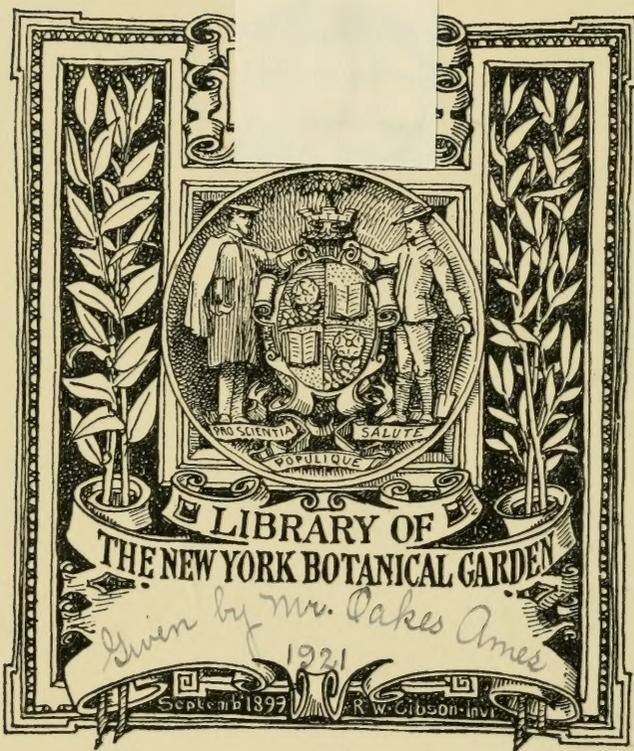


STUDIES IN THE FAMILY ORCHIDACEÆ
OAKES AMES A. M.



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ORCHIDACEÆ

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THE FAMILY ORCHIDACEÆ

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Journal of Botany

ORCHIDACEÆ

VI



PLATE VI

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ORCHIDACEÆ

ILLUSTRATIONS AND STUDIES OF
THE FAMILY ORCHIDACEÆ

ISSUED FROM THE AMES BOTANICAL LABORATORY
NORTH EASTON, MASSACHUSETTS

∴

THE ORCHIDS OF MOUNT KINABALU BRITISH NORTH BORNEO

BY OAKES AMES AND CHARLES SCHWEINFURTH

∴

NOTES ON PHILIPPINE ORCHIDS VII

BY OAKES AMES

DIRECTOR OF THE BOTANIC GARDENS OF HARVARD UNIVERSITY

WITH TWENTY-TWO ETCHINGS BY BLANCHE AMES



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TO
ELMER DREW MERRILL
IN RECOGNITION OF DISTINGUISHED
SERVICES TO MALAYAN BOTANY
THIS VOLUME IS DEDICATED

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PREFACE

MOUNT KINABALU, one of the loftiest mountains of the Malay Archipelago, is situated in British North Borneo. It is an isolated mass of granite 13,455 feet high, divided into several peaks, the highest of which is Low's Peak. The main body of the mountain is about twenty miles inland from Ambong Bay. Its tremendous height is accentuated by isolation. There are no nearby mountains of comparable altitude to affect one's estimate of its proportions. John Whitehead brought out this point very clearly in the narrative of his ascent made for zoölogical purposes in 1887 and 1888. The following lines are his: "The country inland is much broken up by sandstone hills of low elevation, generally bare of trees, and in this month (February) parched and brown, covered with one of the tropical curses, lalang grass. At the back of these lalang-covered hills are others topped with forest, sometimes sharp-peaked and rugged; at the back of all, towering above everything, is that superbly grand mountain Kinabalu. This wonderful mountain looks more imposing than many mountains of a much greater altitude, from the fact that it is an almost isolated mass, at the highest end mounting up to the height of 13,698 feet (Belcher) and finishing off abruptly in sheer precipices of 10,000 feet; its proximity to the sea-coast, being less than forty miles in a direct line, allows of it being viewed at once from the lowest level, none of its imposing grandeur being lost by a series of intervening plateaus which dwarf so many mountains."

The forest cover is described as follows:

1. The secondary forest (2500-4000 feet).
2. The primary forest (3500-6000 feet).
3. The mossy forest (6000-9000 feet).

PREFACE

4. The scrub formation (on the exposed serpentine).
5. The low sheltered forest (9500–10,500 feet).
6. The sub-summit dwarf forest (above 10,500 feet).

Mount Kinabalu has been ascended at intervals since 1851. From the orchidologist's point of view the most important explorations made for botanical purposes, prior to that of Clemens in 1915, were undertaken by Dr. G. D. Haviland in 1892 and by Miss Lilian Gibbs, F.L.S. in 1910. The orchids collected by Haviland were studied and identified by H. N. Ridley and published in Stapf's paper "On the Flora of Mount Kinabalu."¹ Haviland brought out twenty-four species of orchids, representing twelve genera. The orchids collected by Miss Gibbs were published in her paper entitled "A Contribution to the Flora and Plant Formations of Mount Kinabalu and the Highlands of British North Borneo."² The identifications of the orchids were made by R. A. Rolfe at the Kew Herbarium. Miss Gibbs brought out forty-one species, representing twenty-two genera. One new genus was recognized.

In 1915 Chaplain Joseph Clemens, U. S. A. accompanied by Mrs. Clemens, D. LeRoy Topping and native helpers, ascended Kinabalu for the purpose of making botanical collections. Chaplain Clemens, to keep his interest in the expedition constantly stimulated, decided to give his undivided attention to a single group of plants. He chose the Orchidaceae. As a result of his efforts, one hundred and fifty-five orchid species in a condition suitable for identification were secured. Of this number one hundred species proved to be new. He also secured one new genus. Chaplain Clemens spent about six weeks on the mountain. In that time he more than doubled the number of orchid species known to be natives of Kinabalu.

¹Trans. Linn. Soc. Ser. 2, 4 (1894) 69–263.

²Journ. Linn. Soc. 42 (1914) 1–240.

PREFACE

In his expedition Chaplain Clemens went from Jesselton to Usukan, thence to Kotabelud. From Kotabelud he started up the Tampassuk River on the way to Koung, which is near the junction of several rivers that form the Tampassuk. Then he climbed to Kiau, ascending the spur that rises from the left bank of the Kadamian River. From Kiau, after passing the Minitindok Gorge, he ascended to Low's Peak by way of Lobong, collecting at Kamborangah and Pakka on the way. Starting from Kiau again he crossed the Gurulau Spur twice, and after climbing the Marei Parei Spur crossed the Kinitaki River. On the return he climbed from Koung over the Bungol Mountain to Bungol rest-house, then crossed the Kalawat Mountain to Kalawat and reached Tuaran on his way to Gantisan on the coast. The expedition started on October 28, 1915 and was completed by December 12, 1915.

The orchids were gathered chiefly on Marei Parei Spur, near Kiau, at and around Lobong Cave, and in the neighborhood of Kamborangah. A few species were collected at Pakka and on the Gurulau Spur. The approximate altitudes of these localities are as follows: Kiau 3080 feet, Lobong 4790 feet, Gurulau Spur 5000-5500 feet, Marei Parei Spur 5000-7000 feet, Kamborangah 7040 feet, Pakka 9790 feet.

The geological history of Borneo indicates that in the past there were land connections with the Malay Peninsula, Java and Sumatra. These connections must have been broken long enough ago to allow for the development of a high degree of specific endemism in each isolated land mass. In the Malay Peninsula the specific endemism, according to computations made by Merrill, is fifty per cent. The same or approximately the same percentage of endemism may be expected to prevail in the floras of Sumatra, Celebes and the other more important islands of the Malay Archi-

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pelago. As botanical explorations of Borneo become intensive and little known areas are searched, it is reasonable to assume that endemic species will be found to be exceptionally numerous, especially in the mountains above an altitude of two thousand five hundred feet.

When we realize that Borneo is one of the largest islands in the world, its area being five times the area of England and Wales; when we bear in mind that botanical exploration has not yet been undertaken systematically and that a single collector who specialized in a single family discovered in less than six weeks on one mountain one hundred species heretofore undescribed, we must prepare for extraordinary changes in any generalizations as to the extent and nature of the Bornean flora based on our present very incomplete knowledge.

The Orchidaceae, with eighty-seven genera and over eight hundred species, surpass numerically all other families of spermatophytes native to Borneo. Next to the Orchidaceae come the Rubiaceae, with sixty-four genera and approximately three hundred and thirty species. Then, among the more important families, come the Euphorbiaceae, Araceae, Palmae, Leguminosae and Melastomaceae in the order named.

The high degree of endemism characteristic of the Bornean flora in general prevails among the orchids of Mount Kinabalu. About sixty per cent of the species gathered by Chaplain Clemens proved to be undescribed. Of the material that represents old species very few specimens were noted that are characterized by an extra-limital distribution.

Conclusions as to the relationship between the orchids of Borneo and the orchids of neighboring islands must be, for the present at least, lightly entertained. We may conclude quite rightly, however, that the orchid flora of Borneo is of the same

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general type as that of the Malay Peninsula, Java, Sumatra, Celebes and the Philippines. The species that are known to have an extra-limital range are for the most part Malayan. *Spiranthes sinensis* (Pers.) Ames is one of the few exceptions to this rule. Below, under *Dendrochilum*, I have discussed the relationship between the species of Mount Kinabalu and Luzon. What is true of *Dendrochilum* in the regions mentioned seems to be equally true of all the large genera common to Borneo and neighboring regions.

In addition to the orchids found by Chaplain Clemens in 1915 I have added in the following enumeration a small collection made on Kinabalu in 1916 by George Haslam and a complete list of all the species reported to be natives of the mountain.

With regard to several of the orchids described in the text perplexities have arisen, but the more troublesome of these were promptly removed through the kindness of Sir David Prain, Director of the Royal Gardens, Kew, who sent sketches of types preserved in the Kew Herbarium. I am also indebted to Mr. Burkill, Director of Gardens, Straits Settlements, who secured for me a photograph of the type of *Dendrochilum conopseum* Ridl. which is preserved in the Sarawak Museum.

It is a pleasure to acknowledge the valued coöperation of my assistant, Mr. Charles Schweinfurth, in the examination and description of the material which has passed through my hands in the preparation of this work. The species that represent joint authorship are designated by the letters A. & S.

The following enumeration includes fifty-two genera and two hundred and twenty-two species. It is highly probable that intensive explorations throughout the year will bring to light many additions and confirm my belief that Mount Kinabalu will prove

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to be one of the richest mountains in the world in the diversity and interest of its orchid flora.

OAKES AMES

*Bussey Institution of Applied Biology
Harvard University
July, 1919*

ORCHIDACEÆ

THE ORCHIDS OF MOUNT KINABALU

BRITISH NORTH BORNEO

BASED CHIEFLY ON THE COLLECTIONS OF
CHAPLAIN JOSEPH CLEMENS

SYNOPSIS OF THE GENERA¹

I. *Diandrae*. The lateral anthers of the outer series fertile.

CYPRIPEDILINAE

1. *Cordula Raf.* Fl. Tellur. 4 (1838) 46.

II. *Monandrae*. The unpaired anther of the outer series fertile.

- A. *BASITONAE*. Anther adherent by a broad base; caudiculae developed at the base of the anther.

HABENARINAE

2. *Habenaria Willd.* Sp. Pl. 4 (1805) 44.

- AA. *ACROTONAE*. Anther attached to the column by a filament; caudiculae when present developed at the tip of the anther.

- B. *Polychondreae*. Pollinia granular, mealy or powdery.

CRYPTOSTYLIDINAE

3. *Chlorosa Bl.* Bijdr. (1825) 420, t. 31; Fl. Jav. nov. ser. 1 (1858) 113, t. 44, f. 2.

VANILLINAE

4. *Vanilla Juss.* Gen. (1789) 66.
5. *Aphyllorchis Bl.* Bijdr. (1825) t. 77; Fl. Jav. nov. ser. 1 (1858) 43, t. 13, 17 D.

SPIRANTHINAE

6. *Spiranthes L. C. Rich.* in Mém. Mus. Par. 4 (1818) 42, 50; (Separate (1817) 20, 28).

PHYSURINAE

7. *Goodyera R. Br.* in Ait. Hort. Kew. ed. 2, 5 (1813) 197.
8. *Kuhlhasseltia J. J. Sm.* Ic. Bogor. 4 (1910) 1, t. 301.

¹ The *Apostasiinae* represented on Mount Kinabalu by *Neuwiedia* Bl. and *Apostasia* Bl. are excluded from this enumeration as they seem to constitute a distinct family.

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9. *Anoectochilus* *Bl.* *Bijdr.* (1825) 411, t. 15 (as *Anecoehilus*); *Fl. Jav.* 1 (1828) vi.
10. *Vrydagzynea* *Bl.* *Fl. Jav. nov. ser.* 1 (1858) 59, t. 17 E & F, 19, f. 2 & 3, 20.

TROPIDIINAE

11. *Corymborchis* *Thou.* *Hist. Pl. Orch.* (1822) t. 37.
BB. *Kerosphaereae*. Pollinia of waxy consistency.

COLLABIINAE

12. *Mischobulbum* *Schltr.* in *Fedde Rep. Beihefte* 1 (1911) 98.
13. *Nephelaphyllum* *Bl.* *Bijdr.* (1825) 372, t. 22.

COELOGYNINAE

14. *Coelogyne* *Lindl.* *Collect. Bot.* (1825) sub t. 33.
15. *Sigmatochilus* *Rolfè* in *Gibbs in Journ. Linn. Soc.* 42 (1914) 155, t. 3.
16. *Dendrochilum* *Bl.* *Bijdr.* (1825) 398, t. 52.
17. *Pholidota* *Lindl.* in *Hook. Exot. Fl.* 2 (1825) t. 138.
18. *Nabalua* *Ames.* Cf. page 70.

LIPARIDINAE

19. *Malaxis* *Soland.* ex *Sw. Prodr. Veg. Ind. Occ.* (1788) 119.
20. *Oberonia* *Lindl.* *Gen. & Sp. Orch.* (1830) 15.
21. *Liparis* *L. C. Rich.* in *Mém. Mus. Par.* 4 (1818) 43, 52, t. 5, fig. 10;
(Separate (1817) 21, 30, fig. 10).

THUNIINAE

22. *Arundina* *Bl.* *Bijdr.* (1825) 401.

DENDROBIINAE

23. *Dendrobium* *Sw.* in *Schrad. Journ. Bot.* 2 (1799) 234 and in *Nov. Act. Ups.* 6 (1799) 82.
24. *Eria* *Lindl.* in *Bot. Reg.* (1825) t. 904.

GLOMERINAE

25. *Ceratostylis* *Bl.* *Bijdr.* (1825) 304, t. 56.
26. *Agrostophyllum* *Bl.* *Bijdr.* (1825) 368, t. 53.

PODOCHILINAE

27. *Podochilus* *Bl.* *Bijdr.* (1825) 295, t. 12.
28. *Chilopogon* *Schltr.* in *Fedde Rep. Beihefte* 1 (1912) 332.
29. *Appendicula* *Bl.* *Bijdr.* (1825) 297, t. 40.

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POLYSTACHYINAE

30. *Bromheadia Lindl.* in Bot. Reg. (1841) Misc. 90.

PHAJINAE

31. *Acanthophippium Bl.* Bijdr. (1825) 353, t. 47.
32. *Phajus Lour.* Fl. Cochinch. (1790) 529.
33. *Calanthe R. Br.* in Bot. Reg. (1821) sub t. 573.
34. *Spathoglottis Bl.* Bijdr. (1825) 400.
35. *Ascotainia Ridl.* Mat. Fl. Mal. Pen. part 1 (1907) 115.

BULBOPHYLLINAE

36. *Bulbophyllum Thou.* Hist. Pl. Orch. (1822) Tabl. Espèc. III & fig. t. 93-97 & 99-110.

THELASINAE

37. *Thelasis Bl.* Bijdr. (1825) 385, t. 75.
38. *Phreatia Lindl.* Gen. & Sp. Orch. (1830) 63.

CYRTOPODIINAE

39. *Eulophia R. Br.* in Bot. Reg. (1823) t. 686.

CYMBIDIINAE

40. *Grammatophyllum Bl.* Bijdr. (1825) 377, t. 20.
41. *Cymbidium Sw.* in Schrad. Journ. Bot. 2 (1799) 213 and in Nov. Act. Ups. 6 (1799) 70.

THECOSTELINAE

42. *Acriopsis Reinw.* ex Bl. Cat. Gew. Buitenzorg (1823) 97 (nomen); Bl. Bijdr. (1825) 376.
43. *Thecostele Reichb. f.* in Bonpl. 5 (1857) 37.

SARCANTHINAE

44. *Thrixspermum Lour.* Fl. Cochinch. (1790) 519.
45. *Aerides Lour.* Fl. Cochinch. (1790) 525.
46. *Vanda Jones* in As. Res. 4 (1795) 302.
47. *Trichoglottis Bl.* Bijdr. (1825) 359.
48. *Schoenorchis Reinw.* ex Bl. Cat. Gew. Buitenzorg (1823) 100 (nomen); Bl. Bijdr. (1825) 361.
49. *Saccolabium Bl.* Bijdr. (1825) 292.
50. *Malleola J. J. Sm. & Schltr.* in Fedde Rep. Beihefte 1 (1913) 978.
51. *Sarcanthus Lindl.* Collect. Bot. (1825) t. 39 B.
52. *Microsaccus Bl.* Bijdr. (1825) 367.

ENUMERATION OF THE GENERA AND SPECIES

1. *CORDULA* Raf.

Eleven species of this genus have been recorded from Borneo, most of them being well known in gardens. Only two species have been found on Mount Kinabalu.

1. *Cordula Dayana* (Reichb.f.) Rolfe in Orch. Rev. 20 (1912)
2, in footnote.

KINABALU, Haslam, July–August 1916. KIAU, Clemens 100, 151, 321, 349, November 1915. 2000–5000 feet altitude.

2. *Cordula javanica* (Reinw.) Rolfe in Orch. Rev. 20 (1912)
2, in footnote.

KINABALU, Haslam, July–August 1916. LOBONG GORGE, Clemens 274, November 1915. Flower green with purple stripes.

2. *HABENARIA* Willd.

Seventeen species of *Habenaria* are now known to be natives of Borneo. In the present work the generic limits comprehend *Platanthera* and *Peristylus*.

1. *Habenaria bambusetorum* Kränzl. Gen. & Sp. Orch. 1 (1898) 384. *Peristylus gracilis* Bl. Bijdr. (1825) 404.

KIAU, Clemens 193, November 1915. 3000 feet altitude. Flower greenish with some purple. MAREI PAREI SPUR, Clemens 397, December 1915. Flower green.

2. *Habenaria borneensis* Ridl. in Stapf in Trans. Linn. Soc. Ser. 2, 4 (1894) 240.

KINABALU, Haviland. 10,000 feet altitude.

3. *Habenaria crassinervia* A. & S. sp. nov. Herba terrestris. Radices tuberosae, paucae. Caulis sine foliis basalibus, e basi decumbenti suberectus. Folia plus minusve quinque, adpressa, vaginantia, lanceolato-ovata, bractearum instar. Racemus sub-laxus. Sepala nervis crassis praedita. Sepala lateralia falcato-lan-

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ceolata, obtusa. Sepalum dorsale ovatum, late obtusum. Petala obliqua, semiovata, parte basali anteriore in auriculam extensa. Labellum integrum, oblongo-lineare, calcari subaequale. Gynostemium breve, latum.

Roots few, about 4 mm. thick, tuberous with short tubers. Stem, including the inflorescence, 23 cm. or more long, becoming suberect from a decumbent base, provided with five or more sheathing leaves. Leaves up to 3.8 cm. long, 1.7 cm. wide, lanceovate to lanceolate, more or less appressed, sharply acuminate, clasping below, the mid-nerve prominently sulcate on the upper surface and carinate beneath, the uppermost leaves gradually reduced in size. In the dry state all leaves resemble spreading sheaths. Floral bracts similar to the leaves, 1–1.8 cm. long, lanceolate, very long acuminate, about three-nerved, either shorter than, equal to, or longer than the ovaries. Flowers ten or less, forming a loose raceme up to 12 cm. long. Sepals pellucid, petals less so, lip very thick and fleshy. Lateral sepals about 8 mm. long, 3 mm. broad below the middle, falcate-lanceolate, rounded at the apex, the three nerves keeled on the dorsal surface, the lateral nerves somewhat abbreviated. Dorsal sepal ovate, about 6.3 mm. long, 4 to 4.4 mm. wide below the middle, strongly three-nerved, the nerves prominently keeled on the dorsal surface, nerves not reaching the broadly rounded apex. Petals obliquely semi-ovate, ± 6.5 mm. long, 2.5–3 mm. broad, obtuse or subacute, two-nerved, the anterior basal portion extended into an auricle characteristic of this section. Lip about 9.5 mm. long, 2.5 mm. broad, simple, oblong-linear, reflexed, very thick and fleshy especially down the center, abruptly narrowed to an obtuse apex, equaling or slightly shorter than the spur. Spur ± 1 cm. long, curved, cylindric, parallel with the lip. Column broad, about 3.5 mm. long.

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This species is represented by four fragmentary specimens, the flowers of which show some variability in having ciliolate or eciliolate petals, and perianth of variable texture. However, it is practicable to treat the material as representative of a single species. It is unlike its near relatives *H. borneensis* Ridl., *H. Stapfii* (Kränzl.), *H. kinabaluensis* (Kränzl.), and *H. Gibbsiae* (Rolfe), in that it does not possess distinct basal leaves and has strongly carinate veins on the dorsal surface of the sepals.

Habenaria borneensis Ridl. is a much taller plant with basal lobules on the lip. Unlike *H. Stapfii* (Kränzl.), *H. crassinervia* has obtuse petals and a linear instead of an ovate-lanceolate lip. *H. kinabaluensis* (Kränzl.) is apparently much taller and has a differently shaped dorsal sepal, while the lip and spur are of different relative length. It is most closely related to *H. Gibbsiae* (Rolfe), which not only has a taller scape with prominent basal leaves, but apparently ecarinate sepals and a subacute dorsal sepal. *H. halconensis* Ames, which is also an allied species, has a much larger perianth and differently shaped lip.

PAKKA, *Clemens 221*, November 1915. Flower green.

4. *Habenaria Gibbsiae* (Rolfe) A. & S. *comb. nov.* *Platanthera Gibbsiae* Rolfe in Gibbs in Journ. Linn. Soc. 42 (1914) 160.

PAKKA, below Pakka, *Gibbs 4258*, February 1910. In open scrub, 9000 feet altitude. Terrestrial, flowers yellow.

5. *Habenaria gigas* Hook. f. Fl. Brit. Ind. 6 (1890) 160. *var. papuana* (J. J. Sm.) A. & S. *comb. nov.* *Peristylus grandis* Bl. *var. papuanus* J. J. Sm. in Nova Guinea 8 (1909) 3, t. I. 1.

KIAU, *Clemens 45*, November 1915. 3000 feet altitude. Terrestrial, flowers greenish yellow. [Spur very short.]

6. *Habenaria goodyeroides* Don Prodr. (1825) 25.

KIAU, *Haslam*, July–August 1916. 3000 feet altitude. Terrestrial, three feet in height, flower white, slightly fragrant.

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7. *Habenaria kinabaluensis* (Kränzl.) A. & S. *comb. nov.*
Platanthera kinabaluensis Kränzl. ex Rolfe in Gibbs in Journ.
Linn. Soc. 42 (1914) 160.

KINABALU, *Haviland*. MAREI PAREI SPUR, *Clemens* 261, November 1915.
Flower green tinged with yellow.

8. *Habenaria Stapfii* (Kränzl.) A. & S. *comb. nov.* *Platanthera*
Stapfii Kränzl. ex Rolfe in Gibbs in Journ. Linn. Soc. 42 (1914)
160.

MAREI PAREI SPUR, *Haviland*. 5000 feet altitude.

3. CHLOROSA Bl.

The genus *Chlorosa* has not heretofore been recorded as a native
of Borneo.

I. *Chlorosa Clemensii* A. & S. *sp. nov.* *Planta terrestris, acaulis.*
Radices paucae, tuberosae. Folium longe petiolatum, ovatum,
subito acuminatum, ad basim rotundatum. Scapus folium multo
excedens, vaginis paucis vestitus. Vaginae tubuliformes, acumi-
natae. Inflorescentia brevis, floribus perpaucis. Bractee lanceo-
latae, ad apicem subulatum acuminatae. Perianthium paulo
patens. Sepala similia, linearia, sensim acuminata, magnopere
involuta, apice obscure tridentata, trinervia. Petala multo brevi-
ora, linearia, uninervia, apice plus minusve tridentata. Labellum
ovato-lanceolatum, acuminatum, marginibus maxime involutis,
subtus ad basim carinis quinque, parvis, approximatis ornatum.
Gynostemium breve, porrectum.

Roots up to 1.5 mm. thick, tuberous, hairy, few. Plant stem-
less. Petiole ± 3.8 cm. long, stout. Leaf 4–6 cm. long, 2.6–3.6 cm.
broad, rising at an oblique angle from the petiole, ovate, abruptly
acuminate, rounded at the complicate base, mid-vein promi-
nently carinate beneath especially toward the petiole, thin,
many-nerved and cross reticulated. Scape ± 15 cm. high, much

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exceeding the leaves, ascending-arcuate, sparingly clothed with sheaths. Sheaths up to 1.7 cm. long, those of the scape remote, thin, tubular, acuminate; those below, at the base of the scape and petiole, imbricating and scarious. Inflorescence up to 2 cm. long (more or less immature in the material examined), loosely five- or six-flowered. Bracts \pm 1 cm. long, lanceolate, very gradually acuminate, subulate at the tip, cucullate at the base, three-nerved, the upper margins involute. Perianth erect, slightly spreading. Sepals 10.5–11 mm. long, 2.2 mm. wide near the base, the lateral sepals slightly longer, linear, gently long acuminate to an obscurely and unequally three-toothed apex, strongly involute, three-nerved, the mid-vein keeled beneath. Petals much shorter, about 5.7 mm. long, 1.1 mm. broad, linear, one-nerved, at the apex more or less irregularly tridentate with the middle tooth a little longer and sharper. Lip about 9 mm. long, 4.8 mm. broad near the sessile base, ovate-lanceolate, long acuminate to an obtuse apex, thicker in texture than the sepals and petals, the margins very strongly involute enwrapping the column, slightly undulate below, the upper surface closely and very finely papillose, increasingly so above, on the under surface with five approximate, parallel ridges prominent at the base but soon diminishing. Column small, about 1.4 mm. long, extending forward, concave above, convex beneath. Anther two-celled, suborbicular, mucronate. Pollen grains powdery.

This is a perfectly distinct plant from *Chlorosa latifolia* Bl., the only other described species of the genus, which lacks the three-toothed apex to the petals, and has much larger leaves and relatively shorter scapes. (PLATE 80.)

MAREI PAREI SPUR, *Clemens* 399, December 1915. Flower green.

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4. VANILLA *Juss.*

Two species are at present known to be natives of Borneo, *Vanilla borneensis* Rolfe being endemic.

I. *Vanilla albida* *Bl.* Cat. Gew. Buitenzorg (1823) 100; Rumphia 1 (1835) 197, t. 67.

KIAU, *Clemens 148*, November 1915. 3000 feet altitude. Flower yellowish white; *Clemens 308*, November 1915. Flower white with pink tips.

5. APHYLLORCHIS *Bl.*

Three species of *Aphyllorchis* have been recorded as natives of Borneo, *A. borneensis* Schltr. and *A. spiculaca* Reichb. f. being endemic.

I. *Aphyllorchis pallida* *Bl.* Bijdr. (1826) t. 77 and Mus. Bot. Lugd. Bat. 1 (1849) 30.

KIAU, *Clemens 252*, November 1915. Flower white, stem and flower dotted with purple; *Clemens 323*, November 1915. Flower white.

6. SPIRANTHES *L. C. Rich.*

The discovery of *Spiranthes sinensis* on Mount Kinabalu by Clemens not only extended the range of this very variable and widely distributed species, but amplified the number of orchid genera now known to be represented in Borneo.

I. *Spiranthes sinensis* (*Pers.*) *Ames* Orchidaceae 2 (1908)
53. *Neottia sinensis* *Pers.* Syn. 2 (1807) 511.

KIAU, *Clemens 190*, November 1915. 3000 feet altitude. Flowers pink; *Clemens 140*, November 1915. 3000 feet altitude. Flowers pink. MAREI PAREI SPUR, *Clemens 399 A*, December 1915.

7. GOODYERA *R. Br.*

With the addition of *Goodyera rostellata*, the representation of *Goodyera* in Borneo is increased to three species. *G. kinabaluensis* Rolfe is known only from Mount Kinabalu; *G. rostrata* Ridl., the third species, was originally collected at Sarawak by Hewitt.

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1. *Goodyera kinabaluensis* *Rolfe* in *Gibbs* in *Journ. Linn. Soc.* 42 (1914) 159.

GURULAU SPUR, above Kiau Ridge, *Gibbs 3997, 4003*, February 1910. In primary forest, 5000–5500 feet altitude.

