania.—Buds of *Glycyrrhiza glabra*.
 Sir Arthur Hort, Andover.—*Pelargonium* spp., and alpiners.
 Capt. Collingwood Ingram, Benenden, Kent.—Plants of *Rhododendron burlutescens*.
 H.M. The King, Windsor & Sandringham.—Plants of *Aesculus indica*.
 Mr. B. H. Keall, Chelmsford.—A collection of fern spores.
 Mr. H. Q. Levy, Jamaica.—A collection of orchids.
 Sir William Lawrence, Dorking.—Hardy trees and shrubs.
 Mr. C. H. Lankester, Surbiton.—Herbaceous plants; a collection of orchids and succulents.
 Messrs. W. J. Marchant, Wimborne.—Trees and shrubs.
 Earl of Malmesbury, Christchurch.—Plants of *Ixora* spp.
 Mr. E. R. Magnus, Gothenburg.—Plants of *Disa tripetaloides* and *D. Luna*.
 Sir F. W. Moore, Rathfarnham, Dublin.—Rhododendrons.
 Major Sir George Manners, Woodbridge.—A collection of conifers.
 Hon. H. D. McLaren, Bodnant, N. Wales.—Greenhouse plants and *Primula Dickieana*.
 Sir F. A. Newdegate, Nuneaton.—Plants of *Dianella tasmanica*, *Libertia pulchella*, etc.
 Col. G. Napier, Horeham Road, Sussex.—A collection of *Lilium* seeds.
 Mr. N. S. Pillans, Rosebank, Cape Province.—A collection of *Lilium* seeds.
 Dr. R. H. Pulleine, Adelaide.—A collection of Euphorbias.
 Mrs. N. E. Parry, Newton Abbot.—Plants raised from seeds collected in the Lushai Hills, Assam.
 Major A. Pam, Broxbourne.—A collection of trees and shrubs, and tubers of *Gloxinia maculata*.
 Mr. R. H. Rumsey, Dundas, New South Wales.—A miscellaneous collection of plants in wardian case, including *Hoya* spp.
 Messrs. L. R. Russell, Ltd., Richmond.—A collection of *Nepenthes*, and stove plants.

Major L. de Rothschild, Exbury.—Plants, including *Cladrastis Wilsonii*, and *Cytisus Battandieri*.
 Hon. Mrs. E. Ryder, Beaulieu.—Succulents, bulbs and seeds of *Liliums*, and greenhouse plants.
 Royal Army Veterinary Corps, Woolwich.—Hardy trees.
 Major F. C. Stern, Goring-by-Sea.—Plants, including *Hebe* spp., *Kniphofia Northiae*, and seeds of *Lilium* spp.
 Mr. J. E. H. Stooke, Hereford.—Seeds of *Nomocharis* spp. and *Lilium* spp.
 Mr. J. L. Smith, Sydney.—Cuttings of *Populus tremula*.
 Mr. J. B. Stevenson, Ascot.—Plants of *Acer pentapomicum*.
 Major F. J. Stayner, Bath.—A collection of *Mesembryanthemums*, alpiners, hardy trees and shrubs.
 Messrs. Sutton & Sons, Slough.—Hardy plants, including *Meconopsis regia*, and *M. grandis*.
 Mr. A. Scott, Carlisle, N.B.—A collection of *Fragaria* spp.
 Messrs. W. C. Slocock, Woking.—Grafts and cuttings of hardy trees and shrubs.
 Mr. Rees Thomas, Port Talbot, S. Wales.—Herbaceous plants and seedling Rhododendrons.
 Mr. R. D. Trotter, Oakley.—Plants, including *Stewartia koreana*.
 Prof. A. G. Tansley, Oxford.—Plants of *Hevea brasiliensis*.
 Underground Railways, London.—Seeds and cuttings of hardy trees and shrubs.
 Sir O. Warburg, Epsom.—Hardy trees and shrubs.
 Messrs. F. Gomer Waterer, Woking.—Grafts and cuttings of hardy trees and shrubs.
 Mr. E. H. Wilding, Stoke Poges.—Plants, including *Cornus Kousa* var. *chinensis*.
 Mr. J. Cromar Watt, Aberdeen.—Hardy plants, including Camellias in variety.
 Mr. J. C. Williams, Caerhays.—Plants of *Erica Pageana*.
 Mr. C. R. Wadman, London.—Alpines.
 Messrs. R. Wallace & Co., Ltd., Tunbridge Wells.—Plants and grafts of hardy trees and shrubs.
 Mr. J. J. M. van Zyl, Ladysmith.—Seeds of British trees.
 Messrs. K. Yashiroda, Ltd., Japan.—A collection of conifers.
 Mr. K. Zwicky, Hunibach, Switzerland.—Seeds of *Primula* spp.

National Pinetum at Bedgebury.

Most of the trees continue to make satisfactory progress and many are growing very rapidly. Some losses occurred during the year owing to attacks by fungus diseases and insect pests, and several trees that had been injured by the severe spring frosts of 1926, '27 and '28, and that showed no signs of recovery, were destroyed and replaced. On the other hand several young trees that had lived after severe freezing in those years, but had remained in a stunted condition, formed short, erect, vigorous shoots from dormant stem

buds and now appear as though they may resume the normal rate of growth. It is also satisfactory to find that grafted plants of *Abies nobilis* var. *glauca*, which from 1925 gave little evidence of forming good leading shoots, have at last responded to branch pruning and formed good erect leaders, in one instance 18 inches long.

A little browning from the effects of late frost occurred on early shoots, but generally growth was late and little harm was done. The ill effects of a mild winter temperature are very apparent in the case of *Larix sibirica*. In December, 1931, growth buds were bursting and the shoots were quite green by the middle of January. Later on, both young shoots and leaves were badly cut by cold winds, and, as the same thing has happened over a succession of years, the trees are poorly developed when compared with other species of similar age.

March was a trying month, for very cold winds accompanied by frost were experienced throughout several successive days. The foliage of several species of *Pinus* was injured; one young tree of *P. patula* was killed outright, and young shoots of that species, and of *P. caribaea*, were seriously injured. In one place a specimen of *Sequoia sempervirens* 50 years old and 60 or 70 feet high was browned from bottom to top as though it had been scorched by fire.

Thermometers have been installed in four different parts of the Pinetum and daily records are kept in accordance with work in that direction carried out by the Forestry Commission. Although the Pinetum is only 50 acres in extent it has already been found that the temperature in different parts may vary as much as 4 degrees on cold nights and warm days.

Green spruce aphid (*Aphis abietina*) has been very troublesome for several years and it bred on numerous species of *Picea* throughout the winter of 1931-'32, being particularly prominent from January to April. Soon after the hot, dry weather began in June it was noticed that the pest was less in evidence and by the middle of July it had practically disappeared. A few were seen in November, but many less than in previous years. *Dreyfusia* is still present on various *Abies* but its spread appears to have been checked by spraying. Outbreaks of minor insect pests have been noticed, but by prompt attention to spraying and other means of destruction they have not made serious headway. The larvae of the moth *Dichomeris marginella*, reported last year as attacking various kinds of juniper, have again been active, but in smaller numbers, whilst injury by the larch shoot moth has again decreased.

Fungus diseases have become more serious, particularly the honey fungus, *Armillaria mellea*, and several well developed young trees have died after infestation. The wet, mild autumn weather was peculiarly favourable for the spread of this disease, which was known to be present on the old pine butts and roots, and fructifications were found in all directions. It is more than probable that losses will be experienced from this disease for many years. For the first time

larch canker, *Dasyscypha calycina*, was found on the young larch trees, the Silesian form of common larch being the chief sufferer. The attack so far is not of a serious nature and appears to be confined to a few branches. As a larch wood badly infested by this fungus is situated a few hundred yards away, young trees can hardly escape altogether.

Undergrowth was particularly vigorous and an effective effort was made to clear the ground of bracken and grass during early autumn in order to reduce the possibility of damage by fire. As the bracken appears to be increasing in vigour, an attempt to kill some of it by beating down the young undeveloped leaves is to be made next spring. A good deal of dead wood has been removed from old trees and dead butts are being cleared from avenues as time allows. Overgrown plants of *Rhododendron ponticum* have also been cut back. Box drains made of rough oak planks have been laid in the ditches where they cross avenues, and the unequal ground level in such places is gradually being built up by rotting grass and other vegetation.

A start has been made in removing some of the lower branches from the larches, the vigorous growing pines, and from other trees, the idea being gradually to remove the branches while small until the desired height of clear trunk has been attained, rather than to leave all the lower branches to develop until they have attained a considerable size, as is often done with coniferous trees planted for decorative purposes.

Numerous conifers were taken to Bedgebury from Kew in the autumn and about 70 plants were purchased as additions or replacements. A number of water-lilies from Kew were planted in Marshall's Lake in April; they flowered well during the summer and were much admired by visitors. Two lorry loads of large *Rhododendrons* were sent from Kew in November and it is hoped to send some more in the spring. An effort is being made to build up a collection of *Rhododendrons* in place of weedy undergrowth, and gifts of the more vigorous species will be welcomed from anyone who may be overstocked with such plants.

Numerous persons interested in conifers have been given facilities for inspecting the collection during the year. A party of Student Gardeners was taken from Kew in April in connection with the course of lectures on arboriculture, and some 40 members of the Royal English Forestry Society visited the Pinetum in June. The general opinion of those who have paid visits seems to be that the Pinetum and adjacent forest plots are developing into an important educational area for students of horticulture and forestry.

It is with great regret that the death, in November, of Mr. H. A. PRITCHARD, O.B.E., Assistant Commissioner for England and Wales, under the Forestry Commission, has to be recorded. Mr. Pritchard had been a member of the committee responsible for the formation and upkeep of the Pinetum and Forest Plots since its earliest days,

and had a great deal to do with the early negotiations and arrangements. His keen interest in the development and progress of the Pinetum and his active assistance at all times will be greatly missed by his colleagues.

The Museums.

As in past years the work in the Museums has been very largely concerned with answering questions of visitors and correspondents regarding the economic products of plants and the identification of specimens, and with assisting persons who have made prolonged visits for the studying of special subjects. Questions connected with essential oil plants and the possibility of their successful cultivation in various Colonies have been very numerous, and many requests have been made for suggestions as to crops that might be used to replace or supplement others that could not under present conditions be matured and marketed at a price that ensured a reasonable financial return to the producer.

Such crops are difficult to find, for it is very easy to spoil a moderately lucrative market by a little over-production. Further, a good deal of experimental work may be necessary with crops new to a country before an attempt at their cultivation on an extensive commercial scale is warranted, and farmers are usually on the look-out for something that will yield an easily grown, paying crop within a few months from the time of sowing.

Numerous specimens have been dried and added to the Arboretum Herbarium, and pressure on space has been relieved by additional presses and rearrangement. Good progress has been made in the preparation of a collection of dried branch specimens of conifers, with cones, to send to Bedgebury at some future time.

Museum No. 3, Colonial Timbers, has been redecorated throughout. The redecoration of such a building involves a good deal of work, for all the lighter specimens and many of the heavier planks have to be moved. The opportunity was taken of making such rearrangements as were necessary and of replacing some of the poorer specimens. Exhibits representing various Colonies are gradually being renewed and the Tasmanian government is at present considering the replacement of those Tasmanian timbers that have deteriorated with age. By permission of the Director a collection of lily bulbs has been prepared in preservative liquid for purposes of comparison at the Lily Conference to be held under the auspices of the Royal Horticultural Society in 1933.

During the year Mr. J. H. Holland contributed articles to the Bulletin on Ledger Bark and Red Bark, and on "Oiticica" (*Licania rigida*). Mr. J. H. Turner carried out research into the longevity of seeds, and a review of the subject will shortly be published in the Bulletin. In several instances certain leguminous seeds were found to be viable after storage in museum jars for from 60 to 90 years.

The Keeper attended the annual meeting of the Association of Superintendents of Parks and Curators of Botanic Gardens, held at Liverpool in July, as the representative of the Ministry of Agriculture and Fisheries. By invitation of the Association he gave an address on problems connected with trees planted along the sides of streets and roads. He also attended the annual meetings of the Museums Association at Birmingham and the Council for the Preservation of Rural England at Norwich. He has continued to act as Executive Officer for the Pinetum at Bedgebury.

During the year a large number of photographs and lantern slides, mainly of tropical agricultural crops, was acquired by the Bentham Trustees from Dr. C. A. Barber of Cambridge; many of these have been incorporated with slides already at Kew, and the remainder have been prepared for distribution to other institutions.

PRESENTATIONS TO MUSEUMS.—Mr. T. Hedley Barry, 84, Fetter Lane, E.C.4.—Collection of hard resins and copals used in the preparation of his book "Natural Varnish Resins" (1932).

Mr. H. Bruins-Lich, Trinidad.—Sample of Coffee grown in St. Helena.

Mr. A. A. Cavanagh, Liebig's Yerba Maté Plantation, Playadito, Corrientes, Argentine Republic.—Sample of Paraguay Tea.

Miss L. E. Cheesman, 63, Longridge Road, S.W.5.—Specimen of wood of *Santalum austro-caledonicum*.

Dr. L. Cockayne, C.M.G., F.R.S., Wellington, New Zealand.—Ten lantern slides showing different types of vegetation in New Zealand.

Mr. C. T. Collinson, 35, West Cromwell Road, S.W.5.—Two photographs of *Welwitschia mirabilis*.

Mr. E. Fleming, 1006, Government Street, Victoria, B.C.—Photograph of *Cornus Nuttallii*.

The Forestal Land, Timber and Railways Company, Ltd., 15, St. Helen's Place, E.C.3.—Fifty named specimens of Argentine woods.

Mr. J. C. F. Fryer, Pathological Laboratory, Harpenden.—Seeds of *Chrysanthemum cinerariaefolium* from plants raised from Japanese and Swiss seeds.

Dr. Alfred Hay, bequeathed by the late, per The Chartered Bank of India, Australia and China.—Collection of wood specimens and drawings of plants.

Dr. T. A. Henry, The Wellcome Chemical Research Laboratories, 183-193, Euston Road, N.W.1.—Sample of oil and seeds of *Oncoba spinosa*.

Miss M. S. Johnston, 276, Kew Road, Kew.—Wooden figure of Boatman, XIth Dynasty, from the Museum, Cairo; spoon made of sycamore, ash tray and carved dog manufactured in England; also a specimen of old Tunbridge ware.

Messrs. Wm. Marshall & Son, Ltd., 317, Holloway Road, N.7.—Plank of *Zelkova crenata* from a tree grown near Staines.

Pernambuco, H. M. Consul.—Fruits, leafy branches and unopened flowers of "Oiticica" (*Licania rigida*).

Sir David Prain, The Well Farm, Warlingham.—Photographs of *Pinus contorta* var. *latifolia*.

Princes Risborough, Forest Products Research Laboratory.—Collection of 38 hand specimens of wood, and 7 boards of Empire timbers.

The Conservator of Forests, Utilization Circle, Ahlone, Burma.—420 hand specimens of Burmese woods.

Mr. H. N. Ridley, 7, Cumberland Road, Kew.—Walking sticks of *Randia densiflora*, *Arenga saccharifera* and *Diospyros macrophylla*.

Jodrell Laboratory.

The routine work of the laboratory has been mainly concerned with the examination of miscellaneous material, consisting chiefly of timbers, fibres, barks and seeds, with a view to identification from a study of the anatomy.

The collection of microscopical slides of wood-sections, seeds, etc., the formation of which was described in last year's report, has grown steadily. The new slides, most of which have been prepared for comparison with material received for identification, are from a wide range of families. Exchange of slides has been effected with the Imperial Forestry Institute, Oxford, over 150 slides having been received during the year. These exchanges are of great value, since, in addition to increasing the size and therefore the utility of the collections, they sometimes lead to the discovery of wood-specimens in our collections whose identity has been previously incorrectly determined.

The investigation of the structure and taxonomy of some little-known scented woods from the East, mentioned in last year's report, has been concluded, and an illustrated account is published in *Kew Bulletin*, 1933, 3.

At the suggestion of the Director, the anatomy of the phyllode-bearing species *Oxalis Herreræ* R. Knuth and *O. bupleurifolia* St. Hil. was studied. The material of *O. Herreræ* was kindly supplied by the Director, who had collected it some years ago in Peru. An account of this work is to be published shortly in the "Annals of Botany."

In collaboration with Dr. Sprague the anatomy of the leaves and axis of the genera *Barnhartia* and *Didclidanthera* and of certain Polygalaceae was studied in order to determine whether the structure confirmed Dr. Sprague's suggestion, based on gross morphological features, that the Didclidanthaceae and Polygalaceae are closely related to one another. Evidence which favours this suggestion was found.

In connection with the experimental work at Potterne under the direction of Mr. Marsden-Jones and Dr. Turrill, it has been decided that a study of the anatomy of *Centaurea*, carried out at the same time as the genetical and transplant experiments on that genus,

would yield useful results. A start has been made with this work, attention having been directed especially to the nature of the hairy covering of the basal leaves of plants grown on different types of soil at Potterne. It is hoped that this work may be extended in the spring when further fresh material will be available for study.

The most constant visitor this year has been Mr. L. A. Boodle, the late Assistant Keeper of the laboratory. Most of his time has been spent in identifying collections of material made by excavators in the Egyptian tombs. In addition, his wide knowledge of botanical literature and of plant anatomy has been of the greatest assistance in dealing with difficult material received for identification.

The following visitors have also worked at the laboratory during the year :—

Mr. D. V. Daran. Mycology.

Mr. R. N. Aldrich-Blake. Seed germination, and anatomy of root nodules of *Casuarina*.

Mr. G. B. E. Hasselberg. Fixing material for anatomical work.

Mr. H. T. Holland. Food and Drugs.

Mr. E. R. Goodliffe. Elementary Anatomy, etc.

Miss C. L. Perry. Anatomical preparations with the wood-cutting microtome.

The Herbarium.

The outstanding event of 1932 was the completion and opening of the new wing (see Annual Review, 1931, 28). The heating apparatus and electric wiring were completed early in the year and the furniture was delivered during the summer months. The furniture, including stools, tables, large presses and specimen cabinets, is made of steel, the first three being covered with rubber and painted dark green.

The new wing (Wing A) was ready for occupation by the autumn of 1932, and the transference into it of part of the collections and the redistribution of the remainder in the two old wings was carried out without mishap, under the general supervision of the Deputy Keeper, with the aid of labour supplied by H.M. Office of Works. In order to avoid risk of damage or misplacement of material, the work of taking out and putting away the specimens was undertaken by members of the botanical staff. The specimens were conveyed in special containers, which were wheeled to their destination on narrow-gauge trolleys with quietness and admirable celerity. The actual removal of herbarium specimens was completed within six weeks (October–November), but the preparation of new covers and the re-labelling of cabinets will occupy some months.

The total number of shelves-full of herbarium specimens moved was about 36,000, representing over 2,000,000 sheets. These were redistributed among the 50,000 shelves now available in the three wings, space for expansion being left at the top of each vertical row of shelves, at the outside end of each block of cabinets, and at both ends of each floor. The carpological collections are being

placed in the outside row of shelves in each block, adjacent to the corresponding herbarium material. The collection of drawings, which is being remounted on herbarium sheets of standard size, will be placed in cabinets on the same floors as the corresponding specimens, thus facilitating comparison.

The system of Bentham and Hooker has been retained for the general arrangement of the collections. Wing A (the new west wing) contains the Dicotyledons from Ranunculaceae to Compositae (*Zoegae*) inclusive. Wing B (south or centre wing) contains the remainder of the Dicotyledons from Compositae (*Centaurea*, including *Leuzea*) onwards, the Gymnosperms and the Orchids. Wing C (east or old wing) contains the remaining Monocotyledons, the Cryptogams, and the Ecological and Genetical herbaria. For convenience of reference the blocks of cabinets have been numbered consecutively throughout the three wings.

The additional space now available has made it possible to incorporate a large accumulation of specimens which had been kept in store owing to the congested state of the herbarium.

EUROPE, NORTH AFRICA, AND THE ORIENT.

Owing to the very large increase of new collections little was accomplished during the year towards the incorporation of material from the stores. Over 10,000 sheets were mounted and poisoned and the majority laid in, but these were mainly specimens received during the current and past two or three years. Over 8,500 specimens have been received for identification in addition to over 2,500 others which were sent named.

The following genera, amongst others, have been "written up" according to recent monographs or standard lists or floras:—*Linum*, *Matthiola*, *Iberis*, *Glaucium*, *Senecio*, *Pulmonaria*, and *Rhamnus*. The Rev. H. J. Riddelsdell kindly revised critically the *Rubi* from Leicestershire, Devon, and Sussex, and Dr. K. Reehinger determined a considerable part of the genus *Rumex*.