2. *Goodyera rostellata* *A. & S. sp. nov.* Herba terrestris, parva, suberecta vel deflexa. Rhizoma decumbens, glabrum. Folia lanceolata, acuminata, ad basim rotundata, paulo obliqua, supra valde reticulata. Caulis vaginis paucis in parte superiore ornatus. Spica subdensa, multiflora, subsecunda, glanduloso-pubescent. Bractee ovaria excedentes, ad basim latae, subito longe acuminatae, marginibus inferioribus eroso-ciliatis. Perianthium connivens. Sepala concava, late obtusa, uninervia. Sepala lateralialia ovata. Sepalum dorsale oblongo-ovatum. Petala cuneato-spathulata, apice subcarnoso rotundata et retusa, membranacea. Labellum saccatum, suborbiculare, pilis multis longis intus praeditum, ad apicem in laminam parvam deltoideam abrupte constrictum. Gynostemium parvum, rostellum brachii binis conspicuis lanceolato-acuminatis ornatum. Anthera e basi cordata ad apicem angustata.

Rhizome decumbent, glabrous, about 1.75 mm. thick, with short unbranched roots. Plant small, ±12.5 cm. tall, suberect or deflexed. Leaves two or three, about 5 cm. long, 1.75 cm. or more broad, above closely reticulated with white, below with a slight coppery tint, lanceolate, acuminate, with a slightly oblique, rounded or subcordate base, mid-vein prominently carinate beneath. Stem clothed above with about four sheaths, the lowermost like a small deltoid leaf. Spike 5–6 cm. long, rather densely many-flowered, subsecund, closely pubescent and apparently glandular throughout. Bracts about 7.5 mm. long, when mature exceeding the ovaries and clasping them at the base, below broad, abruptly long acuminate, deeply cellular-ciliate below, one-

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nerved. Perianth about 3.5 mm. long, externally closely cellular-glandular, the segments connivent. Sepals concave, with broadly obtuse, overlapping apices, one-nerved. Lateral sepals about 3.6 mm. long, 2.2 mm. wide, ovate. Dorsal sepal about 3.2 mm. long, 2 mm. broad, lance-ovate. Petals cuneate-spatulate, about 3.1 mm. long, 1.5 mm. broad across the upper portion, rounded and retuse at the slightly thickened apex, one-nerved, membranaceous, glabrous. Lip nearly 3 mm. long, 2.4 mm. broad, very strongly concave or pouch-shaped, suborbicular, with many long, scattered, cellular hairs or setae within, three-nerved, toward the apex abruptly narrowed to a small, flat, deltoid, broadly obtuse plate; plate scarcely 1 mm. long. Column about 1 mm. long, narrow below, widened above, provided with a pair of prominent, erect, lance-acuminate, obtuse rostellar arms about 1.5 mm. long. Anther about 1.8 mm. long, two-celled, narrowed from a cordate base to the apex.

There are several near allies of this plant. Of these *Goodyera reticulata* Bl. is distinguished by its larger, differently proportioned flowers, by the shape of the petals, and by the short column arms. *G. Ramosii* Ames has a markedly white central band on the leaf, rather smooth flowers, and short rostellar arms. *G. hispida* Lindl. has subsessile, not reticulated leaves, and differently formed petals and lip.

In the dried material, the leaf reticulation appears creamy in color varying to a coppery tint, and this latter hue is usually noticeable beneath.

KIAU, *Clemens* 401 (Type), December 1915. Flowers white; *Clemens* 322, November 1915; *Clemens* 96, November 1915. 3000 feet altitude. Inflorescence with brownish bracts and white flowers.

8. *KUHLHASSELLTIA* *J. J. Sm.*

The genus *Kuhlhasseltia* is at present a small one with representatives in Java, the Philippine Islands, Ambon, and Borneo.

i. *Kuhlhasseltia kinabaluensis* *A. & S. sp. nov.* Herba terrestri, gracilis, e basi longa decumbenti erecta. Folia plus minusve tria, scapi basim versus approximata, ovata, acuminata, ad basim rotundata, marginibus plus minusve undulatis. Pedunculus basim versus glabratus, in parte superiore densissime albo-pubescentis, vaginis circiter sex praeditus. Vaginae tubulares, apicibus longe acuminatis. Inflorescentia subdensa, plus minusve erecta, rachide densissime albo-pubescenti. Bractee ovaria torta praecedentes, ovaria ad basim vaginantes, in apicem subulatum longe attenuatae, marginibus irregulariter ciliatis, uninerviae, carinatae. Flores plus minusve undecim. Sepala lateralia lanceolata, paulo obliqua, obtusa, uninervia. Sepalum dorsale deltoideo-lanceolatum, obtusum, uninervium. Petala lanceolata paulo sub medio subito angustata, obtusa, uninervia. Labellum in circuitu oblongum, e basi profunde sulcata in unguem fere conduplicatum protensum, subito in laminam extensum; lamina reniformis, emarginata, marginibus plus minusve undulatis et erosis; unguis extensus orbicularis, ad basim callis duobus rotundatis. Gynostemium breve, rostello bifido ornatum, atque parte anteriore tuberculo conspicuo praeditum.

Plant about 24 cm. tall, slender, erect, with a long decumbent freely rooting base. Leaves of the season two or more, approximate near the base of the scape, about 2 cm. long, 1.2–1.5 cm. wide, ovate, gently acuminate, rounded at the base, separated from the sheath by an almost imperceptible isthmus, thin, more or less undulate on the margins. Peduncle glabrate below, very closely white pubescent above, provided with about six sheaths from the base to the inflorescence. Sheaths ± 1.5 cm.

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long, tubular, with ascending, long acuminate apices. Inflorescence 2.7 cm. long, the rachis closely white pubescent, in the natural state apparently erect or nearly so. Bracts up to 9 mm. long, far exceeding the twisted ovaries, at the base concave and sheathing the ovaries, lance-attenuate to a long subulate tip, margins irregularly cellular-ciliate especially below, one-nerved, keeled dorsally along the median line. Flowers about eleven, glabrous except for a very narrow, irregular, pubescent zone at the summit of the ovary and base of the flower. Lateral sepals about 5 mm. long, 2.1 mm. wide near the slightly saccate base, lanceolate, slightly oblique, obtuse, one-nerved. Dorsal sepal about 5 mm. long, 2.2 mm. wide at the base, deltoid-lanceolate, obtuse, one-nerved. Petals about 4.5 mm. long, 1.8 mm. wide a little below the middle, lanceolate with a rather abruptly narrowed basal portion, obtuse, one-nerved, somewhat oblique, of slightly thinner texture than the sepals. Lip about 4.3 mm. long, oblong in outline, from a deeply sulcate base extended forward at right angles into a deeply grooved, almost conduplicate claw or hypochil with strongly incurving sides, then dilated abruptly into a reniform lamina; lamina about 1.4 mm. long, 2.5–3 mm. wide, emarginate, bluntly apiculate, with more or less undulate, erose margins; claw or hypochil, when spread out, orbicular with two prominent round, flat calli near the base. Column short, about 2.7 mm. long, with a conspicuous bifid rostellum, furnished with a prominent chin on the anterior face. Anther large, lanceolate, from a cordate, stipitate base slightly surpassing the rostellum. Pollinia 2, sectile.

This little plant is very closely related to *Kuhlhasseltia Whiteheadii* (Rendle) Ames, a native of the Philippine Islands; but the Bornean plant differs from it markedly in the uniformly smaller

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size of the yellow flowers, and in the more prominent anterior chin on the column.

MAREI PAREI SPUR, *Clemens* 398, December 1915. Flower yellow.

9. ANOECTOCHILUS *Bl.*

Previously but one species of this interesting genus was reported as Bornean. *Anoectochilus spicatus* Miq. from Dutch Borneo is apparently endemic.

I. *Anoectochilus Reinwardtii* *Bl.* Fl. Jav. nov. ser. 1 (1858) 40, t. 12, f. 2, t. 12 b, f. 14-29.

In *Clemens* 263 the fringes of the lip are somewhat fewer than the normal number, which is variable.

MAREI PAREI SPUR, *Clemens* 263, November 1915. Flowers purplish; *Clemens* 400, December 1915. Flowers cream color. KIAU, *Clemens* 164, November 1915. 3000 feet altitude. Flowers purple.

10. VRYDAGZYNEA *Bl.*

This genus is represented in Borneo by three endemic species, *V. Beccarii* Schltr., *V. elata* Schltr., and the following:

I. *Vrydagzynea grandis* *A. & S. sp. nov.* Herba terrestris. Rhizoma crassum, longe repens, glabrum, in nodos divisum. Radices paucae, e nodis orientes, densissime brunneo-lanuginosae, plus minusve simplices. Caulis foliis paucis, approximatis fere in medio ornatus. Folia ovata, abruptius acuta, ad petiolum cuneato-angustata, chartacea, nervo in medio subtus carinata, folia infima atque suprema minora. Petioli breves, in vaginas laxas tubular-esque exeuntes. Spica densissima, crasso-cylindracea. Bractee lineari-oblongae, prope apicem subito angustatae, sulcatae. Perianthium connivens. Sepala persimilia, lanceolata, late obtusa, parte superiore carnosae. Petala sepalis similia, tenuiora. Labellum calcaratum; lamina in positu naturali deltoidea, extensa linguiformis, papillosa, prope basim breviter bilamellata; calcar cylin-

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draceum, in medio paulo latissimum, intus prope apicem glandulis binis pedicellatis praeditum. Gynostemium breve, crassum.

Rhizome stout, elongated, glabrous, about 5 mm. thick, in dried material pale green, divided into distinct nodes usually 1.6–2.8 cm. apart. Roots few, rising from the nodes, fibrous, densely brown lanuginose, simple or sparingly branched. Stem 19–20 cm. tall, with a cluster of approximate leaves about at the middle. Leaves five or six, ± 8.9 cm. long, 4.8 cm. wide, ovate, rather abruptly acute, below cuneate narrowed to the petiole, chartaceous, five or more nerved, with the mid-vein carinate beneath, the lowermost blades somewhat distant and much smaller, the uppermost much reduced and bract-like. Petioles short, winged. Leaf sheaths ± 8 mm. long, infundibuliform. Cauline sheath on the upper portion of the stem, 1.5–2 cm. long, lanceolate, appressed. Spike dense, about 3.1 cm. long, 2.1 cm. wide. Bracts about 9.5 mm. long, 2.8 mm. wide, linear-oblong, narrowed near the apex to an obtuse point, one-nerved, longitudinally sulcate. Perianth connivent, about 11.5 mm. long from the tip of the spur to the apex of the dorsal sepal. Sepals lanceolate, narrowed to a very broadly rounded, fleshy thickened apex, one-nerved. Lateral sepals 5.5 mm. long, 2.5 mm. wide. Dorsal sepal about 5.4 mm. long, 2.5 mm. wide below the middle, forming a hood with the petals. Petals about 5 mm. long, 2 mm. broad, similar to the sepals but thinner, more or less abruptly narrowed to a broadly rounded apex. Lip spurred; limb ± 3.8 mm. long, 2.8 mm. wide at the base, in natural position deltoid with the lateral margins strongly involute, obtuse, lingulate when spread out, upper surface finely papillose, near the base on either side provided with a small, abbreviated, lamelliform appendage; spur 6–7 mm. long, 2.5–3 mm. in diameter at the middle, thick cylindric, anteriorly somewhat inflated, provided within—above the middle—with

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a pair of small ovate-oblong glands free-stalked for a distance of about 1 mm., the stalks running up toward the column. Column short, thick, about 2.2 mm. tall, 1.85 mm. broad, slightly dilated above and raised into a rostellar thickening at each corner.

Clemens 355 shows a portion of an even larger plant than the type with the stem (broken off) 28 cm. long. In this specimen the leaves average 11.1 cm. long, and the spike about 4 cm. long, 2 cm. wide, but no definite floral differences are manifest.

The nearest ally is apparently *Vrydagzynea albida* Bl., which is distinct in its uniformly narrower leaves, longer rachis of the inflorescence and narrower floral segments.

KIAU, *Clemens 340* (Type), November 1915. Flower greenish; *Clemens 355*, November 1915. Flower white with green tips.

II. CORYMBORCHIS *Thou.*

The one widely distributed species, *C. veratrifolia* (Reinw.) Bl., already reported as native of Borneo, is here recorded from Mount Kinabalu for the first time.

I. *Corymborchis veratrifolia* (Reinw.) Bl. Fl. Jav. nov. ser. 1 (1858) 105, t. 43, f. 1, and t. 42, E. *Hysteria veratrifolia* Reinw. ex Bl. Cat. Gew. Buitenzorg (1823) 99.

LOBONG CAVE, *Clemens 123, 200*, November 1915. Flowers white. [Plant said to be 4-8 feet high in specimens of 123.]

12. MISCHOBULBUM *Schltr.*

This genus, originally erected by Schlechter in *Die Orchidaeen von Deutsch-Neu-Guinea*, published in Fedde's *Repertorium*, is represented in Borneo by a single species, which was first made known through specimens imported by Messrs. Low & Company of Clapton, England.

I. *Mischobulbum scapigerum* (*Hook. f.*) *Schltr.* in Fedde

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Rep. Beihefte 1 (1911) 98. *Nephelaphyllum scapigerum* *Hook. f.*
Bot. Mag. (1863) t. 5390.

TENOM, *Gibbs 2884*, January 1910. On hills above 2000 feet altitude in high forest.

13. *NEPHELAPHYLLUM* *Bl.*

Six species referable to this genus have been recorded from Borneo.

1. *Nephelaphyllum flabellatum* *A. & S. sp. nov.* Herba terrestis, parva. Caulis e basi decumbenti adscendens vel flexuosus, vaginis laxis papyraceis omnino obtectus. Radices paucae, ex internodiis orientes, densissime albo-lanuginosae, sulcatae. Folia circiter tria, ovato-cordata, paulo obliqua, obtusa, mucronata, in visu tenuia, quinquenervia, nervis majoribus subtus carinatis. Rachis brevis, pauciflora. Bractee patentēs, conduplicatae, late ovatae, acutae, papyraceae. Flos erecto-patens; labellum erectum; sepala petalaeque conniventia, decurvo-circinnata. Sepala linearia, mucronata, uninervia. Petala lineari-lanceolata, apice oblique rotundata et mucronata, trinervia. Labellum calcaratum, flabelliforme; unguis cuneatus, plus minusve subito in laminam dilatatus, sulcatus, basi in medio carnosus et pubescens; lamina late flabellata marginibus undulatis, extensa paulo emarginata, prope apicem in medio fasciculo papillarum verrucosarum ornata; calcar subgloboso-cylindraceum, extus sulco circumdatum, intus constrictio carina notata. Gynostemium in parte superiore praecipue latius alatum. Ovarium alis sex conspicuis praeditum.

Stem up to 10 cm. tall, ascending or flexuous from a decumbent, slightly thickened lower portion, entirely concealed by loose, imbricating, papyraceous sheaths. Roots apparently sparse, rising from the internodes, densely white lanuginose, longitudinally sulcate, about 1.5 mm. thick, irregularly flexuous. Leaves

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three or more, very thin in dried material, ± 6 cm. long, 4 cm. wide, ovate-cordate, with a shallow basal sinus, slightly oblique, obtuse, mucronate, five-nerved with additional fainter nerves, the mid-vein and prominent lateral nerves more or less carinate beneath. Petioles sulcate, ± 1 cm. long. Rachis about 2 cm. long, zigzag, bearing few flowers, glabrous. Bracts in natural position spreading and conduplicate, when expanded about 9 mm. long, 7 mm. wide, broadly ovate, acute, papyraceous, three-nerved. Flower spreading-erect, the lip erect, the sepals and petals connivent and decurved-circinnate, about 1.6 cm. long from the base of the spur to the apex of the lip. Sepals linear, obtuse, mucronate, one-nerved. Lateral sepals about 1.1 cm. long, 1.7 mm. broad. Dorsal sepal about 1 cm. long, 2 mm. wide. Petals about 9.5 mm. long, 2.8 mm. broad, linear-lanceolate, obliquely rounded and mucronate, three-nerved. Lip spurred, flabelliform, 1.3 cm. long, 1.1 cm. broad across the apex; claw cuneate, rather abruptly dilated into the limb, sulcate, at the base medianly papillose-thickened and pubescent; limb flabellate, with undulate margins, when spread out shallowly emarginate, provided, near the apex, in the center with a cluster of verrucose papillae, those at the apical end largest; spur subglobose-cylindric, about 4.5 mm. long, 3 mm. broad, pubescent on the anterior wall near the base of the limb, with a longitudinal groove extending along the dorsal surface to the anterior wall, the course of this groove marked within the spur by a thickened ridge. Column about 6 mm. long, rather broadly winged especially above, with the apex obtusely triangular with shallow and irregular indentations. Ovary with six sharp wings.

Clemens 263 A shows much smaller plants with leaves ± 4 cm. long, 2.8 cm. wide, lip 1.1 cm. long, 8.3 mm. broad at the apex, and with the apical cluster of papillae arranged in three lines. There

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is present also a depressed semi-globose, two-celled anther externally provided with two parallel ridges terminating in spreading horns. Pollinia ovoid, waxy, without apparent caudicles.

A near ally is *Nephelaphyllum latilabre* Ridl., which shows an exactly reversed relative proportion of petals and sepals, much broader lip and flat anther.

MAREI PAREI SPUR, *Clemens* (Type), December 1915; *Clemens* 263 A, November 1915.

2. *Nephelaphyllum latilabre* Ridl. in Stapf in Trans. Linn. Soc. Ser. 2, 4 (1894) 238.

In the original description compared with *N. pulchrum* Bl., from which it differs in the broad reniform end of the labellum, which has three lines of small papillae in the middle that increase in size toward the apex. Labellum pink veined with oblong orange center.

KINABALU, *Haviland* 1165. 6500 feet altitude.

14. COELOGYNE Lindl.

At present over one hundred and thirty species are referred to this genus. Twenty-eight species have been reported as natives of Borneo, to which number nine new species and one new variety are added in the following enumeration. Seventeen species and one variety are now known to be natives of Mount Kinabalu.

1. *Coelogyne amplissima* A. & S. sp. nov. Radices paucae, flexuosae, glabrae. Pseudobulbi cylindracei, in sicco sulcati, mox fibris solutis inclusi, monophylli. Folium oblongum, valde truncatum, obtusum, apice mucronatum. Inflorescentia synantha. Racemus laxis, rachide glabrescenti. Flores plus minusve decem. Sepala lateralia lanceolata, obtusa. Sepalum dorsale simile. Petala linearia. Labellum trilobatum; lobi laterales parvi, lineari-oblongi, falcati, apice rotundati; lobus medius subquadratus,

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leviter retusus; discus bicarinatus. Gynostemium ad apicem alatum; ala dentata.

Roots few, 2 mm. thick, fibrous, flexuous, glabrous. Pseudobulbs 5.5 cm. long, 11 mm. in diameter at the base, narrowly cylindric, dull yellowish and sulcate in dried specimens, invested by the copious fibrous remains of sheaths, monophyllous. Leaf up to 19 cm. long, 6 cm. wide at the middle, oblong, above abruptly truncated and mucronate, below gradually contracted into the long stout petiole, rigid, coriaceous, about nine-nerved, mid-nerve prominent and rounded beneath. Inflorescence synanthous, somewhat shorter than the petioled leaf, in early growth clothed up to the raceme with several closely imbricating sheaths. Raceme lax, rachis glabrous. Flowers ten or less, expanding simultaneously. Lateral sepals lanceolate, about 1.8 cm. long, 7 mm. wide, narrowed to an obtuse point, concave at the base, indistinctly seven-nerved, on the dorsal surface broadly carinate along the mid-vein. Dorsal sepal 1.7 cm. long, 8 mm. wide, similar to the laterals, inconspicuously carinate along the median nerve. Petals linear, 1.7 cm. long, 1 mm. wide. Labellum three-lobed, \pm 1.8 cm. long, 1.4 cm. wide across the middle, obovate in outline; lateral lobes 5 mm. long, 1.8 mm. wide, linear-oblong, falcate, obtuse; middle lobe unguiculate, the claw as long as the lateral lobes, limb 9 mm. long, 1.4 cm. wide, subquadrate, broadly retuse, bluntly and minutely apiculate; disc bicarinate. Column 1.2 cm. long, stout, toward the apex very broadly winged, the terminal part of the wing truncate and sharply and irregularly dentate.

Clemens 233 is a much more mature specimen than the type, and is characterized by a tall suberect scape that bears flowers with slightly but uniformly larger sepals and petals. *Clemens 231* is intermediate in its vegetative parts between a plant of *Clem-*

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ens 80 and *233*. *Clemens 231* shows a smaller oblong-elliptic leaf and a scape very slightly longer than the petiole.

Coelogyne amplissima is closely allied to *C. sulphurea* Reichb. f., but is clearly distinguishable by its oblong, truncated leaves, larger flowers, and truncate column wing.

KIAU, *Clemens 80* (Type), November 1915. 3000 feet altitude. Flower salmon with a band of brown above. MAREI PAREI SPUR, *Clemens 231*, November 1915. Flower green tinged with cream; *Clemens 233*, November 1915. Flower green with purple under lip.

2. *Coelogyne Clemensii* A. & S. *sp. nov.* Herba robusta. Radices crassae. Pseudobulbi pyriformes vel cylindranei, monophylli. Folium lineari-oblongum vel oblongum, ad apicem basimque sensim angustatum, erectum, rigidum, valde plicatum. Petiolus longus, canaliculatus. Inflorescentia heterantha, perbrevis, e basi decumbenti suberecta, ad rachidem vaginis imbricantibus plus minusve obtecta. Rachis arcuata. Bractee inflorescentiae persistentes, ovatae vel obovato-oblongae, convolutae. Flores simultanei, subcarnosi. Sepala lateralia elliptico-oblonga, valde cymbiformia, apice cucullato complicato-mucronata. Sepalum dorsale simile, apice rotundatum. Petala anguste elliptica, acuta. Labellum in situ naturali gynostemium amplectens et ad medium convolutum, deinde sensim dilatatum; expansum ovale, indistincte trilobatum; lobi laterales longitudinaliter semiorbiculares, apice rotundati; lobus medius suborbicularis, plica magna utrinque praeditus; carinae tres humiles e basi labelli fere ad apicem decurrunt. Gynostemium gracile, rectum, apice ala lata truncata instructum.

Plant stout. Rhizome woody. Roots numerous, stout, long, fibrous, flexuous, ± 1.5 mm. in diameter. Pseudobulbs 4-5 cm. long, slender pyriform to cylindric, more or less oblique, monophyllous, striate-sulcate in the dried specimen. Leaf about

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37–53 cm. long, 3.8–5.3 cm. wide, linear-oblong to oblong, gradually narrowed to both ends with an abruptly acuminate apex, erect, rigid, strongly plicate, coriaceous, many-nerved with about seven nerves prominent beneath. Petiole about (8) 12–25 cm. long, stout, subcylindric, deeply channeled, merging gradually with the leaf blade. Inflorescence heteranthous. Peduncle short, including the raceme up to 17.5 cm. long; the portion below the raceme erect or suberect from a decumbent base and more or less entirely clothed with triangular to lance-tubular imbricating sheaths. Rachis loosely five- to seven-flowered, suberect or arcuate, gently zigzag, usually subtended by an appressed sterile bract. Bracts of the inflorescence persistent, about 2 cm. long, 1.2 cm. wide, apparently convolute and sheathing the pedicellate ovary, spreading, somewhat reflexed in late development, ovate to obovate-oblong, acute or acuminate, scarious, striate-nervose, the lowermost bracts longer and narrower. Flowers simultaneous, sub-fleshy; perianth segments somewhat spreading. Lateral sepals about 1.6–1.8 cm. long, 8–9 mm. wide, elliptic-oblong, strongly cymbiform, cucullate and complicate-mucronate at the apex, about five-nerved. Dorsal sepal similar, a little shorter, rounded at the apex, strongly concave. Petals about 1.5 cm. long, 6 mm. wide in the middle, narrowly elliptic, acute, about three-nerved. Lip in natural position about 1.4 cm. long, tubular-convolute about the column for about half its length, then somewhat reflexed with the lamina gradually spreading into the strongly undulate deflexed anterior portion; lip when spread out oval, about 1.75 cm. long, 1.1 cm. broad, saccate at the base, indistinctly three-lobed above; lateral lobes longitudinally semi-orbicular, at the apex porrect, rounded, overlapping the middle lobe; middle lobe when expanded suborbicular with a very large fold in the middle of each margin, the apex broadly truncate and

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more or less retuse-apiculate; three low simple approximate fleshy keels run from the base of the lip nearly to the apex of the middle lobe. Column about 1.3 cm. long, slender, straight, winged throughout, with a very broadly truncate, simple terminal wing. Anther hemispherical, papillate.

In respect to lip structure there are apparently no near allies of this plant.

MAREI PAREI SPUR, *Clemens 227*, November 1915. Flower white, very fragrant.

Coelogyne Clemensii var. **longiscapa** A. & S. var. nov. A specie, haec planta pseudobulbis brevioribus, petiolis brevioribus, foliis in visu crassis, scapo rigido longiore, petalis angustioribus, differt.

From the type, the following points of difference are noticeable. Pseudobulbs up to 3 cm. long. Petiole up to 8 cm. long, but generally shorter. Leaves apparently fleshy, lacking the very prominent nerves of the species. Scape stout, rigid, clothed only at the base with six or more tubular, imbricating sheaths. Peduncle up to the inflorescence usually ± 16 cm. long, though rarely as short as 8 cm. Rachis rigidly arcuate, subtended by one or more tightly convolute bracts. Petals lanceolate, about 1.6 cm. long, 4.5 mm. broad. Lip apparently less reflexed in the middle, the middle lobe obtusely narrowed.

This plant is so close to the species in general floral character, and the vegetative differences appear so inconstant and easily attributable to variations in environment, that varietal rank is deemed sufficient.

KINABALU, *Haslam*, July–August 1916.

3. **Coelogyne compressicaulis** A. & S. sp. nov. Rhizoma in visu lignosum. Pseudobulbi fusiformes vel anguste cylindranei, diphylli. Folia lineari-oblonga, acuta, mucronata, in petiolum

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angustata, coriacea, supra nitentia, subtus nervis conspicuis quinque ornata. Inflorescentia hysterantha. Pedunculus usque ad inflorescentiam valde compressus, anguste alatus, rigidus, nitens. Rachis subflexuosa, internodiis floralibus perbrevibus irregularibus. Bracteae plerumque deciduae, sed in summa rachidis perpaucæ, erectæ, imbricatæ manent. Flos in sicco membranaceus. Sepala lateralia anguste lanceolata, acuminata, cymbiformia, mucronata, basi gibboso-saccata, carinata. Sepalum dorsale simile, paulo brevius atque latius. Petala anguste linearia, apice obliquissime bidentata. Labellum trilobatum, in circuitu ovato-oblongum; lobi laterales erecti, oblongo-semiorbiculares; lobus medius ex ungue lato in laminam suborbicularem subito dilatatus, marginibus undulatis; carinae tres e basi exoriuntur, quorum laterales ad medium lobi medii extendunt; carina media humilior ad basim lobi medii decurrit, e quo linea crassa per lobum medium ad apicem extendit. Gynostemium arcuatum, in parte superiore praesertim late alatum. Clinandrium conspicuum, ovato-triangulare. Rostellum parvum, leviter retusum.

Rhizome thick, woody. Pseudobulbs about 6.5 cm. long, 1.1 cm. broad below, fusiform or narrowly cylindric, diphyllous, dull, yellow-green in dried specimens. Leaves very variable in size, about 20 cm. long, 2.5 cm. wide, rising suboppositely from the summit of the pseudobulb, linear-oblong, gently narrowed to each end, acute, mucronate from the extended mid-vein, below complicate-narrowed into a petiole, coriaceous, shining above, dull beneath, with five nerves, especially the mid-nerve, prominent beneath. Petiole 3-4 cm. long, winged. Inflorescence hysteranthis. Peduncle up to the raceme about 20.5 cm. long, 4 mm. wide, strongly laterally flattened and narrowly winged, rigid, shining, yellow. Rachis about 6.5 cm. long, slightly flexuous, strongly zigzag, angled, thicker, narrower, and less com-

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pressed than the stem. Bracts of the inflorescence mostly deciduous, but several at the tip of the rachis persistent, erect, about 1.7 cm. long, lanceolate, apparently conduplicate, dull, thinnish. Flower membranaceous in the dried plant. Lateral sepals nearly 2 cm. long, 5.5 mm. wide near the base, narrowly lanceolate, acuminate, mucronate, cymbiform, gibbous-saccate at the base, five-nerved, dorsally strongly keeled especially at the apex. Dorsal sepal similar, 1.85 cm. long, 6.5 mm. wide near the base, dorsal keel evanescent, but at the apex formed into a backward pointing mucro. Petals about 1.6 cm. long, 1.5 mm. wide at the base, narrowly linear, very unequally and sharply bidentate at the apex, one-nerved. Lip about 1.5 cm. long, in outline ovate-oblong, three-lobed; hypochil about 1.1 cm. long, 1 cm. broad when expanded; lateral lobes erect, oblong semi-orbicular, with the free portion about 1.5 mm. long, 3.5 mm. broad; middle lobe about 9 mm. long, 8.5 mm. broad, from a short broad claw abruptly dilated into the nearly orbicular epichil, slightly retuse and broadly obtuse apiculate, undulate on the margins, somewhat thickened on the lateral nerves; three low, fleshy, simple keels run from the base of the lip, the lateral keels about to the center of the middle lobe, the lower central keel only through the hypochil but continued as a thickened ridge through the middle lobe or epichil where it meets the converging continuations of the lateral keels. Column about 11.5 mm. long, arcuate, subequal to the hypochil, prominently winged especially above; apex truncate, shallowly toothed. Clinandrium prominent, ovate-triangular. Rostellum thick, very shallowly indented.