Many members of the Staff have again contributed specimens which have helped to fill the gaps in our series of British plants; in addition the following have also presented material: Mr. B. G. C. Bolland (Devon), Mr. A. K. Jackson, a valuable set of 266 plants from Alderney (supplementing collections previously received from Sark and Jersey), Mr. J. R. Sealy, Mr. A. W. Trethewy (Rutland), Mr. E. Thurston (Cornwall), Mr. C. H. Wright (Devon), Col. H. H. Johnston (Orkney), Miss M. E. Edmonds (Rutland, etc.), Mr. P. M. Hall (various), Mr. E. M. Marsden-Jones (Wiltshire), and Mrs. C. Sandwith (various). The Continental collections were enriched by specimens received from Sir Oscar Warburg (*Cistus*), the Royal Horticultural Society per Dr. O. Stapf (cultivated plants), Mr. J. W. Wyatt (Austria and Switzerland), Mrs. E. W. Moore Kennedy (Balearic Islands) and Dr. H. Lindberg (Spain).

A set of all the known species of *Aegilops*, prepared from the collection which is in cultivation at Reading University, was presented by Professor John Percival.

From the Balkan Peninsula valuable collections have again been received and the recent additions are proving of great use in supplementing the fairly complete sets of many of the older collections. Dr. K. Maly continued to send in exchange plants from Bosnia and Prof. N. Stoyanoff from Bulgaria. Mr. S. C. Atchley continued his most valuable donations (nearly 700 numbers during the year) from Crete and Greece and Mr. H. G. Tedd from Western Thrace. Mr. H. G. Chick sent two collections from Greek Macedonia and one from the Athos Peninsula. Dr. G. Samuelsson presented a set of well-dried plants from Greece. The Rev. and Mrs. H. P. Thompson sent a collection of 250 sheets collected by them in Montenegro, Novi Pazar, and Bosnia. Another valuable contribution consisted of 1,350 sheets, being the Kew share of a collection made during a visit by Messrs. A. H. G. Alston and N. Y. Sandwith to Greek Macedonia.

In addition the following collections were received from various parts of Europe: *Presented*: Andropogoneae by the Botanical Garden of the U.S.S.R. Academy of Sciences, Leningrad; Czechoslovakia, by Dr. K. Domin, Flora Czechoslovenica Exsiccata, Century iii, and by Dr. J. Podpěra, Flora Exsiccata Reipublicae Bohemicae Slovenicae, Century VII. *Purchased*: Mr. P. Aellen, Swiss plants; Mr. J. Wagner, *Tiliae exsiccatae criticae*, Fascicle ii, numbers 51-100.

From the Orient sixteen large consignments of plants collected by Mr. E. R. Guest in Iraq have been received. These consisted of a sufficient number of well-dried specimens to make a number of duplicate sets for exchange. The collection, which is being continued, contains several new species and much critical material. The late Dr. G. C. Druce presented a set of plants from Cyprus. Collections from Palestine have added to the value of our material from this country and include Flora Palaestinae Exsiccata, Century ii, presented by the Hebrew University, Jerusalem, specimens for identification from the Independent Biological Laboratories, Tel Aviv, and Hauran plants collected by J. E. Dinsmore purchased from Fr. Vester & Co. Further specimens collected by Haradjian in Syria, completing the set purchased in 1913, were received from the Conservatoire et Jardin Botaniques, Geneva. Fascicles ix-xii of Herbarium Florae Caucasicae were presented by the Botanical Garden of the U.S.S.R. Academy of Sciences, Leningrad. Dr. P. L. Giuseppi and Mr. E. K. Balls explored little-known parts of Persia and presented useful collections for identification. A set of Anatolian plants was purchased from Prof. J. Bornmüller, and 350 sheets have been received from the Egyptian Ministry of Agriculture for identification.

From North Africa, Dr. H. Lindberg presented an excellent set of plants collected by him in Morocco, and a series of Algerian and Moroccan plants was purchased from M. A. Faure.

Research and Publications.—On the Flora of the Nearer East : XI–XIII (*K.B.* 1932, 193, 248, 450).

Two plants new to the Bulgarian Flora (*Bull. Soc. Bot. Bulg.* v. 78 : 1932).

Variation in *Anemone nemorosa* (*Journ. Bot.* December, 1932).

ASIA.

CHINA AND NORTHERN ASIA.—In addition to the large amount of critical garden material which has been named, several extensive collections have been identified. The most important of these were the Gentians collected by Mr. J. F. Rock on his last two expeditions to Asia, received for critical study from the U.S. National Museum, Washington ; the Gentians collected by Mr. Y. Tsiang in Kweichow, received from the Metropolitan Museum of Natural History, Nanking in 1931, and those collected by the Rev. H. French Ridley in Chinese Turkestan. The authorities of the British Museum (Natural History) kindly sent on loan specimens of *Gentiana* collected in Nepal by Capt. Lall Dhwoj, from which a new species was described.

The following collections were also received :—

Presented : by the Arnold Arboretum, Harvard University (coll. C. Y. Chiao and J. F. Rock), the Fan Memorial Biological Institute, Peiping (*Dioscorea*), the Metropolitan Museum of Natural History, Nanking (coll. Y. Tsiang), and by Mr. R. H. Mobbs.

Purchased : Mr. W. J. Eyerdam, Kamchatka plants.

Research and Publications.—A critical study has been made of all the material of the genus *Cyananthus* which has been brought to this country since the publication of the "Revision of the genus *Cyananthus*" (*K.B.* 1924, 241), and the results of this investigation will appear in a further paper on this genus.

The Chinese and Himalayan Gentians in Cultivation (*Journ. Roy. Hort. Soc.* lvii. 188 : 1932).

A Revision of the genus *Leycesteria* (*K.B.* 1932, 161).

On the Identity of *Aconitum acaule* Diels (*K.B.* 1932, 241).

INDO-MALAYA.—Considerable progress was made with laying in the accumulations in the store of the specimens from the Malay Archipelago and the Philippine Islands referred to in last year's report. The additions of the year which have been determined have also been incorporated in the Herbarium.

Numerous collections were received from the Botanic Gardens at Singapore and Buitenzorg, and from the Forest Department, British North Borneo, and a set of plants collected by Mr. P. Richards, who accompanied the Oxford University Expedition to Sarawak, was presented. Smaller collections were presented by the Imperial Forest Botanist, Dehra Dun ; Professor E. Barnes, of the Christian College, Madras ; Col. C. H. Stockley and Mr. B. O. Coventry from Kashmir ; the Rev. W. J. L. Wenger from the South Lushai Hills of Assam ; and Mr. P. V. Mayuranathan, Botanical Assistant to the Superintendent of the Government Museum, Madras. Professor

Barnes' specimens from the Nilgiri Hills are exceptionally good, being accompanied by valuable notes.

Several small collections were identified for correspondents in North and South India and some progress was made in determining the collections made in North East Assam by Capt. Kingdon Ward and in the Garo Hills by Mrs. N. E. Parry, the former yielding three new species, and the latter one new species and one new variety.

Sheets of South Indian grasses, kindly lent by the Cambridge University Herbarium, the Botanical Gardens, Breslau, and the Royal Botanic Garden, Edinburgh, in connection with the preparation of the Flora of the Presidency of Madras, were received and are proving most useful.

Miss M. M. Whiting has again given valuable help in subdividing the material in the Indo-Malayan region and in rearranging the species at the same time, in conformity with recent work. She has, moreover, written up the sheets of Malayan Dipterocarpaceae in accordance with Foxworthy's recent monograph of this group.

The following collections were also received :—

INDIA.—*Presented* : Burma, by Dr. A. F. G. Kerr and Mr. C. E. Parkinson ; Kashmir, by Prof. R. R. Stewart ; United Provinces, by Mr. P. Maheshwari ; Waziristan, by the Rev. E. Blatter.

MALAY PENINSULA.—*Presented* : by the Forest Research Institute, Kepong, and by Dr. A. F. G. Kerr.

INDO-CHINA.—*Presented* : Laos, by Dr. A. F. G. Kerr ; Siam, by Mrs. D. J. Collins, Mr. H. B. Garrett and Dr. A. F. G. Kerr (coll. A. F. G. Kerr, Noi Put and M. C. Lakshnakara).

PHILIPPINE ISLANDS.—*Purchased* : Mr. C. A. Wenzel.

Research and Publications.—The Koenig Collection in the Lund Herbarium (*K.B.* 1932, 49).

Contributions to the Flora of Burma : X (*K.B.* 1932, 103).

Contributions to the Flora of Siam, by W. G. Craib, Additamenta XXXIII–XXXVII (*K.B.* 1932, 137, 276, 330, 425 and 487).

Contributions towards a Flora of British North Borneo : I and II (*K.B.* 1932, 176 and 292).

Plants new to Assam : IV and V (*K.B.* 1932, 198 and 248).

New or little-known Plants from South India : I (*K.B.* 1932, 245).

Two New Species of *Dentella* (*K.B.* 1932, 289).

The genus *Mariscopsis* (*K.B.* 1932, 457).

AFRICA.

There was no diminution in the amount of material received for identification, over 10,000 specimens being received from Tropical Africa alone during the course of the year. The bulk of this was from East Tropical Africa. It was quite impossible to deal promptly with such a large amount of material with the staff available, and it is regretted that the work of identification is considerably behindhand.

About 11,000 tropical and South African plants have been mounted during the year.

With regard to the African Floras in course of publication, the MS. of Part vi. of Vol. ix. of the Flora of Tropical Africa (Gramineae) has been completed, and includes the important genus *Pennisetum*.

The MS. of the last part of the Flora of West Tropical Africa (Monocotyledons) has been prepared, leaving the Orchidaceae and Gramineae to be completed. Considerable difficulty has been experienced in the elaboration of the Palmae owing to insufficient material, and specimens with field notes and photographs are much needed to complete the Kew collections. Dr. J. M. Dalziel continued to give his valuable help in preparing the Appendix to this Flora which deals with economic plants and vernacular names. It is gratifying to learn that the first three Parts of the Flora are in constant use by the French botanists when studying the plants in French West Africa.

The elaboration of the Cycads having been completed, the MS. of a Supplement to the Flora Capensis containing an account of all South African Gymnosperms has been sent to the press.

The second part of Dr. J. Burt Davy's "Flora of the Transvaal and Swaziland" (Malvaceae to Umbelliferae) was published in July, much of the work entailed having been carried out at Kew over a period of many years. This part should be welcomed by South African botanists, particularly for the account of the Leguminosae, which occupies about one-third of the whole.

WEST TROPICAL AFRICA.—Owing, no doubt, to the publication of the third part of the Flora of West Tropical Africa, which concludes the account of the Dicotyledons and enables botanists in West Africa to name their own collections, only about 1,000 specimens were received from the West African Colonies. These consisted mainly of critical Dicotyledons and Monocotyledons, as botanists have kindly helped by sending material of the latter in order to assist in the working out of that group for the last part of the Flora. From Sierra Leone Messrs. F. C. Deighton and J. W. D. Fisher of the Department of Agriculture have been the chief contributors. Gold Coast plants have been received from Dr. F. R. Irvine and from Messrs. T. Lloyd Williams and W. C. Fishlock of the Department of Agriculture. Nigerian plants collected by Messrs. F. D. Golding, L. H. Saunders (grasses), and C. B. Taylor (grasses) have been received from the Agricultural Department, and by Messrs. J. D. Kennedy, W. D. MacGregor and A. F. Ross from the Forestry Department. Miscellaneous specimens have been presented by Dr. J. Burt Davy of the Imperial Forestry Institute, Oxford.

CAMEROONS AND CONGO.—The poor representation of the Congo flora has been somewhat remedied by the acquisition of further fine collections of Compositae communicated by the Director of the Congo Museum, Tervueren, Belgium. Amongst them were several

novelties, descriptions of which have been published in the Rev. Zool. Bot. Afr. xxiii. 36-42 (1932). Professor W. Robyns presented in exchange about 350 duplicates and an interesting series of Sorghums, and Mr. P. T. L. Putman of Avakubi sent a small collection for naming. A mixed collection, including several new species of Mosses, from the Cameroons Mountain was received from Miss M. Steele.

NORTH-EAST TROPICAL AFRICA.—Major G. Aylmer presented a collection from Erkawit and a series of over 200 specimens was named for Mr. A. P. G. Michelmore and Mr. F. W. Andrews, gathered in connection with their researches on the locust problem in the Sudan. Three small but very interesting collections were received from Miss M. Steele (Gebel Marra), Mrs. D. Macintosh, from the Wau district in the Bahr el Ghazal Province, and from Capt. B. Godfrey-Faussett, from the Western border of Somaliland while engaged on the British Somaliland-Ethiopia Boundary Commission.

EAST TROPICAL AFRICA.—Members of the Agricultural Department, Uganda, have again been active, and specimens have been received from Messrs. P. Chandler, G. L. R. Hancock, C. G. Hansford, C. Hazel, and others; and also from the Forestry Department from Messrs. N. V. Brasnett, W. J. Eggeling, C. M. Harris, and others. Miss E. R. Napier, of the Coryndon Memorial Museum, Nairobi, has forwarded for determination some 1400 specimens collected in Kenya by herself, Miss C. Harvey, Mrs. Brodhurst Hill, Mrs. Chater Jack and others. The Agricultural Department, Kenya Colony, has presented small consignments collected specially by Messrs. D. C. Edwards and C. A. Thorold, and the Forestry Department, Kenya Colony, again forwarded interesting material collected mainly by Messrs. I. R. Dale and H. M. Gardner. From Mount Elgon additional material was received from Major E. J. Lugard, and also some very interesting specimens, especially Orchidaceae, from Mrs. D. R. Tweedie.

The chief collectors in Tanganyika Territory were Messrs. B. D. Burt and G. W. St. Clair Thompson of the Department of Tsetse Research, and A. E. Haarer and V. F. Jessel of the Department of Agriculture. Valuable contributions collected by Messrs. H. E. Emson, H. E. Hornby, P. J. Greenway, N. V. Rounce, and R. R. Staples were received from the East African Agricultural Research Station, Amani.

Our botanical knowledge of the mountainous parts of the southern portion of Tanganyika Territory has been increased during the year by three valuable collections. Mr. R. M. Davies, of the Agricultural Department, made a trip to the Rungwe and Elton Plateau, and forwarded an interesting set of specimens with sketch maps. At a later date Rear-Admiral H. Lynes made a topographical and ecological survey in the Iringa district and brought home a useful collection of specimens accompanied by detailed maps, while additional material from the same regions was received from Mr. G. W. St. Clair Thompson (see p. 4).

SOUTH TROPICAL AFRICA.—A further century of plants collected by Senhor A. F. de Gomes e Sousa in Portuguese East Africa was received from the Director of Agriculture. From Southern Rhodesia a large number of Cyperaceae was communicated by the Secretary of the Department of Agriculture, grasses by Miss S. M. Stent, and miscellaneous plants by Mr. F. Eyles, Miss E. G. Walter and Miss R. J. Myres, and by Mr. D. R. Rosevear of the Forestry Department. A large collection, which included many grasses, was forwarded by Mr. C. G. Trapnell from Northern Rhodesia and a miscellaneous collection from Nyasaland was presented by Mr. E. Lawrence of the Department of Agriculture. Various South Tropical African plants (mostly herbs) were received from Dr. J. Burt Davy, of the Imperial Forestry Institute, Oxford, and over 100 Orchids collected by the members of Lund University, during their expedition to South Africa and Southern Rhodesia, were forwarded for naming by Mr. T. Norlindh. Mr. J. Fish presented a collection of specimens, drawings and seeds of Ceropegias, bequeathed to him by the late Mr. W. E. Ledger. A valuable collection of Madagascan plants was received from M. H. Perrier de la Bathie.

Research and Publications.—The greater part of Mr. J. Hutchinson's time has been spent on the preparation of the manuscript of the Monocotyledons for the Flora of West Tropical Africa and Mr. V. S. Summerhayes has also been largely engaged on the elaboration of Orchidaceae for the same work.

In addition to the Enumeration of Major Lugard's Mt. Elgon plants, which will be published in the Kew Bulletin, and the account of the Belgian Congo Compositae already mentioned (in the press), the following papers have been published :—

- Entandrophragma cylindricum, by A. C. Hoyle (*K.B.* 1932, 40).
- Tropical African Plants: IX (*K.B.* 1932, 94).
- Chidlowia, a new tree genus of Caesalpiniaceae, by A. C. Hoyle (*K.B.* 1932, 101).
- New Trees and Shrubs from Tropical Africa, by J. Burt Davy & A. C. Hoyle (*K.B.* 1932, 257).
- African Orchids: III and IV (*K.B.* 1932, 188, 388).
- The genus Strobilanthesis (*K.B.* 1932, 344).
- Canthium in British East Africa (*K.B.* 1932, 353).
- The Grassland Vegetation of the Cameroons Mountain, by T. D. Maitland (*K.B.* 1932, 417).
- A new species of Arborescent Senecio from Ruwenzori (*K.B.* 1932, 438).
- The Arborescent Senecios of Mount Elgon (*K.B.* 1932, 465).
- New species from Mount Elgon (*K.B.* 1932, 487).

SOUTH AFRICA.—Many specimens from South Africa were as usual sent for purposes of identification or verification from various official sources. About 1000 were communicated by the National Herbarium, Pretoria, mainly from the collections of Messrs. H. G. Flanagan, E. E. Galpin, A. P. G. Goosens and C. G. Trapnell.

Mr. F. R. Long, of Port Elizabeth, Mr. N. S. Pillans, of the Bolus Herbarium, and Miss H. M. L. Forbes, of the Natal Herbarium, also forwarded many species; others were received from the Transvaal Museum, Pretoria, and the Albany Museum, Grahamstown, the latter including many duplicates collected by Mr. R. A. Dyer.

The Hon. Mrs. A. D. Ryder presented a useful collection from the Cape Province, and over 600 miscellaneous plants, including many syntypes, were presented by Capt. T. M. Salter. A well prepared set of *Oxalis* spp., collected by Dr. C. L. Leipoldt, was received through the Bolus Herbarium. Miss W. Barker, who is attached to that Institution in the service of Kew, has forwarded a series of 562 excellently dried specimens, including many interesting species and a proportion of syntypes. Two collections made by General the Rt. Hon. J. C. Smuts, P.C., F.R.S., were communicated by the National Herbarium, one from the mountains in the Eastern Transvaal, the other from the little-known area east of the Zoutpansberg.

A regular flow of small parcels of mounted specimens, mainly of plants which could not be completely determined at the National Herbarium, has been maintained. Specimens of Transvaal Malvaceae and Sterculiaceae were received for determination from the Empire Cotton Growing Corporation, in connection with the investigation of host plants of Cotton pests. A small set of plants was purchased from Mr. E. G. Bryant, collected in the arid and little-known area of Prieska.

In connection with his work on a Flora of Albany and Bathurst Divisions, Mr. Dyer, the South African Assistant, has had on loan 1067 mounted specimens from the Albany Museum, Grahamstown, whilst that Institution and other South African herbaria communicated their collections of Cycadaceae for the Supplement to the Flora Capensis.

Research and Publications.—The Supplement to the Flora Capensis, containing an account of the Gymnosperms, is now in the press, and the investigation of the flora of Albany and Bathurst is in progress. The following papers have been published :—

- Erythrophysa alata (*K.B.* 1932, 149).
- Notes on African Grasses: XII (*K.B.* 1932, 151).
- Notes on the Flora of Southern Africa: I-III (*K.B.* 1932, 152, 443, 510).
- Inezia, a New Genus of Compositae from South Africa, by E. P. Phillips (*K.B.* 1932, 297).
- New South African Iridaceae, by L. Bolus (*K.B.* 1932, 326).

AMERICA.

In this department the study of the Floras of British Guiana and adjacent regions of tropical America has been continued. The identification of the plants collected on the Oxford Expedition to British Guiana was completed and since then a fine set of plants

collected mainly by Mr. T. A. W. Davis, Assistant Conservator of Forests, has been received and studied. These came from the Kanaku Mountains and Upper Rupununi River in the interior of the colony, and include new species of large trees never before felled in this region. Other work on British Guiana includes a revision of the species of *Mora* and *Dimorphandra* and an account of the species of *Strychnos* occurring in the Colony; an investigation of the Bignoniaceae has also been taken in hand.

Several small collections from Tropical America have now been named and incorporated in the Herbarium, notably some interesting plants collected by Mr. W. Fox in the Department of Loreto, Amazonian Peru, received in 1911. The remainder of the Lehmann collection from Colombia and Ecuador has now been named or partially named, and prepared for distribution.

A few large genera were re-arranged and written up by recent monographs, including *Mimulus* by Dr. A. L. Grant's monograph, *Annona* by Prof. R. E. Fries' recent paper, *Anguria* and *Gurania*.