In addition to the type material there are other collections of this species made by Clemens that show striking variability in habit, some of them having clusters of imbricating bracts on the rachis. The large collection by Haslam closely simulates

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the type, although showing great variability in vegetative characters.

An imperfect dwarf plant is present with Clemens' unnumbered material.

This species is to be classed with Kränzlin's section *Longifoliae*, showing close relationship with *Coelogyne tumida* J. J. Sm., *C. modesta* J. J. Sm., *C. carinata* Rolfe, and *C. longifolia* (Bl.) Lindl. *C. tumida* has longer, laxer scapes and smaller flowers. *C. compressicaulis* differs from *C. modesta* in having a flattened scape, larger flowers, and different rostellum. From *C. carinata* Rolfe, it differs in possessing a strict scape and different side lobes of the lip. *C. longifolia* lacks the compressed scape and prominent side lobes of the lip, which are characteristic of *C. compressicaulis*. *C. Merrillii* Ames, from the Philippines, has a shorter scape and much smaller flowers, while *C. chloroptera* Reichb. f. has a flower rather similar in structure to this species.

KINABALU, *Clemens* (Type), November 1915; *Haslam*, July–August 1916.
 LOBONG CAVE, *Clemens 122*, November 1915. 5000 feet altitude. Flower purplish-pink. LOBONG, *Clemens 217*, November 1915. Flower dark salmon.
 LOBONG GORGE, *Clemens 293*, November 1915.

4. *Coelogyne Dayana* Reichb. f. in Gard. Chron. II, 21 (1884) 826.

KINABALU, *Haslam*, July–August 1916. KOUNG, *Gibbs 4339*, February 1910. Secondary forest, 1000 feet altitude.

5. *Coelogyne exalata* Ridl. in Journ. Str. Br. Roy. As. Soc. No. 49 (1908) 29.

PAKKA, *Gibbs 4215*, February 1910. 9000 feet altitude. Terrestrial in open scrub, abundant under *Leptospermum*.

6. *Coelogyne genuflexa* A. & S. sp. nov. Rhizoma crassum, lignosum. Radices plus minusve numerosae, longae, fibrosae. Pseudobulbi in sicco anguste cylindranei, diphylli, sulcati. Folia oblongo-elliptica, apice rotundata, basi cuneata, coriacea, nervis

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nonnullis, conspicuis supra et subtus ornata. Petiolus distinctus. Inflorescentia synantha. Pedunculus vaginis nonnullis, distichis, imbricantibus in parte inferiore vestitus, usque ad inflorescentiam nudus, gracilis, lepidotus. Rachis arcuata, lepidota, bracteis paucis imbricantibus infundibuliformibus sterilibus subtenta. Bractee rotundato-ovatae, apice late rotundatae, rigidae, nervosae, persistentes, reflexae. Sepala basi reflexo-saccata praedita. Sepala lateralia lanceolata, cymbiformia, valde carinata, obtusa, mucronata. Sepalum dorsale simile, apice late obtusum, carina conspicua prope basim solum ornatum. Petala anguste linearia, e basi sensim acuminata, uninervia. Labellum in circuitu lanceolatum, in hypochilium et epichilium conspicue divisum; hypochilium gynostemio parallelum, quadrangulare, marginibus anterioribus praeter in medio truncatis revolutis incrassatis; epichilium oblanceolatum, prope apicem subito acuminatum vel acutum, trinervium. Gynostemium arcuatum, basi tuberculatum, in parte superiore late alatum; ala trilobata.

Rhizome thick and woody. Roots rather numerous, long, flexuous, fibrous, very sparsely branching, finely papillose, ± 1.5 mm. thick. Pseudobulb about 6 cm. long, 5 mm. wide the entire length (when dry and split), diphyllous, narrowly cylindric, coarsely sulcate, dull, yellow-greenish. Leaves about 11 cm. long, 2.5 cm. wide in the middle, oblong-elliptic, rounded at the apex, cuneate at the base, coriaceous, with three to five nerves prominent on both surfaces, especially the mid-rib. Petiole well defined, about 4 cm. long. Flower shoot synanthous. Peduncle up to the inflorescence about 10 cm. tall, clothed for more than half the distance from the base with about nine distichously imbricating, triangular-lanceolate, nervose sheaths, above naked, slender, lepidote. Rachis arcuate, about 8.5 cm. long, zigzag, lepidote, subtended by three or four tightly imbricating, infundibuliform, sterile

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bracts; floral internodes about 6 mm. long. Bracts about 11 mm. long, 8 mm. wide, round-ovate, broadly rounded above, rigid-nerve, surpassing the pedicellate ovary, reflexed, persistent. Sepals with a broad, reflexed-saccate, more or less lepidote base. Lateral sepals about 1 cm. long, 3.3 mm. wide, lanceolate, cymbiform or conduplicate, strongly carinate, obtuse, mucronate. Dorsal sepal very similar, apex broadly obtuse, prominently keeled only near the base. Petals about 1 cm. long, 1 mm. broad below, narrowly linear, gradually acuminate from the base, one-nerved. Lip about 1 cm. long, in outline lanceolate, sharply divided into a hypochil and epichil; hypochil about 5 mm. long, 4 mm. wide, parallel with the arcuate column, quadrangular, with sharply truncated anterior margins that are revolute and thickened on either side of a central cleavage; epichil about 5.5 mm. long, 2 mm. wide above the middle, oblanceolate, abruptly acuminate near the apex, indistinctly three-nerved. Column about 8 mm. long, arcuate, tubercled at the base, broadly winged above, the apex shallowly trilobed with a minute lobule on either side of the central lobe.

Clemens 207 has a much longer raceme of about 30 cm., and little smaller, apparently less mature flowers than the type. A rachis of about 40 cm. is shown in *Clemens 200 A*.

This species is remotely allied to *Coelogyne flavida* Wall., but varies in its much smaller leaves with different venation and in the structure of the lip.

MAREI PAREI SPUR, *Clemens 251* (Type), November 1915. Flower brown. PAKKA, *Clemens 207*, November 1915. Flower brown, yellow, purple; *Clemens 200 A*, November 1915.

7. *Coelogyne kinabaluensis* A. & S. *sp. nov.* Rhizoma repens, magnum, lignosum. Radices crassae, multae. Pseudobulbi in siccis angustissime cylindranei, cauliformes, diphylli, basi vaginis paucis evanidis vestiti. Folia anguste elliptica, ad apicem basim-

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que angustata, acuminata, coriacea, supra nitentia, subtus usque ad novem nervis praedita. Petiolus brevis, indistinctus. Inflorescentia hysterantha. Pedunculus folia multo excedens, erectus, rigidus. Rachis erecta, rigida. Bracteae plerumque deciduae; bractea terminalis erecta, rigida, tubulata, convoluta. Flores succedanei, magni, spectabiles, glabri. Sepala basi gibboso-saccata. Sepala lateralia oblongo-lanceolata, cymbiformia, longe acuminata, complicato-mucronata, paulo falcata, carinata. Sepalum dorsale lanceolatum, leviter complicato-mucronatum, ecarinatum. Petala angustissime linearia, acuta. Labellum in circuitu ovatum, trilobatum; lobi laterales erecti, medium labelli paulo excedentes, parte libera oblongo-rotundata; lobus medius lanceolato-ovatus, apice rotundatus, plus minusve mucronatus, marginibus lateralibus revolutis, parte laterali papillis approximatis parallelis ornata; carinae duae, altae, simplices ad partem anteriorem lobi medii extendunt; carina brevissima similis inter laterales interposita, e basi fere ad medium hypochilii decurrit. Gynostemium lobis lateralibus subaequale, arcuatum, e parte inferiore sensim alatum; ala rotundato-truncata.

Rhizome thick, woody, creeping, ± 8 mm. in diameter. Roots stout, rather numerous, subsimple, up to 3 mm. in diameter near the rhizome. Pseudobulbs 20–28 cm. long, 5–8.5 mm. wide a little above the base where broadest, very narrowly cylindric and stem-like, diphyllous, clothed at the base with one or two linear or oblong, thin, evanescent sheaths. Leaves about 18 cm. long, 5.5 cm. wide, subopposite, narrowly elliptic, from the middle narrowed to both ends, sharply acuminate, coriaceous, shining above, many-nerved, with five to nine nerves prominent beneath. Petiole short, indistinct, about 2.2 cm. long. Inflorescence hysteranthis. Peduncle rising between the leaves, rigid, erect, portion below the inflorescence 8.5–16 cm. long. Rachis 8–13.5 cm.

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long, erect, rigid, zigzag, with the floral internodes ± 1 cm. long. Bracts deciduous except for the apical one; terminal bract about 4.5 cm. long, erect, rigid, apparently lance-linear, convolute, thick. Flowers expanding in succession, large, showy, glabrous throughout. Sepals more or less gibbous-saccate at the base. Lateral sepals about 4 cm. long, 1.25 cm. wide near the base where broadest, oblong-lanceolate, long acuminate to a complicate-mucronate apex, slightly falcate, cymbiform, carinate. Dorsal sepal about 4.3 cm. long and 1.45 cm. wide, lanceolate, slightly complicate-mucronate, ecarinate. Petals about 3.8 cm. long, 1.75 mm. wide at the base, very narrowly linear, abruptly acute, the lower portion three-nerved, the upper part one-nerved. Lip about 3.5 cm. long, 2.15 cm. broad across the side lobes, ovate in outline, deeply trilobed; lateral lobes erect, slightly exceeding one-half of the lip, free portion about 7 mm. long, 6 mm. wide, oblong-rotundate, overlapping and concealing the narrow sinus; middle lobe lance-ovate, about 2.25 cm. long, 1.35 cm. broad, rounded at the apex with a broadly obtuse mucro, lateral margins revolute throughout, the lateral zone covered with approximate, parallel, irregular, papillose ridges; two thin, flat, simple keels about 2 mm. in height run through a distance about three-fifths the length of the middle lobe, and a very short similar keel, interposed between the lateral keels, extends from the base nearly to the middle of the hypochil. Column subequal to the lateral lobes of the lip, arcuate, from below the middle gradually dilated into a wing which is rounded-truncate above.

The lip in *Clemens 369* shows a much more prominent mucro than the type.

This species is a near relative of *Coelogyne cuprea* Wendl. & Kränzl., but differs markedly in the tall narrow pseudobulb, in the size and proportion of the floral segments, and in the char-

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acter of the middle lobe. The pseudobulb is not unlike that of *C. rhizomatosa* J. J. Sm.

KINABALU, *Clemens*, November–December 1915; *Haslam*, July–August 1916. MAREI PAREI SPUR, *Clemens* 229 (Type), November 1915. Flower pink and salmon; *Clemens* 369, December 1915. Flower salmon: “easily drops;” *Clemens* 236, November 1915. Plant brownish purple. KIAU, *Clemens* 29, November 1915; *Clemens* 161, November 1915. 3000 feet altitude. Flower salmon. LOBONG CAVE, *Clemens* 105, November 1915. 5000 feet altitude. Flower purple.

8. *Coelogyne longibulbosa* A. & S. *sp. nov.* Rhizoma cras-
sum, lignosum, teres, vaginis lanceolato-ovatis adpressis imbricantibus vestitum. Radices in fasciculis aggregatae, crassae, rigidae, fibrosae. Pseudobulbi angustissime cylindranei, cauliformes, diphylli. Folia oblongo-elliptica, ad apicem basimque sensim angustata, acuminata, multinervia, nervis usque ad novem subtus prominentibus, chartacea. Petiolus indistinctus. Inflorescentia synantha. Pedunculus pseudobulbo approximatus, adscendens, usque ad rachidem vaginis ovatis vel lanceolatis imbricantibus vestitus. Rachis gracilis, arcuata vel reflexa, laxiflora. Bractee plus minusve persistentes, ovatae, rigidae, nervosae, in visu convolutae. Flores simultanei, glabri; sepala basi concavo-saccata. Sepala lateralia oblongo-lanceolata, cymbiformia, carinata, apice complicato-acuta. Sepalum dorsale simile, concavum, ecarinatum. Petala anguste linearia, prope basim paulo latiora, deinde sensim angustata, apice acuta, uninervia. Labellum in circuitu suborbiculare, trilobatum; lobi laterales late semiobcordati; lobus medius e basi sessili suborbicularis, leviter retusus, apiculatus; carinae duae latae crassae simplices e loco prope basim usque ad partem anteriorem lobi medii extendunt; carina similis brevior utrinque e sinu ad medium lobi medii decurrit. Gynostemium arcuatum, lobis lateralibus paulo brevius, latissime alatum; ala trilobata.

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Rhizome ± 8 mm. thick, woody, terete, closely invested by thin lance-ovate imbricating sheaths. Roots in separate clusters, ± 2 mm. thick, stout, rigid, fibrous, flexuous, sparsely branching, closely brown lanuginose. Pseudobulbs ± 19 cm. long, 5 mm. broad at the base but slightly narrower at the apex, very narrowly cylindrical, stem-like, diphyllous, in dried specimens apparently dull yellowish-green. Leaves about 25 cm. long, 5 cm. wide, oblong-elliptic, gradually narrowed to each end, acuminate, many-nerved, chartaceous, with seven to nine nerves prominent beneath. Petiole indistinct, 2–3 cm. long. Inflorescence synanthous. Peduncle springing from the rhizome at the base of the pseudobulb, up to 37 cm. long; part below the rachis ascending, clothed throughout with imbricating ovate to lanceolate thick sheaths with a pair of young leaves emerging at the apex. Rachis slender, irregularly arcuate-reflexed, loosely flowered, glabrous; floral internodes about 1.1 cm. or more long. Bracts about 1.6 cm. long, 1 cm. wide, more or less persistent, ovate, obtuse, rigid, nervose, apparently somewhat convolute. Flowers simultaneous, glabrous. Sepals concave-saccate at base. Lateral sepals about 1.6 cm. long, 6.5 mm. wide, oblong-lanceolate, cymbiform, carinate, apex complicate-acute, indistinctly seven-nerved. Dorsal sepal very similar, concave, ecarinate. Petals about 1.6 cm. long, 2.1 mm. broad near the base, narrowly linear, slightly widened above the base and then gradually narrowed, with an acute apex, prominently one-nerved. Lip in outline suborbicular, trilobed, ± 1.4 cm. long and subequally broad; lateral lobes broadly semi-obcordate, rounded at the apex; middle lobe suborbicular from a sessile base, shallowly retuse and bluntly apiculate; two broad simple fleshy keels extend from near the base of the lip to the anterior third of the middle lobe; on each side parallel to the central keels there is a similar shorter keel which arises near the sinus of the side lobes.

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Column about 1 cm. long, arcuate, a little shorter than the side lobes of the lip, very broadly winged above, the wing trilobed, with the mid-lobe truncate-retuse. Pedicellate ovary slender, about 1.3 cm. long.

This species is apparently without near allies. In general appearance, it is not unlike *Coelogyne Dayana* Reichb. f., but has very different pseudobulbs, far shorter scape, smaller flowers, and dissimilar markings on the lip. *C. pulverula* Teijsm. & Binn. has similar pseudobulbs, but larger flowers and very different label-lum.

KIAU, *Clemens 79* (Type), November 1915. 3000 feet altitude. Flower white, yellow inside; *Clemens 78*, November 1915. 3000 feet altitude. Flower cream, yellow petals; *Clemens 175*, November 1915. 3000 feet altitude. Flower white with yellow on under parts.

9. *Coelogyne lurida* (L. Linden & Cogn.) A. & S. comb. nov.
Chelonanthera lurida L. Linden & Cogn. in *Lindenia* 11 (1895) 80; 12 (1896) 33, t. 532. *Chelonistele lurida* (L. Linden & Cogn.) Pfitz. in *Engl. Pflanzenreich* IV, 50. II. B. 7 (1907) 138.

MAREI PAREI SPUR, *Gibbs 4095*, February 1910. 7000 feet altitude. Epiphyte in mossy forest. Flowers brown.

10. *Coelogyne papillosa* Ridl. in Stapf in *Trans. Linn. Soc. Ser. 2, 4* (1894) 238.

The stiff tall scape, with a few flowers at the apex, the short papillose lip and the large bracts are distinguishing characteristics of this species. The Clemens and Haslam specimens differ from the type in having more flowers (twelve instead of six), in the relative width of sepals and petals, and in the shorter pseudobulbs.

KINABALU, *Haslam*, July–August 1916; *Haviland 1098*. 8000–10,000 feet altitude. PAKKA, *Clemens 199*, November 1915. ±9500 feet altitude. Flower yellow and white.

11. *Coelogyne plicatissima* A. & S. sp. nov. Rhizoma cras-sum, lignosum, vaginis imbricantibus dense vestitum. Radices

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paucae, fibrosae, ramosae, rigidae, crassae. Pseudobulbus fusi-formi-cylindraceus vel late pyriformis, monophyllus, in visu rugosus, fibris vaginalium cinctus. Folium lineare vel oblongo-ellipticum, ad apicem basimque sensim angustatum, complicato-mucronatum, valdissime plicatum, rigidum, coriaceum. Petiolus cylindraceus, crassus. Inflorescentia heterantha. Pedunculus pseudobulbo approximatus, e basi decumbenti suberectus vel arcuatus, omnino glaber, vaginis nonnullis imbricantibus basim versus. Rachis arcuata vel nutans, bracteis imbricantibus una vel duabus sustentata. Racemus laxus, distichus. Bracteae inflorescentiae variabiles, in visu convolutae, ovarium pedicellatum amplectentes et superantes, oblongo-ovatae, rigidae, nervosae. Perianthium subcrassum. Sepala quinquenervia. Sepala lateralia lanceolato-oblonga, acuta, dorso carinata, leviter cymbiformia. Sepalum dorsale simile. Petala anguste elliptica, subacuta aut obtusa aut subtruncata, basi trinervia. Labellum in situ naturali fere ad medium convolutum, expansum late lanceolatum, parte anteriore incrassata obtusa; lamina prope basim leviter reflexa, marginibus utrisque circa parte tertia ab apice submarginatis; carinae tres humiles simplices e basi ad apicem decurrunt. Gynostemium breve, basi labelli circumdatum, ala magna apicali truncata praeditum.

Rhizome stout, woody, closely invested by imbricating sheaths that become fibrous. Roots up to 2 mm. thick, apparently few, stout, fibrous, flexuous, freely branched, rigid, glabrous. Pseudobulb ± 2.5 cm. long, fusiform-cylindric to broadly pyriform, monophyllous, more or less oblique, rugose in the dried plant, invested by the fibrous remnants of sheaths. Leaf ± 21.4 cm. long, 2.14 cm. broad, linear, oblong-linear or oblong-elliptic, gradually narrowed to a distinct complicate-mucronate apex, similarly narrowed to a complicate base, very strongly

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plicate, rigid, erect, coriaceous. Petiole ± 6.2 cm. long, cylindrical, stout, sulcate. Inflorescence heteranthous. Peduncle about 24 cm. tall, approximate to the pseudobulb, suberect to arcuate from a decumbent base, glabrous throughout, clothed below with several ovate to lanceolate imbricating sheaths. Rachis ± 8 cm. long, loosely few-flowered, arcuate or nodding, more or less zigzag, subtended by one or two strongly convolute or tubular bracts. Floral bracts about 2 cm. long, 1.15 cm. broad, variable in size, oblong-ovate, apparently convolute about the ovary, equaling or surpassing the pedicellate ovary, scarious, rigid-nerve. Perianth sub-fleshy. Sepals five-nerved. Lateral sepals ± 1.78 cm. long, 5.9 mm. broad, lance-oblong, acute, dorsally carinate, shallowly cymbiform. Dorsal sepal ± 1.6 cm. long, 5.8 mm. wide, similar. Petals ± 1.38 cm. long, 4.9 mm. broad, narrowly elliptic, subacute, obtuse or subtruncate, three-nerved at the base. Lip about 1.7 cm. long, 9 mm. broad near the base, in natural position convolute for about half its length, when extended broadly lanceolate, anterior portion fleshy-thickened, obtuse; lamina slightly reflexed near the base, at about one-third the distance from the apex lightly emarginate on each side; three approximate low simple fleshy keels run from the base to the apex. Column short, surrounded by the tube of the lip, about 6 mm. long or including the wing about 8.5 mm. long; wing clavate, very broad at the truncate, entire apex.

This plant appears to be very closely allied to *Coelogyne Clemensii* var. *longiscapa* A. & S., but differs in its smaller, apparently less fleshy leaves and markedly smaller flowers. The mid-lobe of the lip, however, occasionally shows the shallow side lobing so characteristic of *Coelogyne Clemensii* A. & S. The material collected by Haslam cited below shows slightly taller peduncles than the type, the longest peduncle reaching 21.8 cm. in length.

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The group of species formed by *Coelogyne Clemensii* A. & S., *C. Clemensii* var. *longiscapa* A. & S., *C. plicatissima* A. & S., *C. rigidiformis* A. & S., and *C. subintegra* J. J. Sm. shows great variability and interrelationship and should be carefully studied in connection with other similar Bornean material.

KINABALU, *Haslam*, July–August 1916. PAKKA, *Clemens 204* (Type), November 1915. 5000–10,000 feet altitude. Flowers brown and cream.

12. *Coelogyne radioferens* A. & S. *sp. nov.* Radices in visu paucae, rigidae. Rhizoma crassum, lignosum, vaginis mox in fibras solutis vestitum. Pseudobulbus diphyllus, in sicco anguste cylindraceus, obliquus, sulcatus. Folia linearia vel oblongo-linearia, longe acuminata, ad basim sensim angustata, plus minusve plicata, nervis quinque fere aequalibus subtus conspicuis praecipue ornata. Petiolus sulcatus. Inflorescentia synantha. Pedunculus pseudobulbo approximatus, e basi decumbenti, primum adscendens deinde arcuato-flexuosus, usque ad inflorescentiam vaginis ovatis vel anguste lanceolatis tubulatis imbricantibus fere vel omnino vestitus. Rachis flexuoso-arcuata, subglabra. Bractee persistentes, ovato-oblongae, late rotundatae, paulo acutae, scariosae, rigidae, nervosae, tarde patentes vel reflexae. Ovarium valde lepidotum. Flores magni, spectabiles, usque ad quindecim, simultanei, distichi, patentes. Sepala lateralia lineariblonga, carinata, sulcata, plus minusve obliqua apice rotundato acuto praecipue. Sepalum dorsale anguste lanceolato-oblongum, ad apicem truncatum angustatum, plus minusve carinatum. Petala linearia, apice paulo obliquo saepe truncato rotundata, nervis tribus vel quinque. Labellum expansum in circuitu obovatum, prope apicem trilobatum; lobi laterales late semiobcordati, marginibus apicalibus eroso-crenulatis; lobus medius transverse oblongus vel reniformis, retusus, apiculatus, marginibus erosulis, in medio subito atque valde papilloso-convexus, papillis verrucosis

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multis ad margines radiorum instar patentibus. Carinae duae longae humiles papillis digitatis permultis e basi labelli ad lobum medium decurrunt; utrinque in basi carinula similis perbrevis. Gynostemium clavatum, arcuatum, in parte superiore alatum; ala rotundata, obtuse dentata. Rostellum parvum, reflexum. Clinandrium conspicuum, ovatum, reflexum.

Roots few, stout, rigid, about 3 mm. thick, densely clothed with brown tomentum. Rhizome stout, woody, clothed with sheaths that become fibrous. Pseudobulb in dried specimens ± 6 cm. long, 1.4 cm. wide at the base, diphyllous, slender cylindrical, oblique, sulcate, brownish-yellow. Leaves up to 31 cm. long, 2.7 cm. broad, linear to oblong-linear, long acuminate, gradually narrowed below, more or less plicate, prominently and about equally five-nerved, the nerves especially conspicuous beneath. Petiole up to 8 cm. long, sulcate. Inflorescence synanthous. Peduncle approximate to the pseudobulb, from a decumbent base first ascending then arcuate-flexuous; portion up to the inflorescence ± 12 cm. tall, nearly or quite invested by loosely imbricating ovate to narrowly lanceolate tubular sheaths. Rachis up to 20 cm. long, flexuous-arcuate, subglabrous. Bracts ± 3 cm. long, 1.7 cm. broad, persistent, ovate-oblong, broadly rounded, acute, scarious, rigidly nervose, shorter than or surpassing the pedicellate ovary, in development spreading-reflexed, more or less concave. Pedicellate ovary 2 cm. or more long, the ovary closely lepidote. Flowers about 6 cm. across when spread out, up to fifteen, simultaneous, 1.2–1.5 cm. distant, distichously spreading, showy. Sepals somewhat concave at the base, seven- to nine-nerved. Lateral sepals about 3.2 cm. long, 1 cm. wide, linear-oblong, more or less oblique especially at the rounded acute apex, carinate, sulcate. Dorsal sepal ± 3.2 cm. long, 9.5 mm. broad, narrowly lance-oblong, narrowed to a truncated apex, somewhat carinate.

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Petals about 3.1 cm. long, 5.5 mm. broad, linear, rounded at the slightly oblique, often truncated, irregular apex, three- to five-nerved. Lip three-lobed at about four-fifths the distance from the base, obovate in outline when spread out, about 3 cm. long, 2.3 cm. broad across the lateral lobes; lateral lobes broadly semi-obcordate, irregularly erose-crenulate on the apical margin; middle lobe transversely oblong or reniform, erosulate, retuse, apiculate, abruptly and strongly convex in the center due to the converging of two papillose keels which are greatly reinforced by approximate verrucose ridges starting from the lateral sinuses, and by verrucose papillae which spread radially toward the margins. Two long low slender keels crowded with digitate papillae run from the base of the lip to the apical lobe, where they converge; a similar but very short keel on either side at the base. Column about 1.7 cm. long, arcuate, clavate in outline because of the rather broad wing, with the apex broadly rounded and irregularly blunt-toothed. Rostellum very small, reflexed. Clinandrium prominent, ovate, reflexed, with revolute margins.

This plant is very distinctive and showy and is a rather near ally of *Coelogyne Dayana* Reichb. f. It differs, however, in the short scape, much larger flowers, and more papillose mid-lobe. (PLATE 81.)

KINABALU, *Haslam*, July-August 1916. PAKKA, *Clemens* 200 (Type), November 1915. Flower white and yellow.

13. *Coelogyne rigidiformis* A. & S. *sp. nov.* Rhizoma cras-
sum, lignosum. Radices numerosae, fibrosae, ramosae, crassae.
Pseudobulbi cylindracei vel anguste pyriformes, monophylli. Fo-
lium oblongo-lineare, ad apicem basimque angustatum, compli-
cato-mucronatum, valde plicatum, rigidum, erectum, coriaceum.
Petiolus cylindraceus. Inflorescentia heterantha. Pedunculus
erecto-patens, vaginis nonnullis imbricantibus circa pro parte

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tertia vestitus. Rachis arcuata vel flexuosa, bracteis nonnullis adpressis imbricantibus sustentata. Racemus laxus, pauciflorus. Bractee inflorescentiae ovato-lanceolatae, acuminatae, convolutae, ovaria pedicellata multo superantes, nervosae. Sepala lateralia lineari-oblancheolata, acuta, plus minusve obtuse cymbiformia. Sepalum dorsale simile, paulo angustius, obtusum. Petala linearia obtusa vel oblique subtruncata, prope apicem levissime obliqua. Labellum in positu naturali tubulari-involutum et gynostemium amplectens, simplex, anguste ellipticum. Carinae tres, carina media fere ad apicem extensa. Gynostemium gracile, strictum, apice late alatum; ala apicalis crenato-undulata.

Rhizome apparently stout, woody. Roots numerous, fibrous, thick, much branched, generally glabrous, ± 1.5 mm. thick. Pseudobulbs clothed with the fibrous remnants of sheaths, about 3–4 cm. long, apparently cylindrical to narrowly pyriform, monophyllous, somewhat oblique, striate-sulcate, light yellowish in the dried plant. Leaf 20–28.5 cm. long, 1.8–2.3 cm. wide, oblong-linear, gradually narrowed to a complicate-mucronate apex, similarly narrowed to the complicate base, strongly plicate, rigid, erect, coriaceous. Petiole 5.5–7.5 cm. long, cylindrical. Inflorescence heteranthous. Peduncle approximate to the pseudobulb, decumbent at the base, glabrous throughout; below the inflorescence 9.4–21 cm. long, spreading-erect, clothed for about one-half its length with a series of ovate to narrowly lanceolate tubular imbricating sheaths. Rachis up to 12 cm. long, arcuate or flexuous, loosely few-flowered, subtended by several lanceolate appressed imbricating bracts which are up to 3.8 cm. long. Floral bracts and floral segments extremely variable in size, the former ± 2.5 cm. long, ovate-lanceolate, acuminate, strongly convolute, scarious, nervose, far exceeding the pedicellate ovaries. Sepals concave, slightly thickened near the apex. Lateral sepals

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±2.16 cm. long, 5.2 mm. broad, linear-oblongate, acute, more or less obtusely cymbiform, indistinctly five-nerved. Dorsal sepal ±2.1 cm. long, 4.77 mm. broad, similar, obtuse, indistinctly five-nerved. Petals ±1.97 cm. long, 3.4 mm. wide, linear, obtuse or unequally subtruncate, very slightly oblique toward the apex, three-nerved at the base. Lip ±2.2 cm. long, 7.6 mm. broad when spread out, in natural position tubular-involute for two-thirds of its length, enwrapping the column, when extended narrowly elliptic, at about one-third the distance from the apex slightly emarginate on each side, thence narrowed to an obtuse, slightly thickened apex. Three approximate low simple keels run from the base to the mid-lobe, the median keel extending almost to the apex. Column slender, about 1.4 cm. long, broadly winged at the apex, wing crenate-undulate.

This plant is very closely allied to *Coelogyne subintegra* J. J. Sm., but the vegetative differences are marked. Florally the two plants are especially near, but *C. subintegra* has slightly but consistently shorter, broader perianth segments. The rigid habit, plicate leaves and column wing of *C. rigidiformis* are markedly different from the Philippine *C. integerrima* Ames.

KIAU, *Clemens 71*, November 1915. 3000 feet altitude. Flower greenish with purple end on column.

14. *Coelogyne Rochussenii* De Vriese Ill. Orch. Ind. Orient. Néerl. (1854) t. 2; t. 11, f. 6.

KIAU, *Clemens 174*, November 1915. 3000 feet altitude. Flowers yellow, the labellum yellow with brown stripes, column white.

15. *Coelogyne Sanderiana* Reichb. f. in Gard. Chron. III, 1 (1887) 764.

KIAU, on bridle path to Koung, *Gibbs 3971*, February 1910. 2500 feet altitude. Terrestrial in jungle. Flowers white, with the disc of the lip yellow, streaked with brown, fragrant.

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16. *Coelogyne sulphurea* (Bl.) Reichb. f. in Bonplandia 5 (1857) 43. *Chelonanthera sulphurea* Bl. Bijdr. (1825) 383.

MAREI PAREI SPUR, *Clemens* 239, November 1915. Flowers yellow. KIAU, *Clemens* 375, December 1915. Flower cream color.

17. *Coelogyne venusta* Rolfe in Gard. Chron. III, 25 (1904) 259.

KIAU, *Clemens* 28 and 30, November 1915. 3000 feet altitude. Flower whitish; *Clemens* 131, November 1915. 3000 feet altitude. Flower cream color with purple tips; *Clemens* 142, November 1915. 3000 feet altitude. Flower salmon-pink with yellow stripes on the labellum; *Clemens* 315, November 1915. Flower white and yellow; *Clemens* 341, November 1915. Flower cream; *Clemens* 357, November 1915. Flower cream and yellow. MAREI PAREI SPUR, *Clemens* 294, November 1915. Flower dark brown-yellow and brown; *Clemens* 299, November 1915. Flower cream. LOBONG GORGE, *Clemens* 300, November 1915.

15. *SIGMATOCHILUS* Rolfe.

This is a monotypic genus at present known only from Mount Kinabalu.

1. *Sigmatochilus kinabaluensis* Rolfe in Gibbs in Journ. Linn. Soc. 42 (1914) 155, t. 3.

KINABALU, Haslam, July-August 1916. PAKKA, Gibbs 4260, February 1910. 9000 feet altitude. Terrestrial in open scrub on serpentine. Flower white. LOBONG CAVE, *Clemens* 206, November 1915. Flowers cream color; *Clemens* 223, November 1915. Flower white.

16. *DENDROCHILUM* Bl.

Seven species of *Dendrochilum* have heretofore been reported as natives of Mount Kinabalu. The material gathered in 1915 by Joseph Clemens and in 1916 by George Haslam increases the number to twenty-three species. The Clemens collection, by far the most important ever obtained on the mountain, contains three species that were previously described, namely *D. grandiflorum* (Ridl.) J. J. Sm., *D. simplex* J. J. Sm., and *D. stachyodes* (Ridl.) J. J. Sm., this last species being referable to Pfitzer's sub-

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genus *Aphanostelidion* and well characterized by the simple gynostemium which lacks stelia. *D. simplex* has not heretofore been recorded from Mount Kinabalu.

Among the new species described below there are several that are of unusual interest, as they seem to indicate the probable existence of alliances that may reward intensive explorations of the higher altitudes of Borneo.

Dendrochilum quinquelobum Ames, *D. exasperatum* Ames, and *D. Haslamii* Ames, together with the closely related *D. Gibbsiae* Rolfe and *D. kinabaluense* Rolfe, constitute through the structure of the lip a very distinct group that may be largely increased in numbers as botanical explorations proceed. *D. quinquelobum* differs from its allies in the strongly reflexed, falcate terminal lobes of the lip beyond which the fifth lobe or large cusp protrudes. The lip of *D. Gibbsiae* and of *D. kinabaluense* resembles more closely the lip of *D. Haslamii* than that of *D. quinquelobum*.

Dendrochilum alatum Ames, *D. fimbriatum* Ames, and *D. Joclemensii* Ames are clearly distinguished from all other species by means of the elliptical or very broad, round-tipped stelia or wings of the column. From the description *D. latibrachiatum* J. J. Sm. would seem to be a member of this group.

One would expect to find elements of the Philippine orchid flora represented in *Dendrochilum* on Mount Kinabalu. This expectation, however, is not fulfilled. Take for example the paucity of species on the mountain referable to the groups that lack stelia on the column, and then consider the wealth of species referable to § *Acoridium* that have been found in Luzon. § *Acoridium* is devoid of stelia. There is not a single *Acoridium* in the Pfitzerian sense recorded as having been found on Mount Kinabalu, and yet forty-four species of this section of the genus are natives

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of the nearby Philippines, thirty-six species being natives of the higher altitudes of Luzon.

The group formed by *D. Gibbsiae*, *D. Haslamii*, *D. kinabaluense*, *D. exasperatum*, and *D. quinquelobum* lacks Philippine representatives. The same is true of the group to which *D. alatum*, *D. fimbriatum*, and *D. Joclemensii* belong. *D. grandiflorum*, at present known only from Mount Kinabalu, has no near relatives. *D. imbricatum* and *D. Dewindtianum*, on the other hand, are closely allied with the Philippine species that constitute Pfitzer's series Dilatata, but the representatives of this group are few in number on Mount Kinabalu, and belong to that section of *Dendrochilum* which is characterized by wide distribution in the Malayan tropics.

With the additions herein noted *Dendrochilum* with forty-five species becomes one of the largest of Bornean orchid genera. Surely we may expect a rich harvest of interesting acquisitions as intensive collecting brings to our attention the numerous species that must still await discovery. It would seem that Borneo will rival the Philippines as a home of *Dendrochilum* species and furnish material that will help to crystalize our knowledge of one of the most fascinating orchid genera of the eastern tropics.

1. *Dendrochilum alatum* Ames sp. nov. Radices fibratae, glabrae. Pseudobulbi monophylli, obpyriformes, rugosi, superne attenuati. Folium lineari-lanceolatum, prominenter trinervium, obtusum, apiculatum, in sicco subchartaceum, quam pedunculus brevius. Pedunculus gracilis, flexuosus. Racemus multiflorus. Sepala petalaeque similia. Labellum simplex, obcuneatum, bicallosum. Gynostemium erectum, stelidia lateralia in alas ellipticas producta. Ala terminalis tridentata.

Plant from base of pseudobulb to tip of leaf up to 20 cm.

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tall. Pseudobulbs orange-yellow in dried specimens, rugose, about 1.5 cm. long, ± 5 mm. in diameter at the base, when mature partly concealed by the fibrous remains of sheathing bracts. Leaf in the fresh state conspicuously three-nerved, when dry five-nerved, 7–15 cm. long, 6–9 mm. wide, obtuse or subacute, apiculate, attenuated at both ends, and at base contracted gradually into a slender, sulcate petiole. Petiole 1.5–2.5 cm. long. Peduncle slender, naked up to the raceme, including the raceme 12–20 cm. long, variable. Raceme slender, drooping, curved, about 5 mm. in diameter, 5–10 cm. long, many-flowered. Floral bracts slightly exceeding the ovary and its pedicel, about 2 mm. long, sheathing. Flowers small, about 2 mm. apart, yellow with brownish-red center. Lateral sepals 3–3.75 mm. long, narrowly ovate-lanceolate, acute, conspicuously one-nerved through the middle, slightly concave, conduplicate at the apex. Dorsal sepal ± 3 mm. long, about 1 mm. wide near the base, lanceolate, acute, three-nerved. Petals about 3 mm. long, narrowly oblong-lanceolate, subacute or obtuse, margin obscurely denticulate. Labellum about 3 mm. long, simple, obtuse, apiculate, margin obscurely, if at all, denticulate or minutely ragged fringed when magnified, three-nerved, the lateral nerves branching; disc in front of the column slightly concave with two large calli, one on each side below the middle, confluent at base by a transverse ridge. Gynostemium brownish-red, lateral appendages or stelidia elliptical, basal, rounded, scarcely equaling the conspicuously tridentate terminal wing. Rostellum prominent.

In general appearance the plant recalls *D. graciliscapum* (Ames) Pfitz., but is clearly distinguished by the large elliptical lateral wings of the column, which appear like lateral lobes of the simple labellum. Most closely allied to *Dendrochilum fimbri-*

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atum Ames, from which it differs in the outline of the labellum. Referable to Pfitzer's series *Edentula*. (PLATE 82.)

MAREI PAREI SPUR, *Clemens* 383, December 1915.

2. *Dendrochilum angustipetalum* Ames *sp. nov.* Pseudobulbi approximati, fusiformes, adscendentes, monophylli. Folium elongatum, ligulatum, in sicco chartaceum, utrinque attenuatum, ad apicem acutum. Pedunculus gracilis. Racemus multiflorus. Bractee inflorescentiae acutae. Sepala lateralia oblongo-lanceolata, acuta. Sepalum dorsale simile. Petala valde angustata, acuta. Labellum trilobatum, tricarinatum; lobi laterales minuti, denticulati; lobus medius integer, acutus, triangulari-ovatus. Gynostemium gracile. Stelidia super basim inserta, ala apicalis rotundata, obscure denticulata.

From base of pseudobulb to tip of leaf up to 25 cm. long. Roots whitish, smooth. Pseudobulbs 2.5–4 cm. long, aggregated, elongated, fusiform, longitudinally rugose when dry, very slender at the tip, being gradually attenuated, ascending, monophyllous. Leaf up to 22 cm. long, up to 12 mm. wide, nervose when dry, prominently five-nerved, subchartaceous, narrowly oblong, acute, attenuated at both ends, at the base passing gradually into the slender petiole. Peduncle, with the raceme, ± 20 cm. long, slender, shorter than or equaling the leaves, naked below the raceme, but closely sheathed at base by the elongated, chartaceous bracts that clothe the pseudobulbs in their immaturity. Raceme about equaling the leaves, ± 8 cm. long, slender, about 5 mm. in diameter. Bracts subtending the flowers 3 mm. long, glumaceous, acute, slightly exceeding the pedicellate ovary. Flowers small, cream color and brown, about twenty-five, 2 mm. apart, distichous. Lateral sepals 3.5–4.5 mm. long, about 1 mm. wide, faintly three-nerved, slightly falcate, oblong-lanceolate, acute, concave at base, lightly carinate. Dorsal sepal oblong,

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acute, gradually attenuated above the middle. Petals 4.5 mm. long, about .75 mm. wide, one-nerved, falcate, linear-oblong, acute. Labellum 3 mm. long, three-lobed; lateral lobes triangular, irregularly dentate, antrorse, arising near the middle of the labellum; middle lobe triangular-ovate, acute, entire, about 2 mm. long, 1.5 mm. wide. Disc bicarinate, the median nerve prominent. Gynostemium slender. Lateral stelidia oblong, subobtus, equaling the terminal wing, arising from the middle of the column just below the stigmatic orifice. Terminal wing rounded, minutely denticulate. This species is referable to series *Dilatata* Pfitz. (PLATE 83.)

MAREI PAREI SPUR, *Clemens* 270, November 1915.

3. *Dendrochilum conopseum* *Ridl.* in Stapf in Trans. Linn. Soc. ser. 2, 4 (1894) 236.

This species was originally discovered by Haviland in 1892. Aside from the type material, no other specimens have been secured. I have seen a photograph of the type which shows an elongated rhizome with the fusiform pseudobulbs far apart, and the slender scape basal. The general aspect of the plant recalls *D. simplex* J. J. Sm. as represented by a specimen in my herbarium collected on Marei Parei Spur by Clemens, but the leaves of *D. simplex* are oblong-lanceolate rather than oblong-elliptical and the inflorescence is terminal. This is the only representative of § *Eudendrochilum* among the species now known to be natives of Mount Kinabalu.

MAREI PAREI SPUR, *Haviland*. 5500 feet altitude.

4. *Dendrochilum corrugatum* (*Ridl.*) *J. J. Sm.* in Recueil Trav. Bot. Néerl. 1 (1904) 65. *Platyclinis corrugata* *Ridl.* in Stapf in Trans. Linn. Soc. ser. 2, 4 (1894) 233.

MAREI PAREI SPUR, *Haviland*. 5500 feet altitude.

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5. *Dendrochilum crassifolium* *Ames sp. nov.* Pseudobulbi monophylli, graciles. Folium rigidum, oblongum, obtusum. Racemus elongatus, multiflorus. Bracteae inflorescentiae glumaceae, ovarii pedicellatis aequilongae. Sepala lateralia oblongo-lanceolata, acuta, ad apicem carinata. Sepalum dorsale simile. Petala oblongo-elliptica, acuta, denticulata. Labellum trilobatum; lobi laterales denticulati, ad apicem setacei; lobus medius ovato-lanceolatus, acuminatus, acutus. Gynostemium gracile. Ala apicalis lanceolata, acuta. Stelidia lateralia super basim gynostemii orta eique parallela, gracilia, triangularia.

Pseudobulbs ± 1 cm. long, concealed by tubular sheathing bracts, monophyllous. Leaf coriaceous, 8–10 cm. long, about 1 cm. wide at the middle, prominently five-nerved when dry, contracted at base into a stout sulcate petiole. Peduncle much longer than the leaves, 19–25 cm. long, the upper half rather densely many-flowered. Below the raceme several empty closely sheathing bracts, otherwise the peduncle is naked, smooth, terete. Floral bracts glumaceous, 3–4 mm. long, as long as or longer than the pedicellate ovary. Flowers 3–4 mm. apart. Lateral sepals about 7 mm. long, 2.5 mm. wide, oblong-lanceolate, lightly carinate at the tip, three-nerved. Dorsal sepal similar. Petals about 7 mm. long, 2.5–3 mm. wide, oblong-lanceolate, margins irregularly denticulate, acuminate, acute, three-nerved. Labellum three-lobed, 5.5 mm. long, about 3 mm. wide at the base of the middle lobe; disc bicarinate, the keels extending onto the middle lobe, median vein prominent; lateral lobes divaricate, triangular, setaceous at the tip, denticulate on the margin to the base of the lip; middle lobe 3.5 mm. long, ovate-lanceolate or subcordate, acuminate, acute. Gynostemium about 4 mm. tall. Apical wing entire, triangular-lanceolate, acute, about 1 mm. long. Stelidia

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about 2 mm. long, triangular, subacute, arising just above the base of the column, exceeding the rostellum.

Mature pseudobulbs are wanting in the material from which the description was made. *D. crassifolium* is most closely related to *D. kamborangense* Ames, from which it differs in the obtuse leathery leaves, in the lateral and middle lobes of the lip, and in the appendages of the column. *D. perspicabile* is also nearly related, but sufficiently distinct in the lobing of the lip. (PLATE 84.)

KINABALU, *Haslam*, July–August 1916.

6. *Dendrochilum Dewindtianum* W. W. Sm. in Notes Bot. Gard. Edinb. 8 (1915) 321.

This species is referred to Pfitzer's series *Dilatata*. The labellum suggests *D. longifolium* Reichb. f. In the original description the specific name is spelled *Dewindtiana*, presumably because the species was dedicated to the Ranee of Sarawak, but as the specific name is an adjective, it must agree with the generic name.

KINABALU, *Native Collector 99*, August 1913. 7200 feet altitude; *Native Collector 68*, August 1913. 13,000 feet altitude (?).

7. *Dendrochilum exasperatum* Ames sp. nov. Herba gracilis, similitudinem gerit cum *D. quinquelobo*. Pseudobulbi? Folium oblongo-lanceolatum. Pedunculus nutans, multiflorus, folium multo superans. Bractee inflorescentiae ovarium superantes. Sepala lateralia oblongo-lanceolata, acuta. Sepalum dorsale simile. Petala oblongo-lanceolata. Labellum quinquelobum; lobi basiliares triangulares, breves; lobi anteriores oblongi, ad apicem rotundati; lobus terminalis triangularis, acutus. Gynostemium gracile, ala apicalis simplex. Stelidia basilaria.

Pseudobulbs wanting. Leaf oblong-lanceolate, about 12 cm. long, 18 mm. wide, much shorter than the scape. Peduncle with

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the raceme 2.8 dm. long, arching. Floral bracts about 3 mm. long, 2 mm. wide, exceeding the pedicellate ovary. Flowers yellow. Lateral sepals 5 mm. long, oblong-lanceolate, acute. Dorsal sepal similar. Petals oblong-lanceolate, acute, 4 mm. long, 1.5 mm. wide. Labellum five-lobed, similar to *D. quinquelobum*, 2.5 mm. long, 4 mm. wide from tip to tip of the foremost lateral lobes. Gynostemium 3 mm. high. Stelidia basal, erect, hardly equaling the terminal wing, oblong, hamate, blunt. Terminal wing 1 mm. long, round-triangular, entire.

In floral structure it is almost a counterpart of *D. quinquelobum*, but in size conspicuously larger.

MAREI PAREI SPUR, *Clemens* 396, November–December 1915.

8. *Dendrochilum fimbriatum* Ames sp. nov. Pseudobulbi aggregati, rotundati, monophylli. Folium lineare, utrinque attenuatum, ad basim in petiolum brevem sulcatum contractum. Pedunculus folium excedens gracilis. Racemus multiflorus; bracteae flores subtendentes rigidae. Sepala lateralia subfalcata, acuta, ovato-lanceolata. Sepalum dorsale lanceolatum, acutum. Petala lanceolata, acuta. Labellum integrum, margine denticulato vel fimbriato. Discus bicarinatus. Gynostemium breve. Alae laterales ellipticae. Ala terminalis minuta, integra.

Pseudobulbs aggregated, approximately 8 mm. long, about 5 mm. in diameter, yellowish when dry, rugose, rounded, monophyllous. Leaf leathery, linear to linear-lanceolate, attenuated at both ends, contracted at base into a sulcate petiole 8–10 mm. long; lamina 5.5–7 cm. long, 5–6 mm. wide, grooved along the middle, about half as long as the peduncle. Peduncle naked below the sterile bract of the raceme, terminal, slender. Raceme many-flowered, 7.5 cm. long,¹ about 7 mm. in diameter. Floral bracts

¹ In an unnumbered specimen in my herbarium collected by Clemens the raceme is 1 dm. long.

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rigid, about equaling the pedicellate ovary. Flowers small, about 2 mm. apart. Lateral sepals about 3.5 mm. long, 2 mm. wide, strongly reflexed at the tip, falcate, ovate-lanceolate, acute, three-nerved. Dorsal sepal lanceolate, acute, 4 mm. long. Petals lanceolate, acute, about 3.5 mm. long, obscurely three-nerved, margin obscurely denticulate. Labellum ± 2 mm. long, rotundate, apiculate, margin shortly fringed, the fringe irregular, bicallose, middle nerve somewhat prominent. Calli conspicuous, semi-orbicular, erect, fleshy, about half as long as the lip, one on each lateral nerve, confluent at base by a transverse ridge. Gynostemium short, fleshy. Lateral wings rotund, basal, shorter than the column. Terminal wing rounded, entire.

The lateral wings of the column are unusual and indicate affinity with *D. alatum*. An unnumbered specimen secured by Clemens, referable through its flowers to *D. fimbriatum*, is habitually similar to *D. alatum*. The pseudobulbs are elongated and the leaf exceeds 1 dm. in length. Unfortunately the material is limited and insufficient to establish the range of probable variation.

MAREI PAREI SPUR, *Clemens* 248, November 1915.

9. *Dendrochilum Gibbsiae* Rolfe in Gibbs in Journ. Linn. Soc. 42 (1914) 147.

From a study of drawings of this species preserved in my herbarium, it would seem that *D. Gibbsiae* is a very near ally of *D. kinabaluense* Rolfe. There is reason to believe that the examination of more ample material will indicate that the characters relied on for the separation of these species will break down.

MAREI PAREI SPUR, *Gibbs* 4087, February 1910. In mossy forest. Epiphyte. Flowers reddish cream with a large brown blotch on the lip.

10. *Dendrochilum grandiflorum* (Ridl.) J. J. Sm. in Recueil Trav. Bot. Néerl. 1 (1904) 66. *Platyclinis grandiflora* Ridl. in Stapf in Trans. Linn. Soc. ser. 2, 4 (1894) 233.

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KINABALU, *Haviland*. 10,500 feet altitude. KAMBORANGAI, *Clemens* 209, November 1915. 8000–10,000 feet altitude. Flower brown.

11. *Dendrochilum Haslamii* *Ames sp. nov.* Herba parvula. Pseudobulbi subfusiformes, monophylli. Folium lineari-lanceolatum, obtusum, pedunculo brevius. Racemus elongatus, gracilis, multiflorus, arcuatus. Bractee inflorescentiae concavae, acutae, subpatentes. Flores minuti. Ovarium globosum, minutum. Sepala lateralialia valde reflexa, oblongo-ovata, acuta, subtus carinata. Petala porrecta. Labellum carnosum, in lobos divergentes productum, mucronatum. Callus hippocrepiformis in disco labelli. Gynostemium minutum. Stelidia basilaria, linearia. Ala apicalis obtusa, integra.

A diminutive species, less than 1 dm. tall from base of pseudobulb to tip of raceme, allied to *D. kinabaluense* Rolfe and *D. quinquelobum* Ames. Pseudobulbs 1–2 cm. long, slender, subfusiform, clothed with closely appressed sheaths, monophyllous. Leaf 4.5–6 cm. long, ± 4 mm. wide, shorter than the scape, hardly petioled, linear-lanceolate, obtuse, coriaceous, with a prominent mid-nerve. Peduncle 5–9 cm. long to the tip of the raceme, curved. Raceme up to 7 cm. long, very slender, about twenty-five-flowered. Bracts persistent, somewhat shorter than the pedicel and ovary, strongly concave, acute, more or less spreading. Pedicel and ovary 3 mm. long, comparatively stout (the ovary rotund, .5 mm. long). Sepals strongly reflexed, equal and similar, oblong-ovate, strongly concave, lightly carinate along the median nerve externally, 1.75 mm. long. Petals 1.5 mm. long, only slightly spreading, directed forward, similar to the sepals but rather more ovate, strongly concave. Labellum four-lobed, apiculate, deep yellow, 2 mm. long, 3 mm. wide from tip to tip of the divaricate terminal pair of lateral lobes; disc rounded below the middle, about 1.5 mm. wide, above the middle produced into the large, ovate-

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lanceolate, divergent lateral lobes and terminated by a minute cusp or mucro; behind the terminal lobes a pair of smaller lobes is situated. Callus U-shaped, the arms extending to the middle of the disc. Gynostemium 1 mm. long. Stelidia basal, linear, obtuse, equaling the entire, obtuse terminal wing or slightly exceeding it.

The general aspect of the flower suggests close affinity with *D. quinquelobum*, *D. kinabaluense*, and *D. Gibbsiae*, but the plants are diminutive with linear leaves and the lobing of the labellum indicates fundamental differences. In outline the divaricate terminal lobes of the labellum suggest species of *Liparis* that belong to the characteristic group of which *Liparis pallida* and *L. latifolia* are well-known examples. (PLATE 85.)

KINABALU, *Haslam*, July–August 1916.

12. *Dendrochilum imbricatum* Ames sp. nov. Pseudobulbi aggregati, cylindracei, in sicco graciles. Folium petiolatum, oblongo-ellipticum, acutum. Pedunculus elongatus. Racemus bracteis imbricantibus, arcuatus. Bractee flores aequales. Sepala lateralia oblongo-lanceolata vel triangulari-lanceolata. Sepalum dorsale simile. Petala oblonga. Labellum trilobatum, tricarinatum. Gynostemium breve. Ala apicalis retusa vel trilobata. Stelidia lateralia gynostemio multo breviora.

Pseudobulbs contiguous, cylindraceous, elongated, ± 6 cm. long, slender in dried specimens, scarcely 5 mm. in diameter, when immature concealed by a large elongated brownish sheath ± 1.5 dm. long, which also incloses the petiole of the leaf and the base of the scape. Leaf large, chartaceous when dry, ± 3 dm. long, up to 4.5 cm. wide, oblong-elliptic, acute, mid-vein very prominent beneath. Petiole ± 1.5 dm. long, slender. Peduncle exceeding the leaves, naked, with several large imbricating bracts at the base of the raceme. Raceme ± 2.5 dm. long, arched. Floral bracts large, ovate-elliptical, at first closely imbricating,

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8–13 mm. long, equaling or exceeding the flowers. Flowers large, brownish-yellow. Lateral sepals 7–8 mm. long, oblong-lanceolate or triangular-lanceolate, acute, lightly carinate at the tip. Dorsal sepal similar, 7 mm. long. Petals 7 mm. long, oblong, acute. Labellum three-lobed, 4 mm. long, reflexed; lateral lobes triangular, acute, subsetaceous at the tip, from sinus to tip about 1 mm. long; middle lobe somewhat cuneate at base, dilated into a round or suborbicular plate 3 mm. wide, 2 mm. long above the claw, when apiculate, obscurely so, middle nerve raised but evanescent beyond the lateral lobes, otherwise the disc is bicarinate to the middle. Margin of the lip wholly entire. Gynostemium about 3 mm. long, with subulate lateral arms about 1 mm. long, arising from the sides of the column just below the stigmatic orifice, hardly equaling the rostellum. Terminal wing elongated, rounded at the tip or obscurely retuse or irregularly three-lobed, the lobes blunt.

A large plant allied to *Dendrochilum latifolium* Lindl., *D. bracteosum* Reichb. f., and *D. Dewindtianum* W. W. Sm., but very distinct in the structure of the flower and clearly separable by means of the large bracts which nearly conceal the flowers. The raceme is very similar to that of *Dendrochilum cagayanense* Ames, which has a very dissimilar labellum. *D. Dewindtianum* W. W. Sm. differs from *D. imbricatum* in its much shorter floral bracts, larger labellum, and longer stelidia. *D. oxylobum* Schltr. is a near ally, but differs from *D. imbricatum* in the details of the gynostemium and labellum and in the relative lengths of the floral bracts and the flowers. (PLATE 82.)

KINABALU, *Clemens 179* (Type), November 1915. 3000 feet altitude.
 KLAU, *Clemens 318*, November 1915. 2000–5000 feet altitude.

13. *Dendrochilum Joclemensii* Ames *sp. nov.* Rhizoma repens, vaginis omnino obtectum, radicibus elongatis. Pseudobulbi

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approximati, subfusiformes, monophylli, rugosi. Folium erectum, lineare, obtusum, petiolatum, in sicco prominenter trinervium. Pedunculus folio brevior, gracilis, pauciflorus. Inflorescentia in pseudobulbis novellis evolutis, folio multo brevior, rachide tenui. Racemus laxiflorus. Bracteae ovarium aequantes, lanceolatae. Sepala lateralialia lanceolata, acuta, trinervia. Sepalum dorsale simile, acutum, trinervium. Petala lanceolata, acuminata, acuta. Labellum subintegrum, oblongum, abrupte acuminatum, in apicem apiculatum contractum, trinervium, ad basim incrassatum, prope medium bicallosum; calli semiorbiculares, complanati, erecti. Gynostemium breve. Ala apicalis porrecta, concava, obtusa. Alae laterales infra medium gynostemii ortae, quam ala apicalis multo breviores, ellipticae.