During the year 8660 specimens have been mounted and some 6800 sheets have been incorporated.

Some valuable sets of duplicates have been received in exchange, the most notable being the following: seventy-six specimens, mostly syntypes, of plants from the newly-explored Mount Duida in Venezuela, presented by the New York Botanical Garden; a large number of rare and interesting plants from Amazonian Brazil, Peru and Colombia, collected mainly by E. P. Killip and A. C. Smith, from the United States National Herbarium; specimens of new or rare Surinam species, from the Utrecht Herbarium; a set of plants from the Revillagigedo Archipelago, from the California Academy of Sciences; and a series of 330 Willows, critically determined by Dr. C. R. Ball, from the University of California. In addition, a fine collection of over 1400 excellently dried specimens from Mexico has been presented by Mr. G. B. Hinton, and a small set of very useful Patagonian specimens by Mrs. M. E. Blake.

The following collections were also received:—

NORTH AMERICA.—*Presented*: Canada, by Dr. C. Christensen; United States, by Mr. I. H. Burkill; the Bureau of Plant Industry, United States Department of Agriculture, Washington (cultivated grass Sorghums); the California Academy of Sciences, San Francisco (coll. Miss A. Eastwood); the Carnegie Institution of Washington, Stanford University (coll. D. D. Keck); the New York Botanical Garden (coll. H. N. Moldenke); the University of California, Berkeley (coll. E. B. Copeland and V. Duran); and by the University of California, Los Angeles (coll. Carl Epling).

CENTRAL AMERICA.—*Presented*: Costa Rica, by Mr. C. H. Lankester.

Purchased: Mr. W. A. Schipp, British Honduras plants.

WEST INDIES.—*Presented*: Cuba, by the Arnold Arboretum, Harvard University (coll. J. G. Jack); Trinidad and Tobago, by the Department of Agriculture (coll. R. O. Williams).

Purchased: Mr. W. E. Broadway, Trinidad plants; Mr. E. J. Valeur, Dominican Republic plants.

EAST TROPICAL SOUTH AMERICA.—*Presented*: Brazil, by the Gray Herbarium, Harvard University (coll. H. N. Whitford).

WEST TROPICAL SOUTH AMERICA.—*Presented*: Galapagos and Cocos Islands, by the Brooklyn Botanic Garden (coll. H. K. Svenson).

Purchased: United States National Museum, Colombian and Peruvian plants (coll. G. Klug).

TEMPERATE SOUTH AMERICA.—*Presented*: Argentine, by Dr. Angel L. Cabrera.

Purchased: Dr. A. Donat, Plantae Patagonicae, Century iii.

Research and Publications.—The following papers dealing with the botanical results of the Oxford University Expedition to British Guiana have been published:—

New and noteworthy Bignoniaceae from British Guiana (*K.B.* 1932, 81).

New Euphorbiaceae, by J. Lanjouw, Utrecht (*K.B.* 1932, 183), including the description of a new genus.

New and noteworthy species from British Guiana (continued) (*K.B.* 1932, 209).

Other papers are:—

The Tabebuias of British Guiana and Trinidad (*K.B.* 1932, 18).

New Species of Nototriche from Bolivia (*K.B.* 1932, 77).

Lageria "Vahl" = Terebraria Kuntze (*K.B.* 1932, 349).

Mora and Dimorphandra in British Guiana (*K.B.* 1932, 395); and A New Berberis from Chile and Argentina (*K.B.* 1932, 454).

AUSTRALIA (including NEW GUINEA) and NEW ZEALAND.

During the year several genera of grasses have been revised and re-arranged. All the grasses presented to Kew from the Brisbane Herbarium (1800 sheets) and other botanical institutions and by private persons during Mr. C. E. Hubbard's visit to Australia have now been mounted and are being incorporated. Dr. K. Domin kindly lent over 400 sheets of his Queensland specimens, including many types, which have been of great value in the identification of the large collections of Australian grasses which have reached Kew during the last few years. In connection with this work, the types of all of Lindley's species of Australian grasses in the Cambridge University Herbarium have also been borrowed.

Large mixed collections have been received from Mr. C. T. White, of the Botanic Museum and Herbarium, Brisbane, Mr. A. Morris, Broken Hill, New South Wales, and from the National Herbarium of Victoria. These mostly consist of named plants and duplicates of type or authentic material. Dr. F. A. Rodway has continued to send valuable collections amounting to 450 numbers, largely named, mostly from New South Wales. Further instalments of Tasmanian plants have been purchased from the Tasmanian Museum and Art Gallery, Hobart.

A collection of Central Australian grasses was presented by Professor J. B. Cleland, and a set of grasses collected by Mr. L. J. Brass in various parts of North Queensland was received from Mr. C. T. White. These were from the areas which had hitherto been visited by only one or two collectors who had paid little attention to the grasses.

In addition the following collections were presented :—

AUSTRALIA :—New South Wales, by the Rev. E. N. McKie ; Queensland, by the Arnold Arboretum, Harvard University (coll. C. T. White and S. F. Kajewski), Mr. L. J. Brass, and by Mr. G. K. Jackson (ferns and grasses) ; South Australia, by Mr. J. M. Black ; Victoria, by Miss J. Galbraith ; various, by Dr. A. Meebold.

NEW GUINEA :—By the Department of Agriculture (coll. J. L. Froggatt).

NEW ZEALAND :—By Dr. W. A. Sledge and by Miss N. E. Watt.

Research and Publications.—The Occurrence of the genus *Aceratium* (Elaeocarpaceae) in Australia, by C. T. White (*K.B.* 1932, 42).

A paper on the genus *Dentella* in Australia, for which copious material has been presented or loaned by most of the botanical institutions of that continent, has been prepared.

The Gaultherias and Pernettyas collected by the Director and others in New Zealand, Tasmania and Australia have been studied in connection with their S. American allies by the Director and Mr. B. L. Burtt, his botanical Assistant, and the account will shortly be published.

OCEANIA.

Several small collections have been named from Fiji and advantage was taken of the late Dr. J. W. Gillespie's visit to name practically the whole of the collection made by Mrs. J. D. Tothill and also plants collected by Mrs. C. J. Parham. Work was continued on specimens collected by Mr. S. F. Kajewski in the Santa Cruz Islands forwarded from the Arnold Arboretum. Mr. J. H. L. Waterhouse sent some further instalments from Bougainville Island, while collections of *Ficus* have been received for identification from Professor E. B. Copeland, University of California, and from the Bernice B. Bishop Museum, Honolulu. A large collection of duplicates collected by Mr. Kajewski in the New Hebrides was presented by the Arnold Arboretum.

The following collections were also presented :—Bougainville, by the School of Forestry, Yale University (coll. J. H. L. Waterhouse) ; Samoa, by the University of California, (coll. W. A. Setchell) ; Fiji, by the Department of Agriculture (grasses, coll. C. A. Turbet).

Research and Publications.—The collection of New Hebridean Figs presented by the Arnold Arboretum has been named and a paper published in the Journal of the Arnold Arboretum.

Work was continued on the species of *Ficus* from Tonga, Fiji, Samoa and Solomon Islands.

PTERIDOPHYTA.

Amongst additions to the fern and fern-ally collections during the year was a set of 172 specimens collected in Ceylon about the year 1866 and presented to Kew by Mrs. A. McDonell. This collection had been partially named by G. H. K. Thwaites, when Conservator of the Botanic Garden, Peradeniya. Prof. R. R. Stewart presented a set of ferns he collected in the N.W. Himalayas and Kashmir and Dr. G. Morgan presented a collection from Darjeeling. An interesting series from the New Hebrides was forwarded by Mr. R. A. Sykes, formerly Conservator of Forests, and a collection from Queensland made by Mr. G. K. Jackson. A duplicate set of ferns, collected in China by J. F. Rock, was presented by the United States National Museum. Over 1700 sheets were incorporated during the year.

The whole of the Kew material of *Leptochilus* was sent on loan to Mr. R. C. Ching at Copenhagen to assist him in his revision of that genus and was returned duly written up before his departure for China.

A critical investigation of the ferns of West Tropical Africa was commenced for their incorporation in the Flora.

Research and Publications.—Two new Ferns from Colombia, by W. R. Maxon (*K.B.* 1932, 134).

Pteridophyta collected by the Oxford Expedition to British Guiana, 1929, by A. H. G. Alston (*K.B.* 1932, 305).

BRYOPHYTA.

Amongst collections of Mosses received during 1932 the more important were those presented by Professor R. R. Stewart from Kashmir, Mr. R. E. Vaughan from Mauritius, Mr. K. W. Allison from New Zealand, Miss M. Steele from the Cameroons Mountain, and by the United States National Museum, from Jamaica (coll. E. P. Killip and W. R. Maxon). A number of Hepaticae from New Zealand, Mauritius, Ruwenzori, Kashmir, and various parts of Europe has been identified. Before this could be done a rearrangement of the material in various genera was found to be necessary. The formation of a working collection of microscopic preparations of authentic material of Hepaticae has also been started in order to facilitate the naming of collections. Series iii and iv, *Hepaticae Selectae et Criticae* were purchased from Mr. Fr. Verdoorn.

Unofficially, as Excursion Secretary of the British Bryological Society, Mr. C. V. B. Marquand accompanied a small party in a bryological exploration of a previously unworked mountain range in Arctic Norway. A valuable series of specimens has been presented to Kew and a paper on the results of the expedition will be published shortly.

THALLOPHYTA.

ALGAE.—In addition to the determinations of British plants, collections of Algae have been named from Australia, Canada, the

West Indies, the Gold Coast and Mauritius. Assistance afforded to research workers in the British Isles included principally critical determinations for local surveys. Type specimens have also been selected for despatch on loan to other institutes, particularly material of *Codium* to Prof. W. A. Setchell.

At the request of Prof. T. A. Stephenson, of Cape Town University, several extensive collections of Algae have been named in connection with a general ecological survey of the flora and fauna of Still Bay, about 200 miles east of Cape Town. Dr. F. P. Metcalf, of the Lingnan University, Canton, presented a collection of Chinese Algae, and Dr. F. Boergesen contributed specimens of his new species of Indian Rhodophyceae. A small set of South African specimens was purchased from Miss M. Purcell.

Research and Publications.—A new species of *Codium*, of the *adhaerens* section, from the Cape Peninsula, was described in the *Revue Algologique*, and the MS. of a paper on Some Algal Balls from Tasmania was sent to the press.

Some Indian Rhodophyceae: II, by F. Boergesen (*K.B.* 1932, 113).