Rhizome creeping, perhaps pendent, invested by closely appressed sheaths. Pseudobulbs semi-fusiform, rugose, 1.4 cm. long, 3 mm. thick near the middle, ascending, unifoliate. Leaf linear, up to 7 cm. long, 3 mm. wide, obtuse, petiolate, prominently three-nerved. Petiole slender, about 9 mm. long. Peduncle shorter than the leaves, slender, including the raceme \pm 4 cm. long. Inflorescence few-flowered. Raceme lax. Bracts about equaling the ovaries, lanceolate, acute, strongly concave. Flowers salmon-pink, about 5.5 mm. wide between the tip of the petals when spread out. Lateral sepals 3 mm. long, about 1 mm. wide, lanceolate, acuminate, acute, three-nerved, carinate, larger than the petals. Dorsal sepal similar to the laterals. Petals slightly narrower than the sepals, 2.5 mm. long, lanceolate, acute. Labellum about 2 mm. long, about 1 mm. wide, oblong, abruptly contracted near the apex into an elongated, apiculate tip, three-nerved, with two flattened abbreviated lamellae, one on each side of the disc just below the middle; lamellae suborbicular, flattened laterally; behind the lamellae the lip is much thick-

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ened where it joins the column. Gynostemium about 1.5 mm. tall from the base to the tip of the apical wing. Stelidia very broad, rounded at the tip, about .5 mm. wide, slightly longer than broad, not equaling the tip of the apical wing, erect, rather fleshy. Apical wing strongly concave, nearly orbicular, entire.

The very broad lateral wings of the column and the simple labellum indicate relationship with *D. alatum* Ames and *D. fimbriatum* Ames. Unfortunately the material from which my description is drawn is incomplete, the tip of the raceme having been broken off. (PLATE 83.)

MAREI PAREI SPUR, *Clemens* 247, November 1915.

14. *Dendrochilum kamborangense* Ames *sp. nov.* Pseudobulbi subcylindracei, aggregati, rugosi. Folium lineari-lanceolatum, obtusum, in sicco chartaceum. Pedunculus folio longior. Racemus gracilis, multiflorus. Sepala lateralia oblongo-lanceolata. Sepalum dorsale simile. Petala oblongo-lanceolata. Labellum trilobatum, bicarinatum; lobi laterales denticulati vel fimbriati; lobus medius rotundatus, apiculatus. Gynostemium erectum. Stelidia e medio gynostemii orta, anguste triangularia.

Pseudobulbs subcylindrical, 2.5–4 cm. high, yellowish, rugose, when mature surrounded by the fibrous remains of the sheaths. Leaves 1–2 dm. long, up to 16 mm. wide, linear-lanceolate, obtuse, at base petiolate. Flower shoot longer than the leaves, ±3 dm. long including the raceme. Raceme itself up to 1.5 dm. long, about 1.5 cm. in diameter, flowers yellow, 3.5 mm. apart. Floral bracts 3 mm. long, equaling the pedicellate ovary, glumaceous, closely appressed. Lateral sepals 6–7 mm. long, about 2 mm. wide, oblong-lanceolate, acute, carinate near the tip. Dorsal sepal similar, but somewhat narrower. Petals about 6 mm. long, 2.5 mm. wide, oblong-lanceolate, acute, margin minutely denticulate. Labellum three-lobed, about 5 mm. long,

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fleshy, brownish; lateral lobes rounded, from the base minutely fringed on the outer margin; middle lobe 3 mm. long, 3 mm. wide, rotundate, apiculate. Carinae two, fleshy, at base connected by a transverse thickening of the disc, evanescent below the middle of the mid-lobe, middle nerve prominent. Gynostemium about 3 mm. long. Stelidia near the middle of the column but not basal, reaching as high as the rostellum, narrowly triangular, obtuse, divergent. Terminal wing subquadrate, tridentate, erose or denticulate at the tip.

A very beautiful and showy orchid with the general aspect of *D. cornutum* Bl. (PLATE 84.)

KAMBORANGAH, *Clemens* 205 (Type), November 1915. MAREI PAREI RIDGE, *Clemens* 385, December 1915. Flowers yellow with brown tongue.

15. *Dendrochilum kinabaluense* Rolfe in Gibbs in Journ. Linn. Soc. 42 (1914) 148.

This species and *D. Gibbsiae* Rolfe are very similar in the structure of the flower and in general aspect.

MAREI PAREI SPUR, *Gibbs* 4085, February 1910. In mossy forest. 7000 feet altitude. Flowers yellow with a small brown blotch on the lip.

16. *Dendrochilum lancilabium* Ames *sp. nov.* Pseudobulbi approximati vel usque ad 2 cm. distantes, monophylli. Folium lineari-lanceolatum, obtusum, breviter apiculatum. Pedunculus gracilis, multiflorus. Bractee inflorescentiae patentees. Sepala lateralia triangulari-lanceolata, acuta. Sepalum dorsale lanceolatum, acutum. Petala anguste lanceolata, acuminata, acuta, obscure denticulata. Labellum simplex, lanceolatum, acuminatum, acutum, bicallosum. Gynostemium gracile. Stelidia linearia, basilaria. Ala apicalis simplex vel trilobata.

Pseudobulbs 5 mm. thick, either contiguous or 2 cm. apart on the stout creeping rhizome, ± 5 cm. long, very slender when dry, cylindrical or fusiform, monophyllous, stem-like. Leaf ± 2 dm.

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long, about 1 cm. wide, linear-lanceolate, obtuse, apiculate, shortly petiolate, shorter than the slender peduncle, rigid when dry. Peduncle up to 3 dm. long. Raceme about 2 dm. long, less than 1 cm. in diameter. Flowers greenish-yellow, small. Bracts 2 mm. long, hardly clasping the pedicellate ovary which they equal. Lateral sepals 5 mm. long, 1.5 mm. wide, triangular-lanceolate, acute, three-nerved. Dorsal sepal 6 mm. long, lanceolate, acuminate, acute, slightly concave, three-nerved. Petals similar, 4.25 mm. long, but slightly narrower, one-nerved with short lateral nerves, minutely denticulate on the margin. Labellum 4 mm. long, simple, lanceolate, acuminate, acute, very minutely ragged, fringed or denticulate above the middle, three-nerved, very mobile, weakly attached to the base of the gynostemium, bicallose at the base, the calli passing posteriorly into the median nerve, shallowly sulcate. Column very slender. Stelidia basal, linear, obtuse, 2 mm. long, scarcely equaling the subquadrate, entire or minutely three-lobed terminal wing.

A very distinct species of series *Similia* Pfitz. that is well characterized by its lanceolate, very acuminate labellum. In the material examined the terminal wing of the column is very variable, in the type being three-lobed, three-toothed or almost entire. (PLATE 83.)

KINABALU, *Haslam*, July–August 1916. MAREI PAREI SPUR, *Clemens 280* (Type), November 1915; *Clemens 224A*, November 1915; *Clemens 242*, November 1915. PAKKA, *Clemens 114*, November 1915.

17. *Dendrochilum lobongense* *Ames sp. nov.* Pseudobulbi statu juvenili vaginis laxis vestiti, monophylli. Folium quam pedunculus brevius, oblongo-ellipticum. Racemus multiflorus, nutans. Bracteae inflorescentiae patentēs. Sepala lateralia oblongo-lanceolata, acuta. Sepalum dorsale simile. Petala oblongo-ovata, acuta. Labellum trilobatum; lobi laterales anguste trian-

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gulares; lobus medius late ovatus; discus tricarinatus. Gynostemium arcuatum. Stelidia lateralia e medio gynostemii orta. Ala apicalis quadrata, tri- vel quadridentata.

A near ally of *D. oxylobum* Schltr., but differing from it in details of the flower. Pseudobulb ± 2 cm. long, when immature concealed by several loosely sheathing tubular bracts. Leaf about 13 cm. long, 1.4 cm. wide. Peduncle 3 dm. long, comparatively stout, naked below the raceme, arching. Raceme about 22 cm. long. Flowers numerous, about forty, pale yellow, comparatively large, ± 8 mm. long, about 5 mm. distant. Bracts spreading, 4 mm. long, about 2 mm. wide, slightly exceeding the pedicellate ovary, glumaceous, acute. Lateral sepals about 8 mm. long, 2 mm. wide, oblong-lanceolate, acute. Dorsal sepal similar. Petals 8 mm. long, 2 mm. wide, oblong-ovate, abruptly acute. Labellum 7 mm. long, 4 mm. wide at the middle, three-lobed; lateral lobes about 1 mm. long, entire or few and inconspicuously toothed, narrowly triangular, very acute but not setaceous, about equaling the middle of the labellum; middle lobe about 5 mm. long, broadly ovate, obtuse. Disc tricarinate to about the middle or a little beyond; the lateral carinae, one on each lateral nerve, prominent at the base of the column, somewhat rounded when seen from the side, the middle carina simply a thickening of the disc along the median nerve. Gynostemium abruptly arched, rather slender. Lateral arms narrowly lanceolate, 2 mm. long, blunt or subacute, retrorse, arising just below the stigma.

Unfortunately the only material secured has an immature pseudobulb with its leaf still folded.

LOBONG, *Clemens 116*, November 1915.

18. *Dendrochilum longirachis* Ames sp. nov. Pseudobulbi elongati, approximati, cylindranei, monophylli. Folium elliptico-

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lanceolatum, acutum, breviter petiolatum. Pedunculus valde elongatus, gracilis. Bracteae inflorescentiae flores aequantes. Sepala lateralia oblongo-lanceolata, acuta. Sepalum dorsale simile. Petala angustiora. Labellum trilobatum, bicarinatum; lobi laterales serrati; lobus medius cuneato-ovatus, apiculatus. Gynostemium gracile. Stelidia lateralia linearia, ad medium gynostemii. Ala apicalis integra vel obscure lobata, rotundata.

Pseudobulbs approximate, contiguous, much elongated, 5.5–9 cm. long, very slender, in dried specimens up to 5 mm. in diameter, cylindraceous or fusiform, monophyllous. Leaf 8–15 cm. long, 3–4.3 cm. wide, elliptic-lanceolate, attenuated at both ends, chartaceous in dried specimens, prominently nine-nerved, contracted rather abruptly into a short petiole 4–10 mm. long, much exceeded by the elongated, flexuous, curving and drooping raceme. Flower shoot ± 4 dm. long including the raceme; naked portion ± 4 cm. long. Raceme less than 1 cm. in diameter, slender, sometimes with as many as one hundred and thirty-five flowers, furnished below the raceme with three to four closely appressed, brownish, sterile, glume-like bracts. Bracts subtending the pedicellate ovary 2 mm. long, embracing the base of the perianth. Flowers yellow, 4 mm. apart. Lateral sepals 4.5 mm. long, oblong-lanceolate, acute, rounded at the base. Dorsal sepal similar. Petals about 4 mm. long, linear-lanceolate, narrower than the sepals, acute, entire. Labellum about 3.5 mm. long, brownish on the disc, three-lobed; lateral lobes narrowly triangular with a setaceous tip, serrate on the outer margin, with the tips reaching to about the middle of the cuneate-obovate, apiculate middle lobe; middle lobe 2.5 mm. long, 2 mm. wide, entire, bicarinate at the base, with the carinae joined to the base of the thickened or raised median nerve. Gynostemium about one-half as long as the dorsal sepal, slender at base. Lateral stelidia arising just below the

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level of the stigma, linear, slightly exceeding the anther. Terminal wing rotundate, entire or very obscurely lobed.

A very distinct species well characterized by its vegetative parts.

KIAU, *Clemens 332* (Type), November 1915. MAREI PAREI SPUR, *Clemens 377*, December 1915.

19. *Dendrochilum perspicabile* *Ames sp. nov.* Pseudobulbi aggregati, ovoidei, monophylli. Folium oblongo-lanceolatum, rigidum, quam scapus brevius. Racemus flexuosus, multiflorus. Bracteae inflorescentiae patentes. Sepala oblongo-lanceolata. Petala similia. Labellum trilobatum; lobi laterales minuti; lobus medius late ovatus, ad apicem rotundatus; discus infra medium bicarinatus. Gynostemium arcuatum. Stelidia lateralia, e medio gynostemii orta. Ala terminalis, elongata, tridentata.

In habit similar to *Dendrochilum linearifolium* Hook. f. Pseudobulbs aggregated, 2–4.4 cm. long, ± 12 mm. in diameter, ovoid when mature, yellowish when dry, monophyllous. Leaf ± 8 cm. long, 8–12 mm. wide, oblong-lanceolate, blunt or acute, seven-nerved, rigid when dry, petiolate, with the petiole about 2 cm. long. Peduncle ± 15 cm. long, much longer than the leaf, arching, many-flowered. Raceme up to 14 cm. long, up to 2 cm. in diameter, flowers yellow tipped with brown. Bracts 4 mm. long, more or less spreading, subequal to the pedicellate ovary, involute. Flowers 8–10 mm. in diameter. Sepals 7–8 mm. long, about 2.5 mm. wide, oblong-lanceolate, acute. Petals 8 mm. long, 2.5 mm. wide, lanceolate, with the margin irregularly denticulate. Labelum ± 5 mm. long, 3–3.5 mm. wide, obscurely three-lobed; lateral lobes triangular, toothed, acute or obtuse, equaling the base of the middle lobe; middle lobe 3 mm. long or more, broadly ovate, rounded at the tip, not at all apiculate, minutely crenulate or denticulate on the margin. Disc bicarinate (with a prominent

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median nerve between the carinae); the carinae, one on each lateral nerve, reaching the base of the middle lobe, united at the base by a transverse thickening. Gynostemium arched. Stelidia lateral, triangular, falcate, acute, rising from about the middle of the column, reaching about to the middle of the elongated acute terminal tooth. (PLATE 82.)

KINABALU, *Clemens 202*, November 1915. 5000–10,000 feet altitude.

20. *Dendrochilum quinquelobum* *Ames sp. nov.* Pseudobulbi aggregati, semifusiformes, monophylli. Folium lineari-lanceolatum, subobtusum, breviter petiolatum. Pedunculus gracilis, foliis longior. Racemus gracilis, multiflorus; flores parvi. Bractee patentees. Sepala lateralialia ovato-oblonga, acuta. Sepalum dorsale lanceolatum, acutum. Petala oblongo-lanceolata, acuta, sepalis lateralibus angustiora. Labellum quinquelobatum; callus hippocrepiformis in disco. Gynostemium gracile. Stelidia basilaria. Ala apicalis simplex.

Pseudobulbs up to 4.5 cm. long, approximate, crowded, when immature concealed by closely appressed brownish sheaths, semifusiform, very slender, gradually attenuated, monophyllous. Leaves 12–25 cm. long, 8–16 mm. wide, linear-lanceolate or oblong-lanceolate, petiolate, subacute. Petiole about 3 cm. long. Peduncle \pm 2 dm. long, longer than the leaf, slender, naked. Raceme slender, about 16 cm. long, about 5 mm. in diameter, many-flowered. Flowers small, yellow, about 3 mm. apart. Bracts 2.5 mm. long, spreading, for the most part simply sheathing the base of the pedicels, lanceolate, acute, equaling the pedicellate ovary. Lateral sepals 3 mm. long, 1 mm. wide, ovate-oblong, acute. Dorsal sepal 3 mm. long, concave, lanceolate, acute. Petals 2.5 mm. long, oblong-lanceolate, acute, slightly more than one-half as wide as the lateral sepals. Labellum five-lobed, 2.5 mm. long; basal lobes minute, triangular, obtuse, erect; the lateral of

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the three terminal lobes 1 mm. long, .5 mm. wide, oblong-falcate, obtuse, retrorse, ascending; middle lobe or cusp 1 mm. long, narrowly triangular, tooth-like, acute, deflexed-ascending. On the disc below the middle is a prominent U-shaped callus, connected by a transverse thickening just below the opening. Gynostemium slender, 1.5 mm. long. Stelidia basal, oblong-linear, hamate, obtuse, equaling the terminal, rounded, concave wing.

A near relative of *D. Gibbsiae* Rolfe and *D. kinabaluense* Rolfe, from which species it differs in the lobing of the labellum, the lateral lobes being strongly curved backward. Mr. Rolfe compared *D. Gibbsiae* to *D. recurvum* Ames, a native of the Philippine Islands, but that species is a member of *Acoridium*, a section of *Dendrochilum*, and is comparable rather in the structure of the labellum than through actual affinity to either *D. Gibbsiae* or *D. kinabaluense*. Intensive studies of more material than I have been able to examine may reveal closer relationships between *D. quinquelobum* and the species described by Rolfe than now seem likely. From careful drawings of *D. Gibbsiae* and *D. kinabaluense* preserved in my herbarium, their affinity is extremely close. They are clearly referable to the *Platyclinis* section. (PLATE 82.)

KIAU, *Clemens 361* (Type), November 1915; *Clemens 178*, November 1915; *Clemens 146*, November 1915. 3000 feet altitude. LOBONG, *Clemens 289*, November 1915.

21. *Dendrochilum simplex* J. J. Sm. in Bull. Dépt. Agr. Néerl. Ind. 22 (1909) 13.

To this species I refer a specimen gathered by Clemens on Marei Parei Spur. *D. simplex* is closely related to *D. vaginatum* J. J. Sm. and to *D. acuminatum* J. J. Sm. In the very simple lip it recalls *D. aurantiacum* Bl. The elongated rhizome is a con-

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spicuous differentiating character. Originally collected at Liang Gagang by Hallier (No. 2646). Heretofore unknown to occur on Mount Kinabalu.

MAREI PAREI SPUR, *Clemens* 278, November 1915. Flowers brownish.

22. *Dendrochilum stachyodes* (*Ridl.*) *J. J. Sm.* in *Recueil Trav. Bot. Néerl.* 1 (1904) 77. *Platyclinis stachyodes* *Ridl.* in *Stapf* in *Trans. Linn. Soc. ser. 2, 4* (1894) 234.

KINABALU, *Haviland.* 11,000 feet altitude; *Gibbs* 4181, February 1910. In cracks in granite at the base of the granite core. Flowers cream color, abundant. LOBONG, *Clemens* 224, November 1915. Flowers and buds yellow. PAKKA, *Clemens* 115, November 1915. Flowers pale yellow.

23. *Dendrochilum subintegrum* *Ames sp. nov.* Pseudobulbi valde elongati, monophylli. Folium elliptico-lanceolatum, obtusum, breviter petiolatum. Pedunculus gracilis, elongatus, folio longior. Racemus multiflorus, elongatus. Bracteae inflorescentiae patentés. Sepala lateralia oblongo-lanceolata, acuta. Sepalum dorsale simile. Petala oblongo-lanceolata. Labellum subsimplex, lanceolatum; lobi laterales minuti, dentati. Gynostemium arcuatum. Stelidia basilaria. Ala apicalis integra.

Rhizome elongated, with the pseudobulbs clustered at the growing point, rather stout. Pseudobulbs elongated, ± 8 cm. long, 4 mm. in diameter, cylindraceous, monophyllous, clothed with loose imbricating sheaths when immature, yellowish in dried specimens, rugose. Leaf 1.4–1.6 dm. long, up to 3.7 cm. wide, elliptic-lanceolate, obtuse, shortly petiolate, with the petiole about 1 cm. long. Peduncle slender, exceeding the leaf in the type specimen, including the raceme about 2 dm. long. Raceme about 14 cm. long, 7 mm. in diameter, many-flowered; flowers small, yellowish. Bracts spreading, 2 mm. long, not enclosing the ovary but exceeding it, about 1 mm. apart. Lateral sepals 3 mm. long, 1 mm. wide, oblong-lanceolate, acute, three-

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nerved. Dorsal sepal similar. Petals similar to the sepals, 2.5 mm. long, acute, margin obscurely irregular, three-nerved. Labellum 2.25 mm. long, lanceolate, obscurely three-lobed; lateral lobes minute, triangular, irregularly several toothed, rising below the middle of the labellum. The lateral carinae and thickened median nerve form an M-shaped callus which extends to about the middle of the disc. Gynostemium strongly arched, lateral arms basal, oblong, round-pointed, about equaling the terminal triangular obtuse wing.

The type consists of a single specimen which is habitually similar to *D. longirachis*, but distinct in the form of the lip.

LOBONG CAVE, *Clemens 285*, November 1915.

17. PHOLIDOTA *Lindl.*

Eight species of *Pholidota* have been reported as natives of Borneo. The first collection from Mount Kinabalu to contain representatives of this genus was made by Clemens in 1915. Clemens found *Pholidota carnea* (Bl.) Lindl., and *P. gibbosa* De Vriese, the former referred to *Crinonia* and the latter to *Chelonanthera* in Pfitzer and Kränzlin's monograph of the Coelogyneinae in Engler's *Das Pflanzenreich*.

1. *Pholidota carnea* (Bl.) Lindl. *Gen. & Sp. Orch.* (1830) 37. *Crinonia carnea* Bl. *Bijdr.* (1825) 339. *Coelogyne carnea* (Bl.) Reichb. *f.* in Walp. *Ann.* 6 (1861) 237.

This is a Javan species which has also been reported from Sumatra.

LOBONG CAVE, *Clemens 107*, November 1915. Flower pink and maroon; *Clemens 127 A*. 5000 feet altitude. KIAU, *Clemens 331*, November 1915. Flowers cream color.

2. *Pholidota Clemensii* Ames *sp. nov.* Pseudobulbi semifusiformes, monophylli. Folium ligulatum, in sicco nervosum, pedunculo longius. Bracteeae deciduae. Flores in racemum

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subdensum dispositi. Sepala lateralia late ovata, acuta, carinata. Sepalum dorsale ovato-lanceolatum. Petala ovato-oblonga, membranacea. Labellum saccatum, ecarinatum, in laminam oblongam productum. Gynostemium ad apicem tridentatum. Rostellum bifidum.

Rhizome stout. Pseudobulbs semi-fusiform, 4–6 cm. high, ± 1 cm. in diameter at about the middle, monophyllous. Leaf ± 3 dm. long, ± 4 cm. wide, oblong-lanceolate, petiolate, attenuated at both ends, longer than the flower shoot, rather rigid when dry, conspicuously seven-nerved. Petiole about 1 dm. long. Flower shoot from the new growth, synanthous, up to 2 dm. long including the raceme, concealed by five or more large, imbricating, acute, nervose sheaths which rise from the base of a mature pseudobulb. Raceme about 8 cm. long, sub-densely flowered, erect, rigid; bracts deciduous leaving an annulate scar. Pedicel and ovary about 1 cm. long, glandular pubescent. Flowers white, yellow when dry, somewhat globose. Lateral sepals 8 mm. long, about 5 mm. wide, broadly ovate, acute, carinate, at base forming a rounded mentum. Dorsal sepal about 8 mm. long, ovate-lanceolate, acute. Petals about 8 mm. long, 4 mm. wide, ovate-oblong, acuminate, acute, membranaceous. Labellum 8 mm. long, deeply saccate at base, prolonged in front into an oblong round-tipped plate 6.5 mm. long, 3 mm. wide, abruptly reflexed in front of the rounded scrotiform sac. The sulcate disc and sac ecallose, but on each side in front of the sac the lip is conspicuously longitudinally thickened. Gynostemium with two rounded appendages at base; terminal wing three-toothed, the central one obtuse, semi-orbicular, the lateral ones divergent and much smaller, ovate, subobtuse. Rostellum deeply bifid.

Vegetatively *Pholidota Clemensii* recalls a small form of

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P. ventricosa Reichb. f., but in the details of the flower it is very different from that species.

MAREI PAREI SPUR, *Clemens* 390, December 1915.

3. *Pholidota gibbosa* (Bl.) De Vriese Ill. Orch. Ind. Orient. Néerl. (1854) t. 5, fig. 1. *Chelonanthera gibbosa* Bl. Bijdr. (1825) 383.

LOBONG CAVE, *Clemens* 127, November 1915. 5000 feet altitude. Flowers white with yellow tips. KIAU, *Clemens* 24, November 1915. 3000 feet altitude. Flowers cream white; *Clemens* 83, November 1915. 3000 feet altitude; *Clemens* 92, November 1915. 3000 feet altitude.

4. *Pholidota kinabaluensis* Ames sp. nov. Pseudobulbi cylindracei, diphylli. Folium lineari-ligulatum, acutum, quinque-nervium, pedunculo longius. Bractee inflorescentiae deciduae, flores superantes. Sepala lateralia elliptico-oblonga, acuta. Sepalum dorsale simile. Petala cuneato-obovata, ad apicem rotundata. Labellum simplex, in laminam rotundatam apiculatam dilatatum, ad basim profunde saccatum callosum. Gynostemium arcuatum. Ala terminalis trilobata.

Pseudobulbs 3.5–4 cm. long, ± 1.5 cm. in diameter when dry, cylindraceous, rugose, diphyllous. Leaves ± 3.9 dm. long, 1.5 cm. wide, linear, ligulate, acute, much longer than the flower shoot, coriaceous, conspicuously five-nerved, passing gradually into the sulcate petiole. Peduncle erect, stout, concealed below by several ample, imbricating, acute sheaths. Raceme ± 12 cm. long. Floral bracts up to 2 cm. long, 12 mm. wide, soon deciduous but present at anthesis, conduplicate, enfolding and concealing the whitish flowers, cuneate-ovate, acute, nervose. Pedicel and ovary about 6 mm. long, smooth or slightly rough. Lateral sepals 7–8 mm. long, about 3.5 mm. wide, elliptic-oblong, rounded, acute, strongly concave, lightly carinate dorsally along the median nerve, five-nerved. Dorsal sepal similar to the laterals,

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7 mm. long. Petals 7 mm. long, about 5 mm. wide, cuneate-obovate, rounded at the apex, membranaceous. Labellum adherent to the sides of the column nearly up to the stigmatic orifice, forming a deep rounded sac, the free part dilated into a rounded, triangular, acute, fleshy limb above. The anterior wall of the sac provided with a fleshy, transverse callus. From the base of the sac to the apiculate tip of the limb the labellum is 6 mm. long. Gynostemium arcuate, stout, with a three-lobed terminal wing, the middle lobe rounded, the laterals triangular with rounded tips. Rostellum slightly retuse. Anther with a conspicuous retrorse, cucullate appendage in front.

MAREI PAREI SPUR, *Clemens* 279, November 1915.

5. **Pholidota pectinata** *Ames sp. nov.* Pseudobulbi approximati, in sicco rugosi, obpyriformes vel semifusiformes. Folium oblongo-ellipticum, acutum. Pedunculus folium aequans vel excedens. Racemus multiflorus. Bracteae inflorescentiae glumaceae, persistentes. Sepala lateralia ad basim valde concava, ovata, acuta. Sepalum dorsale simile. Petala ad basim cuneata, ad apicem rotundata vel truncata. Labellum simplex, saccatum, in medio bicarinatum, in laminam rotundatam productum. Gynostemium simplex.

Pseudobulbs ± 2 cm. long, approximate, deeply rugose when dry, yellowish, obpyriform to semi-fusiform, monophyllous, when immature concealed, in dried specimens, by brown and closely appressed sheaths. Leaf ± 1.5 dm. long, up to 1.5 cm. wide, elliptic-oblong, acute, petiolate. Petiole slender, up to 7 cm. long. Flower shoot equaling or exceeding the leaves, free from the leaf but enclosed with it in a common tubular sheath. Peduncle naked below the imbricating empty bracts that subtend the raceme. Raceme up to 8 cm. long, 1.5 cm. in its greatest diameter. Flowers brown, distichously arranged, about 1.5 mm. apart. Bracts

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5-8 mm. long, broadly ovate, acute or obtuse, obliquely ascending, pectinate, exceeding the pedicellate ovary, glumaceous, nervous, tinged with yellow in dried specimens. Pedicel with the ovary 3 mm. long. Lateral sepals 4 mm. long, 2 mm. wide, ovate, acute, lightly carinate down the middle on the outer side, strongly concave at the base and moulded round the saccate base of the labellum. Dorsal sepal about 4 mm. long, 2.5 mm. wide, elliptic-ovate, subacute. Petals about 4 mm. long, oblong, rounded or even truncate at the tip, slightly cuneate below the middle, three-nerved. Labellum strongly sigmoid, about equaling the lateral sepals; basal half lightly saccate, limb oblong to about the middle where it is prominently bicallose, then dilated to form a rounded termination 2.5 mm. wide with a cuneate base. Distinct basal or lateral lobes wanting. Gynostemium 2 mm. long, simple, fleshy. Clinandrium entire. Rostellum bifid with a rounded sinus. Above the middle the column expands into two ample rounded wings.

The inflorescence is not unlike that of *Dendrochilum gramini-folium* (Ames) Pfitz. as illustrated in *Orchidaceae* 2 (1908) t. 22. (PLATE 86.)

MAREI PAREI SPUR, *Clemens* 273, November 1915.

18. NABALUIA *Ames gen. nov.*

Flores monoclini, distichi. Sepala subaequalia, lateralia paulum majora, valde concava, carinata. Petala linearia. Labellum trilobatum, leviter saccatum; saccus hemisphericus, discus lobi intermedii callo elevato hippocrepiformi instructus. Gynostemium elongatum, apodum, apice membranaceo-dilatatum, lobulatum vel denticulatum; clinandrium sub apice gynostemii submembranaceum, dilatatum. Anthera clinandrio immersa, incumbens, bilocularis. Pollinia quattuor, complanata. Stigma excavatum. Herbae epiphyticae, diphyllae; pseudobulbi elongati, folia cori-

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acea, pedunculus terminalis; bracteae florum sub anthesi deciduae; flores racemosi; capsula trilata.