FUNGI.—The routine work involved a large number of replies to miscellaneous identification inquiries, both British and foreign, advice on diseases of horticultural plants and the extraction and collation of information relating to fungi of industrial importance. The assistance given to research workers in the determination of critical species has also involved much time. Amongst collections of fungi received for determination, mention may be made of the following material:—from India (Professor S. R. Bose, and Messrs. S. Banerjee, C. E. Parkinson and J. C. Sengupta); Singapore (Mr. E. J. H. Corner); Southern Rhodesia (Messrs. J. C. F. Hopkins and F. Eyles); Kenya (Mr. C. A. Thorold); and Southern and Tropical Africa (Mr. O. A. Høeg). A set of fungi from the Amazons River Drainage collected by J. R. Weir and specimens collected in the United States by O. F. Cook were presented by the Bureau of Plant Industry, United States Department of Agriculture, Washington. Numerous rare and critical species of British fungi have also been added to the collections. Fascicles 50–52, *Mycotheca germanica*, were purchased from Herr. H. Sydow, and Century iii, *Mycospora Domingensis Exsiccata* from Dr. R. Ciferri.

Assistance was given to Dr. R. M. Nattrass in the preparation of a list of the fungi occurring in Cyprus, an area which is practically unknown from a mycological standpoint.

Mr. C. G. Hansford has worked for some months on his collections of Uganda fungi and conjointly with him a paper on the Uredineae of Uganda has been prepared for publication. It is hoped to deal in a similar way with other groups of fungi from this region.

Dr. C. J. Humphrey, Mycologist to the Department of Agriculture, Philippine Islands, spent several weeks studying the Polyporaceae in the Kew collections with a view to the publication of a series

of monographic studies on this group. During Dr. Humphrey's stay he kindly allowed a selection of material to be taken from his own collection. The specimens thus extracted have greatly enriched the Kew collections.

In connection with the opening of the new wing the congestion in the Cryptogamic department was relieved by expanding the collection, and numerous specimens, temporarily housed in boxes, were incorporated in their proper position. The British collection has been placed in a special block of cabinets, and it is hoped to build up a useful working collection of British fungi.

Research and Publications.—Preliminary List of Fungi or Diseases of Economic Plants in Tanganyika Territory, by G. B. Wallace (*K.B.* 1932, 28).

BIOLOGICAL AND GENETICAL HERBARIA.

About 1500 specimens have been added to these collections during the year. These include: (1) additional material from the ecological survey which is being undertaken in Richmond Park, (2) further specimens illustrating breeding and field work in *Anthyllis*, *Silene*, *Centaurea*, and *Saxifraga*, (3) numerous specimens of various genera to illustrate points in their life history or ecological peculiarities. Prof. Baur presented seed of some of his more striking *Antirrhinum* mutants and a good series of specimens has been made from plants raised from this seed at Kew.

SUMMARY.

The routine work, apart from naming, accomplished by the regular staff and by the special store staff during 1932 is summarised as follows:—

Mounted	...	...	...	...	59,000 (approx.)
Incorporated	...	...	...	...	27,000 (approx.)
Duplicates distributed	...	...	...	...	13,092
Specimens received on loan	...	...	...	...	8,772
Specimens sent out on loan	...	...	...	...	6,046
Specimens presented or purchased	...	...	...	...	50,018

ILLUSTRATIONS AND PORTRAITS.

The routine work of preparing drawings, taking photographs and making lantern slides for various purposes has been exceptionally heavy. In addition a number of coloured drawings of various plants has been prepared for the Kew collection of drawings and also a series of studies of *Anthyllis* in connection with the experimental work at Potterne. About 300 sheets of type or authentic specimens borrowed from other herbaria have been photographed for the Kew collection and about 600 sheets of Kew specimens have been photographed for other Institutions.

The third part of vol. ii of the Fifth Series of Hooker's *Icones Plantarum* appeared in June (see *K.B.* 1932, 411). The fourth part is now ready for the press, and the preparation of the first part of the

next volume has been begun. The Bentham-Moxon Trustees intend to publish two parts each year in future. The average output for the twenty years 1897-1916 was one part annually, but publication was suspended during the latter part of the War, and only four parts have appeared since, namely, in 1922, 1927, 1930 and 1932. The new arrangements are due to the appointment of a botanical artist by the Trustees.

The most important acquisition during the year was the presentation by the Bentham-Moxon Trustees of a valuable collection of 648 coloured drawings, including a number on vellum signed by G. D. Ehret and Margaret Meen (see *K.B.* 1933, 2). Another valuable collection was that presented by Miss W. M. E. Fowler, Odiham, Hants. This consists of 300 water-colour sketches of flowers made by her about 30 years ago in the Orange Belt of Florida. They are on paper about $7\frac{3}{4}$ in. by 6 in., are named, and are accompanied by MS. notes.

The miscellaneous drawings and photographs of plants which have been received, and which will be incorporated in the general collection, include 89 original drawings prepared for the Botanical Magazine, and 19 photographs, presented by the Royal Horticultural Society through Dr. Stapf; 40 plates of the Flowering Plants of South Africa from Dr. I. B. Pole Evans; 20 photographs of Bromeliaceae, from the Gray Herbarium, and about 100 photographs of specimens of *Ganoderma* Karst. (*Fomes* Fries), from Dr. C. J. Humphrey of the Bureau of Science, Manila. Other photographs have been received from the Natal Herbarium, the New York Botanical Garden, Mr. I. H. Burkill and Dr. J. Burtt Davy.

Additions to the collection of portraits of botanists include photographs of Mr. Leonard Rodway, from Dr. F. A. Rodway, of Dr. Harold Lindberg, and of Sir J. D. Hooker and Dr. Alexander Prior, both by Messrs. Maull, from Miss E. M. Harting. Miss Harting has also presented a replica, in pewter, of the Gold Medal which was awarded Sir J. D. Hooker by the Linnean Society in 1898.

NOMENCLATURE AND BIBLIOGRAPHY.

Throughout the year numerous enquiries have been received and answered, many requiring detailed nomenclatural investigation, and others entailing the searching of literature for obscure names.

Pending the publication by the Editorial Committee of the third edition of the International Rules of Nomenclature, a rough draft embodying the decisions of the Cambridge Congress was prepared for immediate practical use. This has been found invaluable.

In the early part of the year a study was made of Patrick Browne's Civil and Natural History of Jamaica (1789), in order to ascertain whether his generic names were valid. It was found that the new names of monotypic genera published by him were validated by the accompanying descriptions, and that those genera including more than one species were validly published wherever the type

species was indicated, in spite of the fact that the validating description included characters peculiar to that species in addition to generic ones.

A revision of the plant names proposed for the new edition of the British Pharmacopoeia was undertaken, and in connection with this work an article on "the Botanical Names of Lavender and Spike" was prepared, clearing up the confusion in the nomenclature of these two commercial products (*K.B.* 1932, 295).

It was discovered that the genus of Rubiaceae commonly known as "*Laugeria* Vahl" should bear the name *Terebraria* Kuntze. An account of the synonymy and geographical distribution of the genus and its two species was published in *K.B.* 1932, 349.

An investigation was made into the type of the generic name *Allantoma* Miers (Lecythidaceae), and useful general criteria were obtained for the proposed "Regulations for determining types," which will be discussed at the next International Botanical Congress at Amsterdam, in 1935 (*Journ. Bot.* 1932, 231).

INDEX KEWENSIS.

The compilation of Supplement VIII was brought to a close, and the entire card index has now been duplicated for permanent reference. The preparation of the work for the Press was also completed, and a first instalment of one half was sent to the Clarendon Press in October.

EXPERIMENTAL AND TRANSPLANT WORK.

Work was continued at Potterne and Kew on *Silene* and *Centaurea* and additional ground has had to be acquired in order to accommodate plants of the latter genus. The results of further cytological research on *Saxifraga* have made a series of additional crosses necessary. At present the breeding and cytological results are not fully harmonized, but both are giving results of much interest and importance. The field and breeding studies in *Anthyllis* have been completed and two papers on this genus prepared for publication. Work on the British variations of *Anagallis* is proceeding.

The transplant experiments are being continued and *Fragaria vesca* and *Phleum pratense* (diploid and hexaploid), have been added to the species in the beds.

Publications.—Researches on *Silene maritima* and *S. vulgaris*: VIII-X (*K.B.* 1932, 229, 271, 390).

VISITORS.

The number of signatures in the Visitors' book for 1932 was 5440. The following were amongst the most noteworthy or frequent visitors to the Herbarium:—

Major G. Aylmer, Department of Agriculture and Forests, Khartoum, Sudan.

Mr. E. G. Baker; Dr. J. Barthelet, Antibes, France; Mr. W. J. Bean; Mr. L. A. Boodle; Prof. C. E. B. Bremekamp, Utrecht; Dr. N. E. Brown; Mr. I. H. Burkill; Prof. A. H. R. Buller, University of Manitoba; Dr. E. J. Butler, Imperial Mycological Institute.

Mr. W. S. Chamberlain.

Dr. J. M. Dalziel; Dr. J. Burt Davy, Imperial Forestry Institute, Oxford; Mr. H. N. Dixon.

Mr. A. W. Exell, Natural History Museum; Mr. P. J. Eyma, Utrecht.

Prof. H. M. Fitzpatrick, Cornell University; Mr. H. R. Fletcher, The University, Aberdeen; Dr. B. Floderus, Stockholm; Dr. H. G. Fourcade, S. Africa; Mr. J. Fraser.

Dr. M. Gard, Bordeaux; Dr. J. W. Gillespie, Arizona University; Mr. H. B. Gilliland, University of Edinburgh; Dr. P. L. Giuseppi; Mr. W. B. Grove.

Mr. C. G. Hansford, Dept. Agric., Uganda; Mr. M. R. Henderson, Botanic Garden, Singapore; Mr. A. C. Hoyle, Oxford; Dr. C. J. Humphrey, Bureau of Science, Manila.

Dr. Ivan Johnston, Arnold Arboretum.

Dr. A. F. G. Kerr; Mr. E. P. Killip, U.S. National Museum, Washington.

Mr. C. H. Lankester; Mr. E. Lawrence, Dept. Agric., Nyasaland; Dr. Harald Lindberg, Helsingfors University.

Mr. E. W. Mason, Imperial Mycological Institute; Mr. A. P. G. Michelmore, Gezira Research Farm, Sudan; Mrs. M. Moss, University of the Witwatersrand, Johannesburg.

Dr. J. H. Nannfeldt, Uppsala; Mr. N. T. Norlindh, Lund.

Mr. R. Paulson; Mr. T. Petch; Dr. O. Posthumus, Pasoeroean, Java; Mr. J. Pitt Schenkel; Mr. W. R. Price.

Dr. A. Rehder, Arnold Arboretum; Mr. H. N. Ridley; Mr. N. V. Rounce, Dept. Agric., Tanganyika Territory.

Mrs. C. Sandwith; Mr. A. C. Smith, New York Botanical Garden; Prof. N. J. G. Smith, Rhodes University College, Grahamstown; Mr. J. D. Snowden; Dr. O. Stapf; Prof. R. R. Stewart, Gordon College, Rawalpindi; Mr. C. F. Symington, Forest Research Institute, Kepong, Federated Malay States.

Capt. F. Kingdon Ward; Mr. H. Weimarck, Lund; Miss M. M. Whiting; Lt.-Col. A. H. Wolley-Dod; Mr. W. C. Worsdell; Mr. J. W. Wyatt.

DISTRIBUTION OF DUPLICATES.

The following were the principal institutions to which duplicates were distributed :—

Great Britain and Irish Free State.—Aberdeen, Cruickshank Botanic Garden; Dublin, Trinity College; Edinburgh, Royal Botanic Garden; London, Natural History Museum; Oxford, Imperial Forestry Institute.

Europe and Orient.—Berlin, Botanic Gardens and Museum; Brno, Masaryk University; Brussels, Botanic Gardens; Copenhagen, University Botanic Museum; Jerusalem, The Hebrew University; Leiden, 's Rijks Herbarium; Leningrad, Botanic Garden; Lund, Botanical Museum; Paris, Natural History Museum; Sarajevo, State Museum; Sofia, University, Department of Botany; Stockholm, Botanical Museum; Tervueren, Belgian Congo Museum; Utrecht, University Botanic Museum and Herbarium; Vienna, Natural History Museum; Zürich, Botanic Garden and Museums.

Africa.—Amani, East African Agricultural Research Station; Grahamstown, Albany Museum; Nairobi, Coryndon Memorial Museum; Pretoria, Division of Plant Industry.

Australia.—Brisbane, Botanic Museum and Herbarium.

America.—Chicago, Field Museum; Georgetown, Demerara, Forestry Department; Missoula, University of Montana, Department of Botany; Montreal University, Department of Botany; New York, Botanic Garden; Philadelphia, Academy of Natural Sciences; Rio de Janeiro, Botanic Garden; Washington, U.S. National Museum.

The Library.

The more important presentations received during the year are as follows :—

The Bentham Trustees have presented a number of volumes which include: L. Choulant, *Handbuch der Bücherkunde für die ältere Medicin*, zweite Auflage, 1841, Neudruck, 1926; *The tabular distribution of British plants*, 1787, attributed to the Earl of Bute; and a copy of the rare *Selectarum Stirpium Americanarum Historia*, by N. J. Jacquin (Vienna, about 1780). The last named is bound in three volumes and was formerly in the library of the Earl of Tankerville at Chillingham Castle, Northumberland. An account of a large and valuable collection of original coloured drawings of plants from the same library, which has been presented by the Bentham Trustees, is published in *K.B.* 1933, 2. As in previous years volumes or parts in continuation of several periodicals received in exchange for *Hooker's Icones Plantarum*, have been presented by the Bentham Trustees.

From the Royal Horticultural Society have been received three copies of the *Report of the Conifer Conference*, 1931 (*Conifers in cultivation*), three copies of *An account of the Sempervivum group*, by R. Lloyd Praeger, and one copy of the *Lily Year Book*, 1932. A second copy of the last named has been received from Major F. C. Stern.

Lieut.-Col. Sir David Prain has presented the continuation of several periodicals, as recorded in previous years, and a number of pamphlets.

From the Technological Museum, Sydney, the following have been received: *Cabinet timbers of Australia*, 1913, by R. T. Baker; *A*

research on the *Eucalypts*, especially in regard to their essential oils, by R. T. Baker and H. G. Smith, second edition, 1920; and *Woodfibres of some Australian timbers*, 1924, by the same authors.

The publications received from the Imperial Council of Agricultural Research, India, include the *Indian Journal of Agricultural Science and Scientific Monographs*, no. 1, *The fungi of India*, by E. J. Butler and G. R. Bisby, 1931, and no. 3, *The open pan system of white sugar manufacture*, by R. C. Srivastava, 1931.

The *Icones of the essential forest trees of Hokkaido*, by Professors K. Miyabe and Y. Kudo, the plates by C. Suzaki, a work in three folio volumes containing 86 coloured plates, with text in English and Japanese, was completed by the issue of the 28th fascicle in 1931. This first appeared in 1920, but the set at Kew, which had been presented by the Hokkaido Government, was deficient in fascicle 10, the stock of this and the previous 9 fascicles having been destroyed by fire at the time of the great earthquake in Tokyo in 1923. These fascicles have now been reprinted, and a copy of the tenth, with a second edition of the title-page, prefatory matter and index to the first volume, has been sent to Kew. Mr. Suzaki's coloured plates are admirable.

Among the publications received from the New York Botanical Garden are four further parts of the *North American Flora*, the continuation of *Addisonia*, the *Flora of the prairies and plains of Central North America*, by P. A. Rydberg, *Brittonia*, vol. i. no. 3, and a typed copy of C. S. Rafinesque's *Autikon botanicon: icones plantarum . . . centur. xxv*. Philadelphia, 1840-50, text only. Professor Merrill informs us that no illustrations for this work were ever prepared, Rafinesque's intention having been that the "figures" should take the form of dried specimens to be distributed by him.

The establishment is indebted to the kind offices of Dr. W. T. Swingle of the Bureau of Plant Industry, U.S. Department of Agriculture, for a bound photostat copy of the issues of the *Notes and Queries on China and Japan* from 1867 to 1869, containing the botanical writings of Theophilus Sampson relating to China. A copy of the account of Sampson's life and work given by Bretschneider in his *History of European botanical discoveries in China*, an index to the species of plants mentioned in Sampson's collected writings, and a Chinese-character index are also included in the volume. The work was prepared in the Office of the Chairman, Library Committee, U.S. Department of Agriculture, and was first issued in 1921. A second edition is dated January 20, 1932, and it is a copy of this that has been presented to the library. In a preface to the volume Dr. Swingle states that Sampson's herbarium of some 1800 plants was destroyed by fire in Canton in 1883. He points out that Sampson's writings are full of valuable information about South Chinese plants and that the journal in which they were originally published is now difficult to obtain.

Prof. V. L. Komarov of the Botanic Garden, Leningrad, has presented a copy of a work in Russian of which the English title is *Key for the plants of the Far Eastern Region of the U.S.S.R.*, written by himself and E. N. Klobukova-Alisova, and published by the Academy of Sciences, Leningrad, in two volumes, the first in 1931 and the second in 1932. It contains altogether 1175 pages, including 330 very good full-page figures, and deals with the flowering plants and vascular cryptogams of the region.

The following books were received from their publishers for review in the *Kew Bulletin*. From Messrs. Baillière, Tindall & Cox:—Forrest Shreve, *The Cactus and its home*, 1931; S. A. Waksman, *Principles of soil microbiology*, ed. 2, 1931. From Messrs. Ernest Benn:—T. Hedley Barry, *Natural varnish stains*, 1932. From the Crown Agents for the Colonies:—D. Bannerman, *The birds of Tropical West Africa*, vol. ii. 1931. From Messrs. Macmillan:—C. D. Darlington, *Chromosomes and plant-breeding*, 1932; E. P. Felt & W. H. Rankin, *Insects and diseases of ornamental trees and shrubs*, 1932; C. J. J. van Hall, *Cacao*, ed. 2, 1932. From Messrs. L. Reeve:—N. E. Brown, A. Tischer & M. C. Karsten, *Mesembryanthema, descriptions, with chapters on cultivation and general ecology*, edited by E. J. Labarre, 1931 (in English, German and Dutch).

The more important independent works and reprints from periodicals received, in addition to those already mentioned, are the following, which have been presented by their authors unless otherwise stated:—S. Akiyama, *Conspectus Caricum Japonicarum*, in *Journ. Fac. Sci. Hokkaido Imp. Univ.*, ser. 5, vol. ii. no. 1; A. Andersson, *Studien über die Embryologie der Familien Celastraceae, Oleaceae und Apocynaceae*, in *Lunds Univ. Årsskr. N. F.*, Avd. 2, Bd. 27, nr. 7; L. H. Bailey, *Gentes herbarum*, vol. ii. fasc. 6; Mrs. H. M. L. Bolus, *Notes on Mesembryanthemum and allied genera*, pt. 2, pp. 309-376 (3 copies); *The British Pharmacopoeia*, 1932, published and presented by the General Medical Council; *Catalogue des plantes de Madagascar*, publié par l'Académie Malgache, 1931-32: *Chlaenaceae, Dioscoreaceae, Scrophulariaceae*, by H. Perrier de la Bathie, *Pteridophyta*, by C. Christensen (from the Académie Malgache and the authors); *Centenaire de la Société Royale des Arts et des Sciences de l'Ile Maurice*, 1829-1929 (from the Society); L. Chalk & J. Burt Davy (Editors), *Forest trees and timbers of the British Empire, I: Some East African Conifers and Leguminosae* (2 copies, from the Oxford University Press and the Imperial Forestry Institute, Oxford); C. Christensen, *The Pteridophyta of Madagascar*, in *Dansk Bot. Arkiv*, vol. vii.; G. H. Clark & M. O. Malte, *Fodder and pasture plants [of Canada]*, 1913 (from Dr. O. Stapf); Sir Jeremiah Coleman, Bt., *Hybridization of Orchids: the experiences of an amateur*; *Collected Papers from the Department of Pharmacology, Peiping Union Medical College*, vol. iii. (from Prof. B. E. Read); W. G. Craib, *Florae siamensis enumeratio*, vol. ii. pt. 1 (from The Siam Society, Bangkok); G. H. Cunningham, *The rust fungi of New Zealand, &c.*, 1931; J. Burt Davy, *A manual*