A genus which is allied with *Coelogyne* Lindl. through the Philippine *C. bilamellata* Lindl. The hippocrepiform callus and the sac of the three-lobed labellum are differentiating characters.

I. Nabalua Clemensii *Ames sp. nov.* Radices crassae, ramosae. Pseudobulbi leviter tetragoni, subcylindracei, leviter compressi, statu juvenili vaginis magnis cymbiformibus tecti, diphylli, in sicco flavescentes. Folia petiolata, anguste oblongo-elliptica, coriacea, prominenter quinquenervia, utrinque attenuata. Petiolus sulcatus, rigidus. Pedunculus synanthus, folia adulta superans, infra racemum nudus, squamis complanatis coriaceis imbricatis ad basim inclusus. Bracteae inflorescentiae mox deciduae, glumaceae. Racemus laxis, elongatus, multiflorus. Flores distichi, fusco-lutei. Sepala petalaeque patentia. Sepala lateralia oblongo-elliptica, acuta, valde concava, cymbiformia, carinata, ad apicem cucullato-incrassata. Sepalum dorsale simile, valde concavum, vix carinatum. Petala anguste oblonga, obtusa, trinervia. Labellum trilobatum, elongatum, ad basim in saccum productum; lobi laterales prope basim labelli, anguste oblongi, obtusi, porrecti; lobus medius ex isthmo distincto valde dilatatus, ad apicem re-tusus, apiculatus. Callus incrassatus, erectus, hippocrepiformis. Gynostemium elongatum, ad apicem in alam lobulatam dilatatum. Rostellum emarginatum.

Roots thick, coarse, branched, 2-3 mm. in diameter. Pseudo-bulbs erect, ± 6.5 cm. long, ± 1 cm. in diameter, somewhat cylindrical, apparently tetragonal, diphyllous, somewhat flattened, yellowish in dried specimens. Leaves including the petiole 14-15 cm. long, about 2 cm. wide, acute, coriaceous, prominently five-nerved, the middle nerve especially prominent. Petiole about 5 cm. long, rigid, sulcate. Peduncle ± 2 dm. long, erect from the

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imbricating sheaths of the new growth, terminal, rigid, exceeding the leaves of the mature pseudobulb. Raceme loosely and approximately twenty-flowered, 1 dm. long. Bracts of the inflorescence \pm 2 cm. long, elliptic-oblong, obtuse, glumaceous, nervose, soon deciduous. Flowers about 11 mm. long, distichous, yellowish or brownish, rather fleshy. Pedicel slender, ovary three-winged, together with the pedicel about 8 mm. long. Lateral sepals about 1 cm. long, oblong-elliptic, acute, strongly concave, the tip thickened. Dorsal sepal similar, but weakly if at all carinate. Petals about 1 cm. long, linear-oblong, obtuse, three-nerved. Labellum 8–10 mm. long, three-lobed, produced at base into a small, coriaceous, hemispherical sac 1.5 mm. deep; lateral lobes 3–4 mm. long, less than 1 mm. wide, ascending or erect, similar to the petals but much shorter, rounded at the apex; middle lobe about 6 mm. long, 5 mm. wide across the dilated apical half, cuneate above the lateral lobes, retuse-apiculate at the rounded tip, nerves prominent. Callus above the opening of the sac, hippocrepiform-cucullate, adherent to the disc between the lateral lobes and in part decurrent on them. Column slender at base, dilated above to form an inconspicuously three-lobed, denticulate or lobulate, terminal, flabellate wing, the lateral lobules much reduced, obtuse. Rostellum lightly emarginate. Anther cordate. Pollinia four, flattened. (PLATE 87.)

In the specimens of *Clemens 268* the leaves are oblong-lanceolate, about 25 cm. long, 2 cm. wide. Vegetatively the plants are quite unlike the type, but in the structure of the flowers—although the free ends of the callus are elongated—clearly referable to it.

KAMBORANGAH, *Clemens 210* (Type), November 1915; *Clemens 111*, November 1915. Flower salmon. MAREI PAREI SPUR, *Clemens 395*, December 1915; *Clemens 268*, November 1915. Flower greenish white with yellow tinge and a brown spot on the lip.

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19. MALAXIS *Soland. ex Sw.*¹

Heretofore but two species of *Malaxis* were reported from Mount Kinabalu, although the Bornean representation of the genus was nineteen.

1. *Malaxis calophylla* (*Reichb. f.*) *O. K.* *Rev. Gen.* 2 (1891) 673. *Microstylis calophylla Reichb. f.* in *Gard. Chron.* II, 12 (1879) 718.

PENOKOK RIVER, *Haviland*. 3000 feet altitude.

2. *Malaxis graciliscapa* *A. & S. sp. nov.* Rhizoma lignosum, flexuosum, vaginis mox in fibras solutis vestitum. Caulis brevis, decumbens, vaginis laxis tubulatis omnino obtectus, in basi ramo (in hoc specimine abrupto) praeditus. Folia in ramo utroque plus minusve approximata, elliptica, obtusa, basi rotundata, fere vagina sessilia, dorso carinata, margine crispata, tenuia. Pedunculus gracilis, longissimus, suberectus, sub racemo bracteis remotis reflexis ornatus. Rachis multiflora, prope apicem nutans. Brac-

¹ In the study of species related to those from Mount Kinabalu the following nomenclatorial changes have been found necessary:

1. *Malaxis amplexens* *A. & S. comb. nov. Microstylis amplexens* J. J. Sm. in *Ic. Bogor.* 2 (1903) 39, t. 108 E.

2. *Malaxis bidentifera* *A. & S. comb. nov. Microstylis bidentifera* J. J. Sm. in *Engl. Bot. Jahrb.* 48 (1912) 97.

3. *Malaxis cordifolia* *A. & S. comb. nov. Microstylis cordifolia* Rolfe in *Kew Bull.* (1899) 127.

4. *Malaxis incurva* *A. & S. comb. nov. Microstylis incurva* J. J. Sm. in *Bull. Dépt. Agr. Ind. Néerl.* 19 (1908) 29.

5. *Malaxis kinabaluensis* *A. & S. comb. nov. Microstylis kinabaluensis* Rolfe in *Gibbs in Journ. Linn. Soc.* 42 (1914) 146.

6. *Malaxis moluccana* *A. & S. comb. nov. Microstylis moluccana* J. J. Sm. in *Bull. Inst. Buitenzorg* 7 (1900) 2.

Malaxis moluccana var. *sagittata* *A. & S. comb. nov. Microstylis moluccana* var. *sagittata* J. J. Sm. in *Nova Guinea* 8 (1909) 32, t. 10.

7. *Malaxis nigrescens* *A. & S. comb. nov. Microstylis nigrescens* J. J. Sm. in *Nat. Tijdschr. Ned. Ind.* 58 (1898) 359.

8. *Malaxis obovata* *A. & S. comb. nov. Microstylis obovata* J. J. Sm. in *Ic. Bogor.* 2 (1903) 37, t. 108 D.

9. *Malaxis xanthochila* *A. & S. comb. nov. Microstylis xanthochila* Schltr. in *Schum. & Laut. Nachtr. Fl. Deutsch. Schutzgeb.* (1905) 102.

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teae inflorescentiae breviores, reflexae. Flores in visu pellucidi; sepala apice late rotundata, trinervia, marginibus anterioribus revolutis. Sepala lateralia lanceolato-ovata. Sepalum dorsale lanceolato-oblongum. Petala linearia, apice truncata vel paulo emarginata, uninervia. Labellum in circuitu subquadratum, auriculis basilaribus praeditum; lamina trilobata, basi callo parvo transverso ornata; lobi laterales obtuse atque latissime triangulares; lobus medius semiorbicularis, bilobatus, porrectus, utrinque dente parvo oblongo obtuso praeditus; auriculae deltoideae, parallelae vel paulum diversae. Gynostemium crassum, bialatum.

Rhizome creeping, woody, flexuous, concealed by sheaths which tardily become fibrous, striate-sulcate in the dried specimen. Stem about 5 cm. long, decumbent, entirely concealed by the loose, tubular leaf sheaths. Leaves up to 5 cm. long, 1.7 cm. broad, four to eight on each shoot, more or less approximate, elliptic, obtuse, mucronate, rounded or cuneate below, almost sessile on the leaf sheath, dorsally carinate, crisped on the margins, membranaceous in the dried condition. Peduncle with the raceme about 42 cm. long, suberect, slender, with remote rarely subopposite bracts. Bracts of peduncle ± 6 mm. long, subulate, reflexed. Rachis about 16.5 cm. in height, nodding near the apex, many-flowered. Floral bracts up to 4 mm. long, linear-attenuate from a broad base, sulcate, thin, reflexed. Flower apparently pellucid. Sepals broadly rounded at the apex, three-nerved, with the anterior margins revolute. Lateral sepals about 2.7 mm. long, 1.5 mm. wide below the middle, lance-ovate. Dorsal sepal about 3 mm. long, 1.2 mm. broad at the base, lance-oblong. Petals about 2.5 mm. long, .65 mm. broad above, linear, slightly broader near the apex, truncate or slightly retuse at the tip, margins revolute, one-nerved. Lip subquadrate in

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outline, provided with a basal pair of auricles; limb ± 2 mm. long, 3 mm. broad, three-lobed, furnished at the base under the column with a small transverse callus; lateral lobes very broadly and obtusely triangular; middle lobe semi- to suborbicular, bilobed, porrect, with a small, oblong, obtuse tooth on either side; auricles about 1.5 mm. long, deltoid, rounded at the apex, directed straight backward or slightly spreading. Column up to 1.4 mm. long, stout, two-winged. (PLATE 88.)

Malaxis nigrescens (J. J. Sm.) A. & S. differs markedly from *M. ...* in the ... while *M. ...* (J. J. Sm.)

LEIBURAN RIDGE, BETWEEN THE ...
4065, February 1910. 6000 feet altitude. In mossy forest. Flowers orange.

4. *Malaxis multiflora* A. & S. *sp. nov.* Herba erecta. Radices fibrosae, flexuosae. Caulis brevis, vaginis foliorum omnino obtectus. Vaginae tubulatae, laxae, inflatae, scariosae. Petiolus vix distinctus. Folia ovata vel ovato-lanceolata, [obliqua, acuminata, mucronata, basi late rotundata, tenuia, nervis tribus prominentibus. Pedunculus strictus, usque ad racemum nudus, angustissime pluri-alatus. Bractee inflorescentiae lineares, acu-

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teae inflorescentiae breviores, reflexae. Flores in visu pellucidi; sepala apice late rotundata, trinervia, marginibus anterioribus revolutis. Sepala lateralia lanceolato-ovata. Sepalum dorsale lanceolato-oblongum. Petala linearia, apice truncata vel paulo emarginata, uninervia. Labellum in circuitu subquadratum, auriculis basilaribus praeditum; lamina trilobata, basi callo parvo transverso ornata; lobi laterales obtuse atque latissime triangulares; lobus medius semiorbicularis, bilobatus, porrectus, utrinque dente parvo oblongo obtuso praeditus; auriculae del-

ADDENDUM

PAGE 75. *After Malaxis kinabaluensis add*

3 a. *Malaxis latifolia* Sm. in Rees Cycl. 22 (1819) No. 3.

KINABALU, *Haslam*, July–August 1916.

attenuate from a broad base, sulcate, thin, reflexed. Flower apparently pellucid. Sepals broadly rounded at the apex, three-nerved, with the anterior margins revolute. Lateral sepals about 2.7 mm. long, 1.5 mm. wide below the middle, lance-ovate. Dorsal sepal about 3 mm. long, 1.2 mm. broad at the base, lance-oblong. Petals about 2.5 mm. long, .65 mm. broad above, linear, slightly broader near the apex, truncate or slightly retuse at the tip, margins revolute, one-nerved. Lip subquadrate in

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outline, provided with a basal pair of auricles; limb ± 2 mm. long, 3 mm. broad, three-lobed, furnished at the base under the column with a small transverse callus; lateral lobes very broadly and obtusely triangular; middle lobe semi- to suborbicular, bilobed, porrect, with a small, oblong, obtuse tooth on either side; auricles about 1.5 mm. long, deltoid, rounded at the apex, directed straight backward or slightly spreading. Column up to 1.4 mm. long, stout, two-winged. (PLATE 88.)

Malaxis nigrescens (J. J. Sm.) A. & S. differs markedly from *M. graciliscapa* in the form of the lip, while *M. obovata* (J. J. Sm.) A. & S. has larger leaves, larger flowers, and broader petals. *M. commelinifolia* (Zoll.) O. K. has much shorter leaves, a shorter peduncle, shorter teeth on the lip, and flowers of two colors. *M. bidentifera* (J. J. Sm.) A. & S. has much larger leaves, a shorter peduncle, smaller flowers, and different lip.

MAREI PAREI SPUR, *Clemens 258*, November 1915. Flowers yellow.

3. *Malaxis kinabaluensis* (Rolfe) A. & S. *comb. nov.* *Microstylis kinabaluensis* Rolfe in Gibbs in Journ. Linn. Soc. 42 (1914) 146.

This species closely resembles *Malaxis cordifolia* (Rolfe) A. & S. in habit, but has longer, less caudate leaves, much shorter and broader petals, and a broader terminal lobe to the lip.

PENIBUKAN RIDGE, between the Dahobang and Kinitaki Rivers, *Gibbs 4065*, February 1910. 6000 feet altitude. In mossy forest. Flowers orange.

4. *Malaxis multiflora* A. & S. *sp. nov.* Herba erecta. Radices fibrosae, flexuosae. Caulis brevis, vaginis foliorum omnino obtectus. Vaginae tubulatae, laxae, inflatae, scariosae. Petiolus vix distinctus. Folia ovata vel ovato-lanceolata, [obliqua, acuminata, mucronata, basi late rotundata, tenuia, nervis tribus prominentibus. Pedunculus strictus, usque ad racemum nudus, angustissime pluri-alatus. Bractee inflorescentiae lineares, acu-

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minatae, carinatae, reflexae. Racemus densus; flores juvenes patentes vel reflexi, in sicco pellucidi. Sepala lateralia late ovata, obliquissima, obtusa, sub medio latiora, trinervia. Sepalum dorsale deltoideum, prope basim subito dilatatum, deinde ad apicem obtusum angustatum, trinervium. Petala lineari-oblongata, apice late rotundata, uninervia. Labellum subsagittiforme, auriculis binis parallelis vel approximatis praeditum; lamina integra, obtusa vel subacuta, in medio carinis binis brevibus longitudinalibus et basim propius tuberculo porrecto praedita; auriculae deltoideo-lanceolatae, apicibus rotundatis. Gynostemium breve, crassum, in basi tuberculo conspicuo papilloso decurvo instructum.

Plant erect. Roots fibrous, flexuous. Stem up to 4.5 cm. high, entirely concealed by the leaf sheaths, which are tubular, loose, inflated, scarious. Petiole indistinct, broadly winged. Leaves five, up to 7.3 cm. long, 2.5 cm. broad, ovate to ovate-lanceolate, oblique, acuminate, mucronate, broadly rounded at the base, membranaceous in the dried plant, with three prominent nerves; the lowermost leaf much smaller than the upper ones, ± 1.3 cm. long, 6 mm. broad. Peduncle including the raceme ± 13 cm. long, strict, naked up to the inflorescence, provided with several very narrow wings. Rachis ± 7 cm. long. Bracts of the raceme up to 4.5 mm. long, linear, acuminate, dorsally carinate, reflexed. Raceme dense; flowers at first spreading or reflexed, later ascending. Lateral sepals about 3 mm. long, 2 mm. wide, broadly ovate, very oblique, obtuse, broadest below the middle, three-nerved. Dorsal sepal about 3.5 mm. long, 2 mm. wide near the base, deltoid, abruptly widened near the base, thence narrowed to an obtuse apex, three-nerved. Petals about 3.6 mm. long, .8 mm. broad, linear-oblongate, broadest just above the middle, tapering to each end, broadly rounded at the apex, one-nerved. Lip sub-

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sagittate; limb about 1.6 mm. long, 1.8 mm. broad, entire, rounded to an obtuse or subacute apex, provided in the middle with a pair of short longitudinal dark keels and nearer the base, in the center, with a forward pointing tubercle; auricles 1–1.5 mm. long, deltoid-lanceolate, with rounded apices. Column about 1.5 mm. long, concave on the anterior surface, angled posteriorly, with a prominent papillose decurved tubercle at the base.

The flowers show considerable range in size of perianth parts; the measurements given are of one of the larger flowers. In habit this plant resembles *Malaxis kinabaluensis* (Rolfe) A. & S., but the flower is different. *M. Burbidgei* (Reichb. f.) O. K. has longer leaves, shorter scapes, acute sepals and petals, and smaller lip auricles. *M. moluccana* var. *sagittata* (J. J. Sm.) A. & S. is similar, but has much larger racemes, broader petals, and a different lip callus. *M. incurva* (J. J. Sm.) A. & S., while nearly related, is larger especially as regards the flowers and lip auricles. This is a much smaller species than *M. tubulosa* (J. J. Sm.) Ames, with orange instead of greenish-yellow flowers. From *M. uncata* Ames, *M. multiflora* differs in the absence of the long pedicels and in the peculiar lip calli. (PLATE 88.)

KIAU, *Clemens 86*, November 1915. 3000 feet altitude. Flower orange with a black cap on column.

5. *Malaxis variabilis* A. & S. sp. nov. Radices numerosae, fibrosae, flexuosae. Rhizoma repens. Caulis brevis, crassus, leviter flexuosus, vaginis tubuliformibus inflatis membranaceis omnino obtectus. Petiolus brevis, alatus. Folia plus minusve approximata, lanceolata vel lanceolato-oblonga, basi latissime rotundata et obliqua, deinde sensim longe acuminata, in visu tenuia, marginibus undulatis. Pedunculus plus minusve erectus, glaber. Rachis nutans. Bracteae e basi lata ad apicem angustatae. Flores juvenes in visu approximati, sed tardius remotiores. Sepala valde

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concava, late rotundata, leviter trinervia. Sepala lateralia rotundato-ovata. Sepalum dorsale oblongo-ovatum. Petala breviora, lineari-oblancoolata, apice late rotundata, uninervia. Labellum in circuitu suborbiculare, trilobatum, in auriculas binas dorsales extensum; lamina infra medium lata, basi in medio sulcata; lobi laterales bidentati; lobus medius semiorbicularis, bilobatus; auriculae deltoideae, obtusae. Gynostemium breve, bialatum.

Roots numerous, fibrous, flexuous. Rhizome creeping. Stem up to 7 cm. long, often once branched at the base, stout, slightly flexuous, entirely concealed by the swollen, tubular, membranaceous leaf sheaths. Petioles short, broadly winged, merged with the leaf sheaths. Leaves three to nine, more or less approximate, up to 10.7 cm. long, 3.2 cm. wide near the base, lanceolate or lance-oblong, very broadly rounded and oblique at the base, broadly dilated just above the base, then gradually long acuminate to the apex, membranaceous in the dried plant, undulate on the margins, with three or five prominent nerves. Peduncle including the raceme about 31 cm. in height, single or rarely two, erect or nearly so, glabrous, provided with one or several linear bracts. Rachis ± 20 cm. long, generally slightly nodding at the summit. Bracts up to 7 mm. long, narrowed from a broad base to an obtuse apex. Flowers appearing crowded when immature, but the fruiting pedicels scattered. Sepals strongly concave, broadly rounded above, indistinctly three-nerved. Lateral sepals about 2.5 mm. long, 1.9 mm. wide, round-ovate. Dorsal sepal about 2.6 mm. long, 1.6 mm. broad, oblong-ovate. Petals about 2.2 mm. long, .8 mm. wide near the apex, linear-oblancoolata, broadly rounded above, one-nerved. Lip suborbicular in outline, three-lobed, auriculate; limb ± 2.3 mm. long, 3.15 mm. wide below the middle, sulcate at the base in the middle; lateral lobes extended on each side into two or three linear triangular teeth, the outer

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tooth on each side acutely or obtusely triangular; middle lobe semi-orbicular, sharply bilobed; auricles about 1.1 mm. long, deltoid, obtuse. Column less than 1 mm. long, two-winged.

Great variability is manifest in this species especially in leaf proportions and lip characters, the middle lobe of the lip showing a wide range of variation. The tendency toward inequality and lack of uniformity in the teeth of the lip is noticeable in the type only.

Malaxis variabilis is a near relative of *M. oculata* (Reichb. f.) O. K., which, however, has much shorter elliptic leaves, differently shaped lip, and yellow instead of purple flowers. *M. amplexans* (J. J. Sm.) A. & S. has much more numerous leaves and a differently formed lip, while *M. xanthochila* (Schltr.) A. & S. has more elliptic leaves and different details of lip. (PLATE 88.)

Clemens 156 shows a set of plants that are much more slender than those of the type, with smaller leaves and little larger flowers with large auricles. The Haslam collection exhibits a much more robust form than the type with large flowers and leaves up to 13.6 cm. long. The material from Sarawak (Native Collector 1946), although closely matching other collections, shows smaller less acuminate leaves than those of the type.

KINABALU, *Haslam*, July–August 1916. KIAU, *Clemens 75* (Type), November 1915. 3000 feet altitude. Flower wine purple; *Clemens 156*, November 1915. Flower and stem purple, white end on column, purple fringe to lip; *Clemens 134*, November 1915. 3000 feet altitude. Flower and stalk purple. SARAWAK, *Native Collector 1946*.

20. OBERONIA *Lindl.*

Heretofore sixteen species of this genus were recorded from Borneo, twelve of these being endemic. Four species, which are new, are herewith described from Mount Kinabalu.

1. *Oberonia affinis* A. & S. *sp. nov.* Radices numerosae,

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fibrosae, flexuosae. Herba caulescens. Caules saepe approximati, suberecti vel leviter arcuati, flexuosi, vaginis foliorum omnino obtecti. Folia disticha, equitantia, linearia, falcato-incurva, ad apicem acutum sensim angustata, laxe patentia. Pedunculus infra racemum perbrevis, pubescens, bracteatus. Rachis pubescens vel tomentosa. Bracteae inflorescentiae lanceolatae, aristatae, irregulariter fimbriatae. Racemus adscendens vel saepissime arcuatus, multiflorus. Flores minuti, verticillati. Sepala ovata, concava. Sepala lateralia acuta. Sepalum dorsale obtusum. Petala linearia, apice abrupte rotundata. Labellum panduratum, basi auriculis rotundatis praeditum, prope apicem in lobulos binos suborbiculares erosos sinu lato separatos extensum. Ovarium cellulari-tomentosum.

Roots numerous, fibrous, flexuous, ± 5 mm. thick. Plant caulescent. Stem from the base of the plant to the base of the rachis ± 15 cm. tall, suberect or arcuate, regularly flexuous or sinuous, entirely concealed by the leaf sheaths. Leaves ± 4.5 cm. long, 4 mm. thick dorso-ventrally just above the sheath, distichous, equitant, linear, rarely linear-oblong, falcately incurved, broadest at the base, narrowed to an acute apex, provided below with loose scarious sheaths, the basal and apical leaves much reduced in size. Peduncle up to the raceme very short and inconspicuous, up to 1.4 cm. long, pubescent, covered with numerous narrowly lanceolate bracts. Rachis up to 14 cm. long, pubescent or tomentose. Bracts of the raceme about 2 mm. long, lanceolate, irregularly fimbriate, aristate, sheathing the pedicel. Raceme about 5 mm. wide, ascending or generally arcuate, sub-densely many-flowered, the apical portion very remotely flowered. Flowers minute, verticillate. Sepals less than 1 mm. long, concave, tomentose without. Lateral sepals ovate, acute, oblique. Dorsal sepal round-ovate, obtuse. Petals as long as the sepals,

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linear, abruptly rounded, obtuse or subacute at the apex. Lip, including the basal auricles, about 1.5 mm. long, 1.35 mm. wide across the apical lobes, pandurate, at the base thickened and concave in the middle, extended back into two broadly rounded auricles, gently narrowed to the middle, abruptly dilated above the middle into a pair of spreading lobules which are suborbicular, obtusely and irregularly erose, separated by a deep sinus. Ovary cellular-tomentose.

This is a plant with many related species, hence the name. *Oberonia masarangica* Schltr. has much longer denser leaves, shorter stems, and erect racemes, but very similar flowers. *O. Oxystophyllum* J. J. Sm. has denser, often longer, less falcate leaves, rather smooth perianth, and much smaller lip. *O. hispidula* Ames, while similar to this species in general appearance, is very different in lip features. *O. McGregorii* Ames has smaller flowers, markedly ciliate sepals, and a different lip. There are several other species related either vegetatively or in flower structure. However, the narrow spreading linear-falcate loosely disposed leaves and the long arcuate racemes are diagnostically characteristic. Great variation in size of leaves and height of stem is manifest. (PLATE 89.)

LOBONG CAVE, *Clemens 102* (Type), November 1915. 5000 feet altitude. Flowers orange. MAREI PAREI SPUR, *Clemens 275*, November 1915. Flowers brown. KIAU, *Clemens 380*, December 1915. Flowers yellow.

2. *Oberonia kinabaluensis* A. & S. *sp. nov.* Herba acaulis, caespitosa, habitu *O. Elmeri* Ames et *O. Costerianae* J. J. Sm. similis. Radices numerosae, fibrosae. Folia equitantia, longe linearia, acuminata, leviter falcata, ad basim arcte imbricantia. Scapus folia superans, suberectus, paulum flexuosus, bracteis subinflorescentia nonnullis anguste lanceolatis praeditus. Rachis glabra, striata. Bracteae inflorescentiae anguste lanceolatae, irregulariter

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erosae, per medium longitudinaliter incrassatae. Flores laxè subverticillati. Sepala petalaeque reflexa. Sepala persimilia, rotundato-ovata, obtusa vel subacuta, concava. Petala oblonga, leviter spatulata, apice late rotundata. Labellum in circuitu triangulari-subquadratum, trilobatum; lobi laterales triangulares, obtusi, marginibus lateralibus erosis praediti; lobus medius porrectus, in lobulos oblongos rotundatos patentes ad medium sinu magno divisus. Ovarium hexagonum.

Plant stemless, caespitose, similar in habit to *Oberonia Elmeri* Ames and *O. Costeriana* J. J. Sm. Roots numerous, fibrous, flexuous, glabrous, up to 1 mm. thick. Leaves usually five, three well developed and two smaller basal ones, equitant, elongate-linear, closely imbricated at the sheathing scarious-margined base, free portion up to 17 cm. long, 9 mm. thick dorso-ventrally at the middle, strict, acuminate, gently falcate, with a tendency to thicken in development. Peduncle surpassing the leaves especially in age, terminal, gently flexuous-suberect, striate, provided below the raceme with several ascending, narrowly lanceolate, erose bracts. Inflorescence up to 15 cm. long, 1.4 cm. wide in course of development. Rachis glabrous, deeply striate, the apical portion (up to 1.6 cm. or more in length) flowerless and provided only with irregular whorls of appressed bracts. Bracts ± 3.2 mm. long, narrowly lanceolate, shallowly and irregularly erose, concave, longitudinally thickened down the middle. Flowers loosely subverticillate. Sepals and petals reflexed. Sepals very similar, about 1.4 mm. long, shortly round-ovate, obtuse or subacute, strongly concave. Petals about 1.5 mm. long, oblong, slightly spatulate, broadly rounded above, upper margins irregularly and very shallowly denticulate. Lip triangular-subquadrate in outline, three-lobed, about 2.25 mm. long, at the base nearly 2.25 mm. broad across the lateral lobes; lateral lobes triangular, acuminate to an

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obtuse apex, bluntly irregularly and deeply erose on the lateral margins, separated from the middle lobe by a deep scarcely noticeable sinus; middle lobe porrect, divided as far as the middle by a deep broad sinus, into two oblong rounded spreading lobules, a small triangular tooth at the base of the sinus. Ovary hexagonal.

Clemens 328 shows several specimens that are smaller than the mature plants of the type. The plants from Lobong Cave are less mature than those from Kiau, with shorter broader leaves (up to 1.2 cm. wide), which have a more fleshy texture.

Oberonia kinabaluensis is very similar to *O. Costeriana* J. J. Sm., but with generally smaller laxer leaves, salmon instead of brown flowers, and a very different mid-lobe of the lip. It has much narrower leaves, petals which are twice as large, and longer lip than *O. dubia* J. J. Sm. It is almost identical in habit with *O. Elmeri* Ames, but varies in the petals, lip, and color of the flowers. (PLATE 89.)

KIAU, *Clemens 329* (Type), November 1915. Flowers salmon; *Clemens 328*, November 1915. LOBONG CAVE, *Clemens 104 A*, November 1915. 5000 feet altitude; *Clemens 102 A*, November 1915. 5000 feet altitude.

3. *Oberonia patentifolia* A. & S. *sp. nov.* Herba caulescens. Caulis erectus vel erecto-patens, regulariter flexuosus, vaginis foliorum omnino obtectus. Folia disticha, equitantia, ensiformia, obtusa, erecto-patentia, non incurva; folia suprema ac infima multo minora. Pedunculus infra racemum perbrevis, striatus, verticillo bractearum ornatus. Racemus arcuatus. Rachis densissime pubescens. Bracteae inflorescentiae triangulares vel lanceolatae, concavae, valde fimbriatae. Flores subdensi, verticillati, prope apicem laxiores. Perianthium reflexum. Sepala concava. Sepala lateralia ovata, obtusa, mucronata. Sepalum dorsale rotundato-ovatum, late obtusum. Petala ovato-oblonga, acuta. Labellum

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panduratum, utrinque in medio constrictum, in auriculas binas dorsales falcatas obtusas extensum, parte anteriore in lobulos binos approximatos semi- vel suborbiculares abrupte dilatatum.

Plant caulescent. Stem from the base of the plant to the base of the raceme, ± 23 cm. tall, erect or erect-spreading, regularly flexuous or sinuous, entirely concealed by the leaf sheaths. Leaves (measuring the outer margin to the leaf blade next below) ± 7 cm. long, (measuring the inner margin to the blade next above) ± 6 cm. long, ± 1 cm. thick dorso-ventrally below, distichous, equitant, ensiform, gradually narrowed to an obtuse or microscopically truncate apex, spreading-ascending, not incurved, the uppermost and lowermost leaves markedly shorter than the intermediate ones. Peduncle below the raceme about 1.4 cm. long, striate, provided with an irregular whorl of lanceolate bracts, glabrous below, pubescent above. Raceme about 12 cm. long, 5 mm. broad, arcuate; rachis densely pubescent. Bracts of the raceme triangular to lanceolate, concave, deeply fimbriate, sparsely pubescent without. Flowers minute, verticillate, rather dense, looser toward the apex. Perianth reflexed. Sepals concave. Lateral sepals about 1.25 mm. long, ovate, obtuse, mucronate. Dorsal sepal about 1.25 mm. long, round-ovate, broadly obtuse. Petals about 1 mm. long, ovate-oblong, acute. Lip about 1.4 mm. long, 1.1 mm. wide at the base and near the apex, pandurate, constricted in the middle, extended back into two spreading, broadly falcate, obtuse auricles, the anterior portion abruptly dilated into two semi- or suborbicular lobules which are scarcely spreading, but are sometimes slightly overlapping. Column short. Ovary very densely pubescent.

The material gathered by Clemens at Kiau consists of two plants that are much smaller and less robust (one with a spike up to 17.5 cm. long) than the type; the flowers are less ad-

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vanced and the terminal part of the raceme bears only whorls of bracts.

This species is very close to the Philippine *Oberonia hispidula* Ames, but it shows several distinct differences. In *O. hispidula* the leaves are gently but distinctly falcate-incurved, the bracts are aristate, the flowers smaller and greenish. *O. mindorensis* Ames has blunt leaves and greenish flowers which are different in detail. *O. padungensis* Schltr. is a similar plant with fewer leaves and broader racemes of larger flowers. *O. pleistophylla* Schltr. possesses denser incurved leaves, erect racemes, and green flowers with a different lip. (PLATE 90.)

LOBONG CAVE, *Clemens* 104 (Type), November 1915. 5000 feet altitude. Flowers brown. KIAU, *Clemens* 27, November 1915. Flowers tan brown.

4. *Oberonia triangularis* A. & S. *sp. nov.* Radices fibrosae, flexuosae, longitudinaliter sulcatae. Herba caulescens. Caulis flexuosus, in visu erectus, foliis omnino obtectus. Folia disticha, equitantia, valde imbricantia, a latere visa triangularia apparentia, marginibus superioribus anguste scariosis. Pedunculus infra racemum perbrevis, striatus, verticillis bractearum fimbriatarum obtectus. Racemus arcuato-flexuosus. Rachis densissime pubescens. Bractee inflorescentiae lanceolatae, concavae, fimbriatae. Flores subverticillati, in medio racemi densissimi, parte apicali rachidis omnino deficientes. Sepala lateralia ovata, acuta. Sepalum dorsale rotundato-ovatum, obtusum. Petala anguste ovata. Labelum sepalis majus, in circuitu triangulari-subquadratum vel subquadratum, basi truncatum, apice bilobatum. Ovarium densissime tomentosum.

Roots fibrous, flexuous, furrowed, up to 1 mm. thick. Plant caulescent. Stem about 9.7 cm. tall from the base of the plant to the base of the raceme, regularly flexuous or sinuous, entirely concealed by the leaves. Leaves distichous, equitant, closely im-

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bricated so that each blade appears triangular, about 2.2 cm. long on the lower margin, about 1.7 cm. long on the upper margin, and about 7 mm. across the widest part of the blade; the upper margin narrowly scarious, extending about 5 mm. beyond the leaf above and more or less narrowed to an obtuse tip. Peduncle below the raceme 7 mm. long, striate, thickly covered with whorls of lanceolate, fimbriate bracts. Raceme about 8 cm. long, 4 mm. wide, arcuate-flexuous. Rachis striate, closely pubescent. Bracts of the raceme lanceolate, concave, deeply fimbriate. Flowers subverticillate, very dense in the middle of the raceme, looser below and above, near the apex the rachis provided only with whorls of appressed bracts. Lateralsepals about 1.1 mm. long, ovate, acute. Dorsal sepal about 1.1 mm. long, round-ovate, more or less obtuse. Petals about 1 mm. long, narrowly ovate. Lip much larger than the sepals, about 1.5 mm. long and equally broad at the base, in outline triangularly subquadrate or subquadrate, the base broadly truncate and extended into short rounded auricles, above the auricles the limb gradually contracting to a deeply bilobed apex, the lobules broadly rounded, the sinus narrow, the apices slightly converging; disc slightly concave and thickened in the middle near the base. Another form of lip is definitely subquadrate in outline and about equally wide near the base and apex. Ovary densely tomentose.

This species closely resembles *Oberonia aporophylla* Reichb. f. vegetatively, but differs markedly in the flower. *O. spathulata* Lindl. also suggests *O. triangularis* superficially. The deeply imbricating leaves with short free apices give this species a distinctive appearance, but the single specimen that constitutes the type fails to show the variation that is highly probable. Another collection, *Clemens 275 A*, represents a form with somewhat shorter clustered stems, more spreading sub-fleshy leaves and deflexed

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racemes which are less than 3 cm. in length. This form as well as the type is figured in the plate. (PLATE 90.)

LOBONG CAVE, *Clemens 104 B* (Type), November 1915. 5000 feet altitude. MAREI PAREI SPUR, *Clemens 275 A*, November 1915.

21. *LIPARIS* *L. C. Rich.*

Twenty-two members of this genus have previously been recorded from Borneo of which four are found on Mount Kinabalu. Five new species are described below.

1. *Liparis* (§ *Distichae*) *disticha* (*Thou.*) *Lindl.* in *Bot. Reg.* (1825) sub t. 882. *Malaxis disticha* *Thou.* *Hist. Pl. Orch.* (1822) t. 89.

GURULAU, above Kiau Ridge, *Gibbs 4014*, February 1910. 5000 feet altitude. Epiphytic in primary forest. Flowers reddish.

2. *Liparis* (§ *Mollifoliae*) *grandis* *A. & S. sp. nov.* *Herba robusta*. *Rhizoma lignosum*. *Radices fibrosae, striato-sulcatae, rigidae*. *Pseudobulbi monophylli, parvi, inconspicui*. *Folium majus, elliptico-lanceolatum vel anguste oblanceolatum, acuminatum, ad basim longe angustatum, subcoriaceum, nervis circiter quinque subtus prominentibus*. *Petiolus longus, conduplicatus, in laminam folii transeuns*. *Pedunculus basi folii approximatus, folium superans, e basi breviter decumbenti erectus, teres, basi vaginis nonnullis imbricantibus et bracteis lanceolatis remotis subadpressis usque ad inflorescentiam praeditus*. *Rachis levissime arcuata*. *Bractee inflorescentiae anguste lanceolatae, acuminatae*. *Racemus laxissimus*. *Pedicellus filiformis*. *Perianthium in sicco pellucidum*. *Sepala lateralia linearia, apice cucullato obtusa*. *Sepalum dorsale paulo angustius*. *Petala anguste linearia, obtusa*. *Labellum e basi cuneata in laminam suborbicularem vel interdum late ellipticam dilatatum, subito conspicue mucronatum, marginibus anterioribus eroso-crenulatis, ad basim*

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callo \wedge -formi instructum. Gynostemium in positu naturali valde arcuatum.

Plant stout. Rhizome .5–1 cm. thick, woody, concealed by sheaths. Roots \pm 1 mm. thick, fibrous, flexuous, rigid, striate-sulcate, apparently unbranched. Pseudobulb monophyllous, small and very inconspicuous, closely wrapped by the base of the petiole and indicated only by a slight dilation. Leaf \pm 30 cm. long, 5 cm. wide, elliptic-lanceolate oblong-lanceolate or narrowly oblanceolate, acuminate above, gradually narrowed to a complicate or conduplicate base, erect or erect-spreading, subcoriaceous, many-nerved with five nerves prominent beneath. Petiole \pm 10 cm. long, conduplicate, merged into the leaf blade. Scape approximate to the leaf base, 40–60 cm. long, surpassing the leaf, rigidly suberect from a shortly decumbent base, terete, clothed at the base with several lanceolate imbricating scarios sheaths and apparently enclosed—together with the base of the petiole—in one or more narrowly lanceolate sheaths, provided—up to the rachis—with remote, lanceolate, appressed or ascending bracts. Rachis 22–36 cm. long, slightly arcuate above. Bracts of the inflorescence \pm 1.2 cm. long, narrowly lanceolate, clasping at base, long acuminate to the apex. Pedicel 2–3 cm. long, filiform, ascending, the ovary short and little thickened. Perianth in the dried specimen pellucid. Lateral sepals about 1.25 cm. long, 2.5 mm. broad across the lower half, linear-lanceolate, gradually narrowed to an obtuse cucullate apex. Dorsal sepal linear, about 1.25 cm. long, 2 mm. wide, similar. Petals about 1.3 cm. long, 1.5 mm. broad, linear, obtuse. Lip about 1.3 cm. long, 8–9 mm. broad, dilated from a cuneate base into a suborbicular or rarely broadly elliptic limb, abruptly mucronate, the forward margins erose-crenulate, provided with a \wedge - or λ -shaped callus at the base, the middle nerve thickened and carinate beneath. Column

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in natural position 3.5–4 mm. long, strongly arcuate, thickened at the base, provided above with a rounded membranaceous wing.

This species has several allies. The plant is taller, the leaves are longer and narrower, with longer petioles and lip than *Liparis matuanensis* J. J. Sm. *L. tricallosa* Reichb. f. has several shorter leaves, an obtuse instead of sharply mucronate lip and a suberect column. Unlike *L. acaulis* Schltr., the scape of this species exceeds the leaf and the flower has a different callus. The Philippine *L. jarensis* Ames¹ is particularly closely allied, but it has slender scapes much shorter than the leaves and slightly smaller flowers.

The tall stout scapes of this plant with the many-flowered lax racemes of large flowers and the mucronate lip are characteristic marks.

KINABALU, *Haslam*, July–August 1916.

3. *Liparis* (§ *Mollifoliae*) **kamborangensis** *A. & S. sp. nov.*
Herba humilis, erecta. Pseudobulbi parvi, pyriformes, approximati. Folium singulum, ovatum, acuminatum, petiolo longe vaginanti praeditum. Pedunculus leviter flexuosus vel suberectus. Bractee inflorescentiae anguste lanceolatae, obtusae, sulcatae, carinatae. Sepala lateralia lanceolato-oblonga, obtusa, apice minute cucullata. Sepalum dorsale persimile. Petala linearia, obtusa, circinnata. Labellum cuneato-subquadratum, parte apicali leviter triangulari, conspicue apiculatum, margine anteriore utrinque dentibus septem subulatis irregularibus praeditum, prope basim callis duobus subparallellis instructum. Gynostemium arcuatum, e basi lata ad partem superiorem angustatum.

Plant small, stout, strict, up to 16.5 cm. or more tall. Roots fibrous, apparently few and unbranched, closely white lanate. Pseudobulbs approximate, ±8 mm. tall, pyriform, oblique. Leaf about 4 cm. long, 2.5 cm. wide, spreading, broadly ovate, acu-

¹ For description cf. page 293.

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minate, complicate at the rounded base. Peduncle when immature flexuous-suberect with the raceme arcuate, when mature erect or nearly so, narrowly two-winged or sulcate, enveloped at the base by the sheathing petiole. Rachis ± 5 cm. long. Bracts of the raceme ± 8 mm. long, narrowly lanceolate, obtuse, conspicuously carinate, sulcate-concave, ascending. Flowers somewhat lax. Lateral sepals about 6.6 mm. long, 2.5 mm. wide at the base, lance-oblong, obtuse, carinate, minutely cucullate at the apex, three-nerved, sharply reflexed. Dorsal sepal very similar. Petals about 6.35 mm. long, .75 mm. wide at the base, linear, very gradually narrowed from below to a rounded apex, one-nerved, somewhat circinnate. Lip about 6 mm. long, cuneate-subquadrate, prominently apiculate, gradually dilated from the base to the broadly flattened-triangular anterior portion which is nearly 6 mm. wide, the apical margins provided on each side of the prominent narrowly triangular apicule with about seven subulate irregular undulate teeth, the lateral margins gently concave; near the base of the lip there are two indistinct, oblong, subparallel, distant calli. Column about 3.7 mm. long, strongly arcuate, gradually contracted from the broad base to the upper portion, with a pair of small rounded wings at the apex.

There are apparently no near allies of this little plant.

KAMBORANGAH, *Clemens 220*, November 1915. Flower purple.

4. *Liparis* (§ *Coriifoliae*) *latifolia* Lindl. Gen. & Sp. Orch. (1830) 30.

KIAU, *Clemens 180*, November 1915. 3000 feet altitude. Flower red, tip grading to salmon, column cream color.

5. *Liparis* (§ *Distichae*) *lingulata* A. & S. *sp. nov.* Rhizoma gracile, lignosum, vaginis scariosis imbricantibus vestitum. Radices numerosae, fibrosae, longitudinaliter sulcatae. Pseudobulbi approximati vel subremoti, longi-rostrati, monophylli. Folium

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anguste lineare, apice complicato acutum, basim pedunculi plus minusve vaginans, rigidum, erectum, subcoriaceum. Pedunculus cum inflorescentia semper folium excedens, bialatus. Rachis brevis. Bracteae distichae, approximatae vel imbricatae, conduplicatae. Flores succedanei, parvi. Sepala lateralia lanceolato-ovata, apice incrassato cucullata, obtusa, leviter obliqua, nervis tribus subapproximatis. Sepalum dorsale lanceolatum, apice obtusum et paulum incrassatum, nervis similibus praeditum. Petala spathulato-lineararia, e basi perangusta sensim dilatata, apice rotundata, uninervia. Labellum in circuitu triangulari-lingulatum, ad basim plica magna utrinque instructum, deinde fere ad medium constrictum, tum in laminam ovatam truncatam extensum. Callus magnus, transverse oblongus ad basim in medio stat. Gynostemium breve et crassum, basi latissimum, in parte superiore alis binis parallelis porrectis rotundatis instructum.

Plant slender. Rhizome 1.5–2 mm. thick, slender, woody, clothed with short imbricated scarious sheaths. Roots about .6 mm. thick, numerous, fibrous, flexuous, longitudinally sulcate. Pseudobulbs approximate or as much as 1 cm. apart, \pm 3 cm. long, 5 mm. wide below, monophyllous, more or less gradually attenuated from a pyriform base to the long closely striate neck, sheathed when young. Leaf \pm 15.7 cm. long, 6 mm. wide across the slightly broader upper portion, narrowly linear, acute at the complicate-mucronate apex, more or less sheathing the base of the peduncle, rigid, erect, subcoriaceous, many-nerved. Peduncle with the inflorescence \pm 21 cm. long, always surpassing the leaf, two-winged, about 1.4 mm. wide in the middle and a little wider just beneath the inflorescence. Rachis 1–4 cm. long, zigzag. Bracts \pm 5 mm. long, alternately distichous, closely approximate or imbricating, conduplicate, ascending. Flowers successive,

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small. Lateral sepals about 4.5 mm. long, 2.25 mm. broad, lance-ovate, apex thickened cucullate and obtuse, slightly oblique, with three subapproximate nerves. Dorsal sepal about 5 mm. long, 1.75 mm. wide near the base, lanceolate, obtuse at the slightly thickened tip, with three approximate nerves. Petals about 4.8 mm. long, scarcely 1 mm. wide near the apex, spatulate-linear, gradually broadened from a very narrow base to the rounded apex, one-nerved. Lip in natural position about 3.4 mm. long, 2.9 mm. broad near the base, triangular-lingulate in outline; disc short-clawed, extended on each side, from a broad rounded base, into a conspicuous fold then abruptly contracted to about the middle from which point extended into an ovate limb which is truncate at the apex with a small central rounded callus. There is a large transversely oblong callus which is situated, near the base, in the middle and just below the folds. Column about 2 mm. long and nearly as broad at the base, gradually narrowed from the base, with a pair of parallel porrect triangular rounded wings above.

There are several rather near allies of this species. *Liparis pseudo-disticha* Schltr. has leaves about equaling the flowering peduncles and differently colored, smaller flowers with a larger lip. *L. Gjellerupii* J. J. Sm. possesses shorter pseudobulbs, a scape which about equals the leaves and a differently proportioned lip. It is vegetatively a much smaller plant than *L. geelvinkensis* J. J. Sm. The very similar *L. lobongensis* Ames has a much larger callose lip and differently colored flowers. *L. gautierensis* J. J. Sm. is a much larger species than *L. lingulata*.

KIAU, *Clemens 324*, November 1915. Flower salmon.

6. *Liparis* (§ *Distichae*) *lobongensis* Ames *sp. nov.* Pseudobulbi approximati, monophylli. Folium lineare, acutum, scapo longius. Scapus bialatus. Racemus complanatus. Bractee inflo-

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rescentiae distichae. Flores succedanei. Sepala lateralialia oblonga, acuta, valde reflexa. Petala erecta, oblanceolata vel spathulata. Labellum obscure trilobatum; lobi laterales parvi; lobus medius oblongo-ovatus, truncatus, pro parte papillosum; discus ad basim callosus. Gynostemium breve, crassum.

Pseudobulbs 5–10 mm. long, 3–4 mm. in diameter, approximate, minute, pyriform, attenuated toward the leaf base, monophyllous, rugose. Leaf 22–36 cm. long, 5–7 mm. wide, linear, grass-like when dry, acute, articulated. Petiole 14–24 mm. long, persistent. Scape up to 24 cm. long, shorter than the leaf, conspicuously two-winged, naked below the inflorescence. Raceme 1.5–4.5 cm. long, elongating during anthesis, about 1 cm. wide. Bracts of the raceme 6 mm. long, distichous, lanceolate, acute, approximate, persistent, obliquely ascending, rigid, shorter than the pedicellate ovary. Flowers yellow, opening in succession, rarely more than one present at a time. Lateral sepals 5.5 mm. long, about 2.5 mm. wide, oblong, acute, reflexed, margins revolute. Dorsal sepal pendent, similar to the laterals. Petals 6 mm. long, 1–1.25 mm. wide above the middle, erect, linear-oblanceolate, obtuse, attenuated below the middle. Labellum 5 mm. long, somewhat three-lobed, sharply reflexed above the base; lateral lobes rounded, each forming an auricle thickened with a convex bullate callus; middle lobe 3 mm. long, 2 mm. wide, oblong-ovate, lingulate, truncate, papillose on the margins and distal half, the middle of the upper half smooth, depressed. Disc smooth with a large three-lobed callus near the column. Column very short and stout, 2 mm. long, about 2 mm. wide, with two blunt triangular wings just below the stigma.

A large collection of specimens, *Clemens 103*, shows much smaller vegetative proportions and considerably smaller lip of the same peculiar character.

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The details of the flower recall *Liparis Janowskyi* J. J. Sm., a native of New Guinea.

LOBONG, *Clemens* 219 (Type), October 1915; *Clemens* 103, November 1915.

7. *Liparis* (§ *Densiflorae*) *longipes* Lindl. in Wall. Pl. As. Rar. 1 (1830) 31, t. 35.

KIAU, *Clemens*, October 1915. Flowers white; *Clemens* 35, November 1915. 3000 feet altitude. Flowers white; *Clemens* 38, November 1915. 3000 feet altitude. Flowers white; *Clemens* 49, November 1915. 3000 feet altitude. Flowers white; *Clemens* 90, November 1915. 3000 feet altitude. Flowers white; *Clemens* 175, November 1915. 3000 feet altitude. Flowers greenish white; *Clemens* 337, November 1915. 2500–3000 feet altitude. Flowers cream color. GURULAU SPUR, *Clemens* 312, November 1915. ±4000 feet altitude. Flowers cream color.

8. *Liparis* (§ *Distichae*) *pandurata* Ames sp. nov. Pseudobulbi pyriformes, elongati, monophylli. Folium ligulatum, acutum, scapo longius. Bractee inflorescentiae distichae, falcatae, acutae. Flores succedanei, eodem tempore singuli vel perpauci aperti. Sepala lateralia oblonga, acuta. Sepalum dorsale simile. Petala lineari-triangularia, acuta. Labellum panduratum, apice retusum, apiculatum, margine denticulato. In disco callus bicornutus. Gynostemium valde arcuatum.

Rhizome stout, creeping. Pseudobulbs ±5 cm. long, elongated, pyriform, attenuated above into a slender complanate neck, monophyllous, concealed by three diverging ensiform sheaths. Leaf ±3 dm. long, 2 cm. wide, ligulate, acute, narrowed into a conduplicate petiole, deciduous. Scape ±2 dm. long, shorter than the leaf, conspicuously two-winged, naked below the raceme, at base sheathed by the leaf. Racemes ±5 cm. long. Bracts of the inflorescence 7 mm. long, falcate, acute, conduplicate, rigid, obliquely ascending, shorter than the pedicellate ovary, closed at the end. Flowers dark salmon, opening in succession, usually only one fully open at a time. Lateral sepals 8 mm. long, about 3 mm.

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wide, oblong, contracted at the apex into a terete point, reflexed, pendent. Dorsal sepal similar to the laterals, reflexed, pendent. Petals about 6.5 mm. long, linear-triangular, acute, reflexed. Labellum pandurate, about 8 mm. long, 12 mm. wide near the retuse apiculate apex, ascending for 1.5 mm. then sharply reflexed, apical margin irregularly serrate-dentate; at base near the column a bi-cornute callus is situated. Column strongly arched above the middle, the tip of the anther cap pointing downward.

Allied to the Philippine *Liparis nutans* Ames, but clearly distinguished by the toothed apex of the pandurate labellum.

LOBONG, *Clemens 117*, November 1915.

9. *Liparis* (§ *Densiflorae*) *parviflora* Lindl. Gen. & Sp. Orch. (1830) 31.

KIAU, *Clemens 350*, November 1915. Flower cream with red on tongue.

10. *Liparis* (§ *Coriifoliae*) *stricta* J. J. Sm. in Bull. Dépt. Agr. Ind. Néerl. 5 (1907) 3.

A large number of specimens collected on Mount Kinabalu, together with several collections from the neighborhood of Sarawak, must be referred to this species. All these specimens show an apiculate lip, a character not mentioned in the description, and the leaves are markedly narrower than those attributed to this plant. Some of the leaves measure 6 cm. in length and 1 cm. in width.

KINABALU, *Haslam*, July–August 1916. KIAU, *Clemens 35A*, November 1915. 3000 feet altitude. Flower white; *Clemens 37*, November 1915. 3000 feet altitude. Flower whitish-green, column yellow; *Clemens 46*, November 1915. 3000 feet altitude. Flower greenish with orange column; *Clemens 77*, November 1915. 3000 feet altitude. Flower creamy white; *Clemens 139*, November 1915. 3000 feet altitude. Flower cream with yellow lip and column; *Clemens 141*, November 1915. 3000 feet altitude. Flower cream with yellow petals. GURULAU RIDGE, *Clemens 306*, November 1915. 5000 feet altitude. LOBONG CAVE, *Clemens 119*, November 1915. 5000 feet altitude. Flower cream with salmon column. SARAWAK, *Native Col-*

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lector 1348. MOUNT SUDAN, Native Collector 2097, February–June 1914. Flower pale yellow. MOUNT SANTUBONG, Native Collector 2248, February–June 1914. “Fl. red.”

22. ARUNDINA Bl.

Five species of this genus are now reported from Borneo, three of which are recorded from Mount Kinabalu. Except for the one new species, none of the plants are endemic.

1. *Arundina Cantleyi* Hook. f. Fl. Brit. Ind. 5 (1890) 858.

A very variable form with leaves ranging from 5–12 cm. in length, larger bracts than the type and oblanceolate petals.

MAREI PAREI SPUR, *Clemens 272*, November 1915. Flowers white and yellow; *Clemens 266 A*, November 1915.

2. *Arundina gracilis* A. & S. sp. nov. Herba gracilis, alta. Caulis erectus, vaginis coriaceis foliorum omnino obtectus. Folia disticha, patentia, linearia, apice rotundata vel paulum bilobata, basi plus minusve amplectentia, sensim acuminata, nervo medio supra sulcato, subtus carinato. Inflorescentia terminalis, simplex, brevis, nutans vel reflexa, foliis multo brevior. Rachis pauciflora. Bracteae valde cymbiformi-conduplicatae, prope apicem conspicue alato-carinatae, ovaria aequantes et amplectentes. Sepala lateralia oblongo-lanceolata, complicato-mucronata, plus minusve falcata, carinata in parte superiore praesertim. Sepalum dorsale anguste ellipticum, acutum, sepalis lateralibus paulo longius et latius. Petala linearia, circa in medio latiora, leviter falcata, abrupte obtusa vel subacuta. Labellum in circuitu ovato-oblongum, in medio trilobatum; lobi laterales parvi, triangulari-oblongi, rotundati; lobus medius oblongo-subquadratus, late truncatus, apiculatus; carinae tres, undulatae, e basi usque ad partem anteriorem lobi medii extendunt, carinula brevis utrinque stat. Gynostemium apodum, gracile, arcuatum, in parte superiore alatum.

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Plant relatively slender, up to more than 40 cm. tall (stem broken off). Stem erect or nearly so, terete, entirely concealed by the close coriaceous striate leaf sheaths, including these up to 5 mm. thick. Leaves up to 12.5 cm. long, 1.3 cm. wide near the base, distichous, spreading, linear, gradually narrowed from a rounded subclasping base to a rounded or minutely unequally bilobed apex, rigid, thick, coriaceous, with revolute margins; the mid-nerve strongly sulcate above and carinate beneath; the uppermost leaves abruptly much smaller. Internodes ± 1.5 cm. long. Inflorescence about 1 cm. long, terminal, nodding or reflexed, racemose, springing from the uppermost of several abruptly shortened internodes, markedly exceeded by the upper leaves. Rachis bearing three or four flowers, zigzag, glabrous. Bracts about 1.4 cm. long, apparently somewhat broader when expanded, strongly cymbiform-conduplicate, near the apex prominently wing-keeled, enveloping and about equaling the pedicellate ovary, the lowest bracts often with long foliaceous tips. Lateral sepals about 2 cm. long, 6.5 mm. broad, oblong-lanceolate, complicate-mucronate, somewhat obliquely falcate, seven-nerved, mid-nerve carinate especially near the apex. Dorsal sepal about 2.25 cm. long, 7.5 mm. broad across the middle, narrowly elliptic, acute, about nine-nerved. Petals about 2.1 cm. long, 4.5 mm. wide, linear, slightly falcate, gradually narrowed from about the middle to the base and to the apex which is abruptly contracted to an obtuse or subacute tip. Lip ovate-oblong in outline, three-lobed at about the middle, about 1.7 cm. long, 1 cm. broad across the side lobes; lateral lobes small, free part about 2.7 mm. long, 2.5 mm. broad at the base, triangular-oblong, broadly rounded at the apex; middle lobe much larger, about 7.5 mm. long, 5.5 mm. wide at the base, oblong-subquadrate, broadly truncate, apiculate; three fleshy undulate keels extend from the thickened base

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of the lip to a point near the apex of the middle lobe, on each side a shorter supplementary keel running from the middle of the lateral lobes to the middle of the median lobe. Column footless, about 1.4 cm. long, slender, arcuate, flattened on the anterior surface, winged above, the wing shortly dentate at the apex.

Great variability is indicated by several contemporary collections. *Clemens 266* shows one inflorescence indicating five flowers. Another collection, *Clemens 244*, shows stems exceeding 55 cm. in height, smaller cream-colored flowers, and a two-celled anther with eight complanate, ovoid, waxy pollinia. A fragmentary specimen collected by Haslam shows shorter leaves and ovate middle lobe of lip.