of the flowering plants and ferns of the Transvaal with Swaziland, pt. 2; O. Degener, *Flora hawaiiensis*, 151 ff.; G. Delevoy, *Études systématiques des bois du Katanga*, fasc. 4-7, 1930-32 (from Comité Spécial du Katanga); É. De Wildeman, *Plantae Bequaertianae*, vol. v. fasc. 4; D. S. Damba, *Étude physique et mécanique du bois roumain* (from Casa Autonomia a Pădurilor Statului, Bucharest); A. Eaton, *Manual of botany*, ed. 5, 1829 (from the Gray Herbarium); P. J. Eyma, *The Polygonaceae, Guttiferae and Lecythidaceae of Surinam*; M. L. Fernald, *The linear-leaved North American species of Potamogeton, section Axillares*, in *Mem. Amer. Acad.* vol. xvii. pt. 1, forming *Mem. Gray Herb.* III.; *Flora Sibirica i Dal'nego Vostoka (Flora Sibiriae et Orientis extremi a Museo Botanico Academiae Scientiarum edita)*, pts. 2-4, 1915-26 (from the Academy of Sciences, Leningrad); R. E. Fries, *Revision der Arten einiger Anonaceen-Gattungen*, II, 1931, in *Acta Horti Bergiani*, Bd. 10, no. 2; Mme. L. Gauthier-Lièvre, *Recherches sur la flore des eaux continentales de l'Afrique du Nord*, 1931, as *Mém. hors-série, Soc. d'Hist. Nat. de l'Afrique du Nord*; A. W. Goldsmith & A. L. Hafenrichter, *Anthokinetics: the physiology and ecology of floral movements* (from the Carnegie Institution of Washington); Christine J. Gorter, *Groeistofproblemen bij wortels*; J. Th. Henrard, *A monograph of the genus Aristida*, vol. ii. in *Mededeel. 's Rijks Herb. Leiden*, no. 58A; L. J. Laporte, *Recherches sur la biologie et la systématique des Desmidiées*, 1931 (from the Editor of *Nature*); A. Lemée, *Dictionnaire descriptif et synonymique des genres de plantes phanérogames*, tome 4; H. Lindberg, (1) *Die nordischen Alchemilla vulgaris-Formen und ihre Verbreitung*, 1909, in *Acta Soc. Sci. Fenn.* vol. xxxvii. no. 10, and (2) *Itinera mediterranea: ein Beitrag zur Kenntnis der westmediterranen Flora*, in *Acta Soc. Sci. Fenn.* N.S., vol. i. no. 2; E. J. Lindeijer, *De Bacterieziekte van den wilg veroorzaakt door Pseudomonas saliciperda n. sp.* (from Director, Phytopathologisch Laboratorium "Willie Commelin Scholten," Baarn, Holland); J. C. Loudon, *An encyclopaedia of plants*, 1829 (from the Rev. F. A. Rogers); M. Louvel, *Atlas des plantes ornementales et curieuses de Madagascar*, publié à l'occasion de l'Exposition Coloniale Internationale de Paris, 1931 (from Librarian, Department of Overseas Trade); T. Lundblad, *Beiträge zur pflanzlichen Elektrophysiologie*, 1927; S. Mangham & W. Rae Sheriffs, *A second biology*, 1931 (from Prof. S. Mangham); T. Martyn, *Flora rustica* [1792-94], issued in one volume, with uncoloured plates (from the Rev. F. A. Rogers); B. Miyazawa, *Results in breeding Paeonia albiflora and its botanical and horticultural history*, in *Bull. Kanagawa-Ken Agric. Exper. Stat.* no. 52; T. Nakai, *Flora sylvatica koreana*, pars xix. (from the Forest Experiment Station, Government General of Chosen); J. A. Nannfeldt, *Studien über die Morphologie und Systematik der nicht-lichenisierten inoperculaten Discomyceten*, in *Nova Acta Reg. Soc. Sci. Upsal.* ser. 4, vol. viii. no. 2; E. Nelmes & W. Cuthbertson, *Curtis's Botanical Magazine dedications*, 1827-1927; *portraits and biographical notes*, 1931 (from Mr. W. Cuthbertson); *Nova Guinea: résultats des expéditions*

scientifiques à la Nouvelle Guinée, vol. xiv. Botanique, livr. 4 (from Maatschappij ter Bevordering van het Natuurkundig Onderzoek der Nederlandsche Koloniën); G. B. Patvardhan & G. B. Deshmukh, *A hand book of horticultural practices*, 1931 (from Mr. I. H. Burkill); Helena F. M. Petter, *Over roode en andere Bacteriën van gezouten visch*; A. Pulle (Editor), *Flora of Surinam*, 4 parts (from Kon. Ver. Koloniaal Instituut, Amsterdam); L. Kolderup Rosenvinge & E. Warming (Editors), *The botany of Iceland*, vol. ii. pt. 3 (9), *Fungi of Iceland*, by P. Larsen; H. St. John & E. Y. Hosaka, *Weeds of the Pineapple fields of the Hawaiian Islands*, in *Univ. Hawaii Research Publ.* no. 6 (from Prof. H. St. John); A. C. Smith, *The American species of Thibaudieae*, in *Contr. U. S. Nat. Herb.* vol. xxviii. pt. 2; *Simon van der Stel's Journal of his expedition to Namaqualand*, 1685-6; edited from the manuscript in the Library of Trinity College, Dublin, by G. Waterhouse (from Sir A. W. Hill); C. Tadulingam & G. Venkatanarayana, *A handbook of some South Indian weeds*, 1931 (from Director of Agriculture, Madras); R. O. Williams, *Flora of Trinidad and Tobago*, vol. i. pt. 5, 2 copies (from Department of Agriculture, Trinidad and Tobago). Those of which the year of publication is not stated were issued in 1932.

The periodical and serial publications now received as purchases, exchanges or presentations are so numerous that even all of the last named cannot be mentioned in the restricted space of this note. In addition to the continuation of most of those recorded in previous Reviews and of the few already referred to in this note, the following have been presented, as a rule by the editors, societies or institutions issuing them:—*Acta Phytotaxonomica et Geobotanica*, published by the Phytogeographical Society, Kyoto, Japan, vol. i. nos. 1-3; *Agricultural Journal*, Department of Science and Agriculture, Barbados, vol. i. nos. 1-2 (2 copies); *The American Orchid Society Bulletin*, vol. i. nos. 1-2; *Annales Botanici Societatis Zoologicae-Botanicae Fennicae Vanamo*, vol. i; *Annales de l'École Nationale des Eaux et Forêts* (Nancy), vol. i-iv. fasc. 1 (1923-31); *Annual Report of the Indian Museum, Industrial Section*, 1901-02-1910-11 (from Mr. I. H. Burkill); *The British Bryological Society, Reports*, 1927-31; *The Cactus Journal*: official organ of the Cactus and Succulent Society of Great Britain, vol. i. nos. 1-2; *Ecology*, vol. xiii. (from Director, Imperial Mycological Institute, Kew); *Lavori dell'Istituto Botanico della R. Università di Cagliari*, 1-7, 1930-31 (reprints of papers by Prof. R. Pampanini); *Leaflets of Western Botany*, vol. i. nos. 1-4 (from Miss Alice Eastwood); *Memoirs of the Faculty of Science and Agriculture, Taihoku Imperial University*, vol. iv. *A monograph of the Satsuma orange*, by T. Tanaka; this has also been issued as *Contributions from the Horticultural Institute, Taihoku Imperial University*, no. 8, a copy of which has been presented by the author; *Northern Rhodesia, First Annual Bulletin of the Department of Agriculture*; *Proceedings of the Dorset Natural History and Antiquarian Field Club*, vol. xxix. & xxx. 1908 & 1909 (from Mr. H.

J. Goddard); *Rapport sur le fonctionnement de l'Institut des Recherches Agronomiques* (Paris) pendant l'année 1931; *Report of the Department of Agriculture and Forests, Palestine, for the years 1927 to 1930*; and *Symbolae Botanicae Upsalienses, i: Cytological studies in Primula*, by H. G. Bruun (from the Botaniska Institutionen, Upsala).

Periodicals or other publications issued by them have been received as in previous years from the Empire Marketing Board, the Empire Cotton Growing Corporation, the Imperial Agricultural Bureaux at Cambridge and Aberystwyth (Plant-Genetics), at Harpenden (Soil Science), at East Malling (Fruit Production), and at St. Albans (Agricultural Parasitology), the Botanical Laboratory of the University of Utrecht, the Botanical Museum of the University of Zurich, the Departments of Agriculture and Forestry in India and in many of the colonies, protectorates and other parts of the British Empire, the Indian Lac Association for Research, the Department of Agriculture, Industry and Commerce in the Dutch East Indies, the Bureaux of Science, Plant Industry and Forestry, Philippine Islands, the Smithsonian Institution, Washington, the United States Department of Agriculture, the Missouri Botanical Garden, St. Louis, the Cornell University Agricultural Experiment Station, Ithaca, the Arnold Arboretum and the Gray Herbarium of Harvard University, and the University of California. Many publications have been received from institutions in the U.S.S.R. in addition to those from the Academy of Sciences, Leningrad. The Institute of Applied Botany and New Cultures, Leningrad, and the Scientific Research Institute of Cotton Culture and Industry, Nihi, Tashkent, have contributed very liberally, and several issues of *Soviet Subtropics*, in Russian, published at Sukhoum, Abkhasia, have been received.

Reprints, usually from periodicals, additional to those already mentioned in the paragraph relating chiefly to independent works, have been received from numerous authors, among whom are: Mr. John Adams, Mr. S. Akiyama, Prof. Oakes Ames, Mrs. H. M. L. Bolus, Dr. F. Börgesen, Miss A. Camus, Dr. E. B. Copeland, Dr. B. H. Danser, Dr. É. De Wildeman, Prof. K. Dinter, Mr. H. N. Dixon, Dr. G. Einar Du Rietz, Mr. H. Dusi, Prof. R. R. Gates, Dr. H. A. Gleason, Dr. Marshall Howe, Mr. H. S. Jackson, Dr. F. Morton Jones, Miss M. C. Karsten, Dr. R. Lemesle, Dr. W. R. Maxon, Mr. T. Petch, Prof. K. von Poellnitz, Mr. J. Ramsbottom, Prof. W. Robyns, Prof. Harold St. John, Prof. C. Skottsberg, Dr. J. J. Smith, Dr. C. G. G. van Steenis, Dr. W. T. Swingle, Mr. I. Thériot, Prof. F. Tobler, and the late Prof. J. Valckenier Suringar.

A provisional map showing the types of vegetation in Southern Rhodesia, prepared by the Division of Forestry in 1930, has been received from the Chief Forest Officer, Salisbury, and a tourist map of the north coast of New South Wales, 1916, from the Agent-General for New South Wales.

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