This plant is quite characteristic, but in flower structure it is similar to *Arundina Cantleyi* Hook. f.

KINABALU, *Haslam*, July–August 1916. MAREI PAREI SPUR, *Clemens 370* (Type), December 1915. Flower cream color and purple; *Clemens 266*, November 1915. Flower purple and white; *Clemens 244*, November 1915. Flower cream color.

3. *Arundina speciosa* Bl. Bijdr. (1825) 401, Tabell. f. 73.

KINABALU, *Clemens*, November–December 1915; *Haslam*, July–August 1916. KIAU, *Clemens 186*, November 1915; *Clemens 265*, November 1915. Flower white with pink and purple lip; *Clemens 277*, November 1915.

23. DENDROBIUM Sw.

One hundred and nineteen members of this large genus have been recorded from Borneo, of which only three were previously known from Mount Kinabalu. In the present work *Sarcopodium* is regarded merely as a subgenus of *Dendrobium*.

1. *Dendrobium* (§ *Desmotrichum*) *bicarinatum* A. & S. sp. nov. Radices in basi caulis numerosae et e locis prope nodos raro orientes. Caulis gracilis, pluriarticulatus, vaginis mox in fibras solutis vestitus. Pseudobulbi fusiformes vel pyriformes, mono-

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phylli. Folium ovato-oblongum, acuminatum, basi rotundatum, coriaceum. Flos e summa pseudobulbi post folium exoriens. Sepala lateralia late ovato-triangularia, acuta, obliquissima, mentum saccatum formantia. Sepalum dorsale ovatum, obtusum. Petala anguste elliptica, subacuta. Labellum in circuitu obovato-oblongum, trilobatum, e basi ad ultra medium cuneato-flabellatum, deinde abrupte contractum lobos triangulares formans; lobus medius subquadratus, profunde bilobulatus; carinae duae e basi ad medium lobi medii extendunt. Gynostemium breve, pede lato praeditum.

Plant about 36 cm. tall from the rhizome to the apex of the erect terminal leaf. Rhizome woody (broken off at the base of the stem). Roots thickly clustered at the base of the stem or occasionally adventitious near all but the lowest nodes, fibrous, flexuous, subrigid, glabrous, up to 1 mm. thick. Stem slender, many-jointed, slightly thickened at the base, rigid, yellow, shining, smooth or somewhat striate-sulcate, the nodes crowned with a narrow black ring, the internodes invested by sheaths which become frayed remnants in course of development. Pseudobulbs produced from the uppermost and two middle nodes of the stem, ± 3.5 cm. long, 1 cm. broad, fusiform-cylindric to narrowly pyriform, monophyllous, yellow, shining, striate-sulcate, when young invested by a sheath. Leaf about 9.6 cm. long, 3.3 cm. wide below the middle, ovate-oblong, acuminate above (point broken off), broadly rounded to a sessile complicate base, coriaceous, the mid-nerve markedly sulcate above and carinate beneath. Flower at the summit of the pseudobulb behind the leaf, rising from a tuft of fibrous bracts, pellucid in the dried specimen. Lateral sepals about 7 mm. long, 8 mm. wide, broadly ovate-triangular, acute at the complicate apex, very oblique, forming a deeply saccate mentum below, provided with three more or less distinct

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nerves and many supplementary ones. Dorsal sepal about 6 mm. long, 3.5 mm. broad near the base, ovate, obtuse, concave, indistinctly seven-nerved. Petals about 7 mm. long, 2.5 mm. wide, narrowly elliptic, subacute, three-nerved. Lip obovate-oblong in outline, three-lobed, about 12 mm. long, 6.2 mm. wide across the lateral lobes, gradually cuneate-flabellate from the base to slightly above the middle, then abruptly contracted to form the subquadrate middle lobe; lateral lobes shallowly triangular with a rounded or subtruncate apex; middle lobe bilobed to about the middle, with semi-orbicular spreading lobules about 2.5 mm. long, which are separated by a broad sinus provided at the base with a minute blunt tooth; two high, thin, parallel keels extend from the base of the lip to the center of the middle lobe, where they converge slightly toward a short median verrucose ridge which extends from the base of the middle lobe nearly to the sinus. Column short, provided with a broad upwardly curved foot. Anther subglobose, two-celled, with ciliolate margins.

Dendrobium bicarinatum is vegetatively very similar to *D. Eurorum* Ames, which, however, has differently colored much smaller flowers with different lip characters. *D. schistoglossum* Schltr. differs from *D. bicarinatum* in its broader pseudobulbs and floral details. From a photograph, *D. appendiculatum* Lindl. is apparently a near ally, but the pseudobulbs appear broader than in this plant.

KIAU, *Clemens 335*, November 1915. Flower cream color.

2. *Dendrobium* (§ *Grastidium*) *connatum* (*Bl.*) *Lindl.* Gen. & Sp. Orch. (1830) 89. *Onychium connatum* *Bl.* Bijdr. (1825) 328.

KINABALU, *Haslam*, July–August 1916.

3. *Dendrobium* (§ *Crumenata*) *crumenatum* *var. parvi-*

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florum *A. & S. var. nov.* A specie, haec planta floribus parvis atque petalis apice rotundatis differt.

This plant differs from the species in the much smaller flowers and broadly rounded petals. Lateral sepals about 1.25 cm. long, 1.35 cm. broad, triangular, very oblique, acute, forming a shallowly saccate mentum. Dorsal sepal about 1 cm. long, 5.8 mm. wide, lance-ovate, obtuse. Petals about 1.1 cm. long, 6 mm. wide, elliptic, broadly rounded at the apex. Lip about 2 cm. long, 1.3 cm. broad across the lateral lobes, cuneate-flabellate, three-lobed; middle lobe largest, about 6 mm. long, 8.5 mm. broad, suborbicular, very broadly rounded or slightly retuse; five parallel approximate keels are conspicuous just above the middle, as in the species.

KIAU, *Clemens 188*, November 1915. 3000 feet altitude. Sepals pink-tinged, inner parts pinkish-white with yellow tongue.

4. **Dendrobium** (§ *Grastidium*) **fusco-pilosum** *A. & S. sp. nov.* Herba erecta. Caulis pilis fuscis subdense vestitus. Folia disticha, latissime patentia, lineari-lanceolata, sensim acuminata, apice oblique bilobata. Flores singuli, e nodis superioribus exorientes. Sepala lateralia lineari-oblonga, obliquissima, complicato-mucronata, basibus et marginibus anterioribus calcar arcuatum formantibus. Sepalum dorsale oblongum, complicato-mucronatum. Petala angustissime linearia, acuta. Labellum in circuitu cuneato-spathulatum, papillosum, ex ungue longo involuto in laminam trilobatam extensum; lobi laterales parvi, anguste triangulares, rotundati; lobus medius suborbicularis, plus minusve retusus, apiculatus, verrucosus, erosus. Gynostemium in parte superiore alatum, latissime truncatum, apiculatum.

Plant up to 37 cm. tall, erect or nearly so. Roots fibrous, flexuous, somewhat branched, whitish, more or less indistinctly sulcate, occasionally adventitious at the lower nodes, ± 1.5 mm.

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thick. Stems slender, slightly sinuous, longitudinally sulcate, sub-densely clothed with reddish-brown hairs, especially the younger portions; internodes ± 1.6 cm. long. Leaves ± 4.5 cm. long, 5.3 mm. wide near the base, distichous, widely spreading, narrowly lanceolate to linear-lanceolate, long acuminate, at the apex very obliquely bilobed with sharp acute teeth, subcoriaceous, many-nerved, the mid-nerve somewhat sulcate above, three more or less conspicuous nerves beneath, provided with infundibuliform, brownish-hairy leaf sheaths which are ± 5 mm. long. Flowers rising singly from one or more of the nodes above the middle. Lateral sepals about 7.5 mm. long, 5 mm. broad, linear-oblong, exceedingly oblique, complicate-mucronate, three-nerved, carinate, connate with the column foot and paired sepal forming a saccate mentum and an arcuate spur which is ± 4.5 mm. long. Dorsal sepal about 7 mm. long, 2.3 mm. broad, oblong, complicate-mucronate, three-nerved. Petals about 7 mm. long, .8 mm. wide, narrowly linear, acute or acuminate, one-nerved. Lip issuing from the spur-shaped sack formed by the lateral sepals, three-lobed, about 1.2 cm. long and 6 mm. broad across the lateral lobes, in outline cuneate-spatulate, the entire lamina papillose; claw long, narrow, involute; lateral lobes erect, about 1.5 mm. long, dentiform, narrowly triangular, broadly obtuse; middle lobe about 4.5 mm. long, 4.5 mm. broad, suborbicular from a broad base, more or less retuse, apiculate, verrucose, erose. Column short, provided above with a fleshy broadly truncate wing which has a slender apicule in the center, below soon uniting with the walls of the lateral sepals. Anther subglobose, sulcate, papillose roughened, two-celled.

In *Clemens 284* occurs one plant which is more than 48 cm. tall.

The two nearest allies appear to be *Dendrobium Lobbii*

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Teijsm. & Binn. and *D. orbiculare* J. J. Sm. *D. fusco-pilosum* differs from the former in having an ecarinate lip, from the latter in having reddish-brown instead of black hairiness on the stem and sheaths and in numerous floral proportions.

GURULAU RIDGE, *Clemens 300* (Type), November 1915. Flower cream color. MAREI PAREI SPUR, *Clemens 284*, November 1915. Flower white, purple lip.

5. *Dendrobium* (§ *Aporum*) *kiauense* A. & S. *sp. nov.*
Herba robusta, suberecta. Caulis valdissime complanatus, vaginis foliorum fere vel omnino obtectus. Folia densa, scalpelliformia, erecto-incurva vel adscendentia. Flores e glomerulis lateralibus et terminalibus bractearum exorientes. Sepala lateralialia triangulari-ovata, obliqua, acuta vel obtusa, mentum conspicue saccatum formantia. Sepalum dorsale late ovatum, acutum vel obtusum. Petala ovata, acuta. Labellum spathulato-flabellatum, trilobatum; lobi laterales erecti, oblongo-rotundati; lobus medius subquadratus aut latissime truncatus aut retusus aut bilobulus; callus transversus inter lobos laterales extendit. Gynostemium ala carnosae late truncatae apiculatae et subtus pede lato saccato praeditum.

Plant stout, suberect. Roots numerous, fibrous, flexuous, branching, glabrous, up to 1 mm. thick. Stem up to 35 cm. tall, strongly complanate from a subterete slender base, almost or entirely concealed by the sheathing leaf bases, yellow, shining, lightly sulcate in the dried specimen; internodes ± 1.5 cm. long. Leaves ± 3.7 cm. long measuring the upper margins, ± 6.1 cm. long measuring the lower margins, 6 mm. to 1.1 cm. broad at the base, distichous, equitant, scalpelliform, acute, falcately incurved and erect or scarcely falcate and ascending, rigidly nervose, coriaceous. Flowers produced successively from few-flowered glomerules of scarious fibrous bracts which occur at

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the bases of the upper leaves and at the apex of the stem, pellucid in the dried specimen; perianth segments connivent, concave. Lateral sepals about 3.7 mm. long, 3.7 mm. wide, broadly triangular-ovate, oblique, obtuse or acute, forming a deeply saccate mentum, three- to five-nerved. Dorsal sepal about 3.3 mm. long, 2.5 mm. broad across the middle, broadly ovate, acute or obtuse, three-nerved. Petals about 3.2 mm. long, 1.8 mm. wide, ovate, acute, three-nerved. Lip connate with the column foot, in natural position parallel to the column, sharply decurved near the base, about 4–4.5 mm. long, about as broad across the lateral lobes when spread out, spatulate-flabellate in outline, three-lobed; claw broad, concave-involute, abruptly spreading into the lamina; lateral lobes erect, oblong-rounded, porrect-spreading; middle lobe reflexed, subequal to the lateral lobes, subquadrate, broadly truncate shallowly retuse or bilobed; a transverse, fleshy, shallowly bilobed callus extends between the lateral lobes. Column short, provided above with a fleshy wing which is broadly truncate with a narrow apicule, extended below into a broad saccate unciform foot.

Collections from Mount Kinabalu show variations from the type; for example, in *Clemens 128* there occurs a much greater sized flower with large middle lobe which has divergent lobules. Plants generally stouter and apparently much taller than the type and with a similarly large middle lobe are shown by *Clemens 304*.

In vegetative characters *Dendrobium kiauense* is very like *D. anceps* Sw., but has a markedly distinct labellum. *D. xiphophyllum* Schltr., while a near ally, is distinguished by its petals and far smaller lip with a four-lobed callus. *D. lobatum* (Bl.) Miq. is a more slender plant with differently proportioned flowers.

KIAU, *Clemens 176* (Type), November 1915. 3000 feet altitude. Flower

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cream color and yellow with purple stripes. LOBONG CAVE, *Clemens 128*, November 1915. Flower cream color, pink stripes, white column. GURULAU RIDGE, *Clemens 304*, November 1915. Flower cream color and purple.

6. *Dendrobium* (§ *Sarcopodium*) *kinabaluense* *Ridl.* in *Stapf in Trans. Linn. Soc. Ser. 2, 4 (1894) 234.*

KINABALU, *Haviland*.¹ 7000 feet altitude. Epiphytic. KAMBORANGAH, *Clemens 197*, November 1915. Flower yellow with pink on lip. MAREI PAREI SPUR, *Clemens 249*, November 1915. Flower cream color; *Clemens 367*, December 1915. Flower yellow; *Clemens 370 A*, December 1915.

7. *Dendrobium* (§ *Desmotrichum*) *longirepens* *A. & S. sp. nov.* Rhizoma longe repens. Pseudobulbi subremoti, monophylli, anguste pyriformes vel rarius fusiformes, obliqui, sulcati. Folium oblongum, apice rotundatum et inconspicue bilobulum, ad basim breviter angustatum. Flores singuli, purpurei, e summa pseudobulbi exorientes. Sepala lateralia ovato-oblonga, acuta, mucronata. Sepalum dorsale simile, late rotundatum, plus minusve mucronatum. Petala oblanceolato-oblonga, apice late rotundata. Labellum in circuitu suborbiculare, fere in medio trilobatum; lobi laterales erecti, late rotundati; lobus medius major, suborbicularis, papillosus; callus triangularis in medio stat. Gynostemium late alatum; ala apice angusta obtusa cucullata; pes latus saccatus.

Rhizome long creeping, slender, terete, rarely branched, many-jointed, yellowish-green and shining in the dried plant, invested by brownish imbricating scarious sheaths. Roots rather sparingly produced from the under side of the rhizome, slender, fibrous, simple or sparingly branched, the older minutely and finely verruculose and rarely showing black spreading hairs, about .5 mm. thick. Pseudobulbs ± 1.5 cm. high, narrowly pyriform or rarely fusiform, obliquely reclining, sulcate or rugose, at distances of 3 cm. or less, concealed by sheaths when immature. Leaf about

¹ This is the type of the species.

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4.2 cm. long, 8 mm. wide, oblong, rounded at the obscurely bilobed apex, shortly narrowed to a complicate subsessile base, rigid, suberect, coriaceous, the mid-nerve prominently sulcate above and carinate beneath, the margins somewhat revolute. Flowers solitary, rising from the summit of the pseudobulbs. Pedicellate ovary nearly 2 cm. long, slender, conspicuously exerted from the sheath. Lateral sepals about 10.5 mm. long, 4 mm. wide, ovate-oblong, acute, with a dorsal mucro, five-nerved, forming a slightly and inconspicuously saccate mentum. Dorsal sepal about 9.5 mm. long, 4.5 mm. broad across the middle, similar, broadly rounded and more or less mucronate at the apex. Petals about 1 cm. long, 4 mm. wide above, oblanceolate-oblong, broadly rounded at the apex, indistinctly mucronate, five-nerved, the upper margins very slightly erose. Lip 8 mm. long, 7.5 mm. broad across the middle, in outline suborbicular, deeply three-lobed; lateral lobes erect, broadly rounded with free part semi-orbicular; middle lobe larger, suborbicular, shallowly subretuse, minutely erose, very papillose except in the center at the base; a little below the center of the lip there is a V-shaped or shallowly triangular callus with one or two irregular longitudinal ridges running toward the base. Column short, stout, about 4 mm. long, broadly winged; wing narrowed from the base upward terminating in a cucullate blunt point; foot broad, saccate, wing-margined.

Clemens 372 shows somewhat smaller foliage and less distant pseudobulbs than the type. These differences are further accentuated in flowerless, apparently immature specimens, found at Kiau and Lobong.

In habit *Dendrobium longirepens* resembles *D. Fargesii* Finet.

MAREI PAREI SPUR, *Clemens 245* (Type), November 1915. Flower purple;

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Clemens 372, December 1915. Flower purple. KIAU, *Clemens 68 A*, November 1915. 3000 feet altitude. LOBONG CAVE, *Clemens 116 A*, November 1915.

8. *Dendrobium* (§ Crumenata) *minimum* A. & S. *sp. nov.*

Herba gracilis. Caules approximati, prope basim in partem incrassatam oblongam, valdissime complanatam dilatati, graciles, pluriarticulati, plus minusve ramosi. Folia disticha, anguste linearia, sensim acuminata, apice profunde et acriter bilobata. Flores perparvi, e nodis superioribus exorientes. Sepala lateralia ovato-triangularia, obtusa vel subacuta, obliqua, falcata, mentum conspicue saccatum formantia. Sepalum dorsale lanceolatum, acuminatum. Petala linearia, obtusa vel acuta, falcata. Labellum flabellatum, latissime truncatum, involutum, leviter decurvum, margine anteriore lato inconspicue sed profunde emarginato. Gynostemium perparvum, late alatum; ala emarginata, apiculata; pede lato saccato.

Plant slender, up to 45 cm. or more high. Roots numerous, slender, fibrous, flexuous, more or less longitudinally sulcate, glabrous, intertwining, up to 1 mm. thick. Stems approximate, near the base broadened into a strongly complanate, two- or three-jointed, sulcate, oblong, bulbous thickening which is up to 8 cm. long and 10.5 mm. wide where broadest, slender above, laterally flattened, many-jointed, more or less branched, yellow, shining, when immature invested throughout by long tubular scarious leaf sheaths that become fibrous in late development; the internodes—as seen on the older naked stems—2.3 cm. long, the nodes slightly inflated. Leaves up to 8.6 cm. long, 4.8 mm. wide near the base, distichous, linear, grass-like, long acuminate, very unequally and sharply bilobed at the apex, rounded at the clasping base, spreading, somewhat coriaceous, many-nerved with the mid-nerve prominent beneath. Flowers very small, rising singly from the uppermost nodes opposite the leaves, surrounded with

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scarious bracts that become fibrous. Perianth pellucid in the dried specimen. Lateral sepals about 3.5 mm. long, 3.6 mm. wide at the base, ovate-triangular, obtuse or subacute, strongly obliquely falcate, three-nerved, forming a deeply saccate mentum with the column foot. Dorsal sepal about 3.6 mm. long, 1.45 mm. broad, lanceolate, acuminate, slightly thicker near the apex, somewhat concave, three-nerved. Petals about 3 mm. long, 1.6 mm. broad above the middle, linear, acute or obtuse, falcate, one-nerved. Lip about 4 mm. long, 4 mm. wide at the apex, simple, flabellate, gently decurved in the middle with the lateral margins upcurving, very broadly truncate at the apex, in the middle of the apical margin abruptly narrowly and deeply emarginate and minutely apiculate, margins at the apex minutely erose, lip above papillose. Column very short and stout, provided with a broad wing which is emarginate with a slender apicule in the center; column foot broad, deeply saccate, upcurving. Anther triangular-prismatic. Pollinia semi-ellipsoid.

This plant is easily distinguished from *Dendrobium cuneilabrum* J. J. Sm. and *D. inconcinnum* Ridl. by its much smaller size and very different leaves.

The minute flower with its simple, flabelliform, truncate lip makes this species unique. A specimen with somewhat smaller flowers than the type is shown by another collection, *Clemens 403*. (PLATE 91.)

MAREI PAREI SPUR, *Clemens 287* (Type), November 1915. Flower white; *Clemens 403*, December 1915. Flower white and yellow.

9. *Dendrobium* (§ *Aporum*) *oblongum* A. & S. *sp. nov.* Herba robusta. Caulis foliis omnino obtectus. Folia disticha, equitantia, scalpelliformia, valde imbricantia, patienti-falcata, acuta. Pedunculi breves, laterales, bracteis distichis imbricantibus omnino obtecti. Flores in visu purpurei, singuli. Sepala lateralia late trian-

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gularia, apice complicata, mentum conspicue saccatum formantia. Sepalum dorsale lanceolatum, acutum, apiculatum. Petala lineari-oblonga, apice late rotundata. Labellum ligulato-oblongum, ad basim apicemque paulo latius, leviter retusum, marginibus anterioribus eroso-crenatis. Gynostemium breve, crassum, in pedem extensum.

Plant stout. Roots numerous, slender, fibrous, flexuous, about .5 mm. thick. Stem entirely concealed by the imbricated leaves, when exposed slender, complanate, often with one or more incipient branches above; internodes clavate, ± 1 cm. long. Leaves up to 7 cm. long, 1 cm. wide near the base, distichous, equitant, closely imbricating, linear-scalpelliform, somewhat spreading-falcate, acute or slightly mucronate. Peduncles lateral, rising from the bases of the middle or upper leaves, mostly concealed by the imbricating leaves, simple or two-forked, clothed with distichous imbricating deltoid bracts which are about 1 cm. long. Flower solitary, conspicuous, apparently purple. Lateral sepals about 6.5 mm. long, 6 mm. wide, broadly triangular, acuminate to a complicate apex, very oblique, forming a deeply saccate mentum, prominently four-nerved with a fifth less conspicuous nerve. Dorsal sepal about 6 mm. long, 2.7 mm. wide near the base, lanceolate, acute and apiculate, three-nerved. Petals about 4.2 mm. long, 1.5 mm. wide, linear-oblong, broadly rounded at the apex, one-nerved. Lip about 6.5 mm. long, 3 mm. wide at the slightly broader base and apex, ligulate-oblong, shallowly retuse, anterior and lateral portions thickened, anterior margins erose-crenate, lateral margins ciliolate. Column short, stout, broadly winged, extended into a foot.

The nearest relative of this species is apparently *Dendrobium Elmeri* Ames of the Philippine Islands, but the Bornean plant is distinguished by the more robust habit, by the leaves being

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broader at the base, by the uniformly larger perianth, and by the slightly different lip. *D. tumoriferum* J. J. Sm. has far shorter leaves, acute petals, smaller sepals, and a different lip from *D. oblongum*. In habit *D. hypodon* Schltr. is similar, but the present species has longer broader leaves, lateral instead of terminal inflorescences and larger obtuse petals.

As is often the case in this section of *Dendrobium*, the flowers are in rather poor condition. Similar but flowerless material, apparently belonging to this species, was collected by Clemens. The name is in reference to the lip.

KINABALU, *Haslam* (Type), July–August 1916. KIAU, *Clemens 334*, November 1915.

10. *Dendrobium* (§ *Aporum*) *patentilobum* A. & S. sp. nov.
 Caulis erectus vel suberectus, sinuosus, vaginis foliorum fere omnino obtectus, parte superiore sine foliis. Folia disticha, equitania, anguste linearia, late patentia, falcata, decurva, obtusa vel subacuta, rigida. Flores singuli, e nodis superioribus exorientes. Sepala lateralia ovato-triangularia, obtusa vel subacuta, obliquissima, mentum conspicue saccatum formantia. Sepalum dorsale ovato-lanceolatum, acutum vel subacutum. Petala oblonga vel elliptico-oblonga, obtusa vel acuta. Labellum trilobatum, unguiculatum; unguis parvus, oblongus; lamina abrupte reflexa; lobi laterales latissime patentés, rotundato-ovales; lobus medius suborbicularis, profunde bilobatus, lobuli semiorbiculares approximati; carina transversa inter lobos laterales extendit; callus angustus V-formis basim propius stat. Gynostemium breve, crassum, pede valde saccato praeditum.

Rhizome not seen. Plant erect or nearly so. Roots fibrous, flexuous, glabrous, sparingly branched, up to 1 mm. thick. Stem up to 44 cm. in height, sinuous, strongly complanate from a slender subterete base, almost entirely enveloped by the leaf

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sheaths, the upper portion (one-third to one-fourth of the entire height) leafless; the internodes 2–3 cm. long, yellow, shining, terminated by a dark band, the uppermost concealed by scarious sheaths. Leaves up to 8 cm. long, 4.9 mm. broad across the base although usually about 3.5 mm. wide (the lowermost and uppermost blades much smaller), distichous, equitant, narrowly linear, widely spreading, strongly falcate, decurved, obtuse or subacute, coriaceous, rigid. Flowers apparently successive, borne singly in the axils of scarious (becoming fibrous) bracts which are situated at the nodes of the leafless, sinuous, terminal axis. Lateral sepals about 7 mm. long, 6.8 mm. wide, broadly ovate-triangular, obtuse or subacute, very oblique, falcate with the dorsal margin very convex, forming a deeply saccate mentum with the column foot, prominently three-nerved. Dorsal sepal about 7 mm. long, 4.2 mm. wide in the middle, ovate-lanceolate, acute or subacute, concave, with three prominent nerves. Petals about 6.5 mm. long, 3.1 mm. wide, oblong to elliptic-oblong, obtuse or acute, three-nerved, very variable in size and shape. Lip clawed, semi-orbicular in outline, three-lobed; claw ± 2.2 mm. long, ligulate, channeled, thickened above; limb sharply reflexed, ± 7 mm. long, ± 1.3 cm. broad across the lateral lobes; lateral lobes about 5 mm. long, 4 mm. wide, rounded oval, horizontally spreading, erect in natural position; middle lobe about 4.5 mm. long, 5.3 mm. broad, suborbicular in outline, deeply bilobed to below the middle, the lobules semi-orbicular, approximate; a transverse fleshy keel extends from center to center of the lateral lobes and is triangularly dilated above each sinus; a small, median, narrow, somewhat three-lobed, V-shaped callus near the claw. Column short, stout, ± 2.7 mm. long, provided with a broad saccate upcurving foot.

Plants of *Clemens 226* show stouter stems, little larger leaves and less perfect slightly smaller flowers than the type.

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Dendrobium patentilobum is a very variable species in all its parts. In habit it resembles *D. ventricosum* Kränzl. and *D. MacFarlanei* F. v. Muell., but has very different flowers. It is unlike *D. Smithianum* Schltr. in its longer leaves and in its very distinct petals and lip. *D. calceolum* Roxb. has flowers that are larger and differently colored.

MAREI PAREI SPUR, *Clemens 366* (Type), December 1915. Flower purple and cream color; *Clemens 226*, November 1915. Flower purple and cream color.

11. *Dendrobium* (§ *Desmotrichum*) *pseudoconvexum* Ames
Orch. 5 (1915) 135.

KIAU, *Clemens 68*, November 1915. 3000 feet altitude. Flower wine-red.

12. *Dendrobium* (§ *Nigro-hirsuta*) *reticulatum* J. J. Sm.
in Bull. Jard. Bot. Buitenzorg 13 (1914) 18.

KINABALU, *Dumas. 650* feet altitude. In sparse woods, rare.

13. *Dendrobium* (§ *Grastidium*) *singulare* A. & S. sp. nov.
Herba eximia. Radices simplices, fibrosae, subflexuosae, rigidae. Caulis suberectus, complanatus, vaginis foliorum omnino obtectus. Folia disticha, anguste lanceolata, rigida, patentia, apice bilobata, basi rotundata amplectentia, contorta. Flores e glomerulis bractearum exorientes. Perianthium carnosum, connivens. Sepala valde concava. Sepala lateralia late triangularia, obtusa, mentum conspicue saccatum formantia. Sepalum dorsale ovatum, obtusum. Petala linearia, subacuta. Labellum in circuitu cuneato-flabellatum, quadrilobatum; lobi laterales cuneato-ligulati; lobus medius profunde ad callum bilobatus, lobulis linearibus quam lobis lateralibus multo minoribus, basi callo carnosissimo tridentato obtecta. Gynostemium breve, crassum.

Roots simple, fibrous, subflexuous, rigid, often longitudinally sulcate, more or less provided with black spreading hairs especially the older parts, ±1 mm. thick. Stem about 26 cm. tall,

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suberect from a decumbent base, usually with one immature branch above, entirely concealed by the tightly clasping leaf sheaths, laterally flattened, zigzag, yellow, shining, terminated at the nodes by a narrow dark band, in late development bare of leaves and leaf sheaths; the internodes ± 2 cm. long. Leaves ± 5 cm. long, 9 mm. broad near the base, the uppermost abruptly much smaller, distichous, spreading, rigid, narrowly lanceolate, rounded at the clasping base, gradually narrowed to the broad obtusely bilobed apex, the mid-nerve prominently sulcate above and carinate beneath, usually more or less contorted. Flowers apparently successive, rising singly from glomerules of ovate scarious imbricated bracts, opposite the upper leaves. Perianth segments fleshy, connivent. Sepals strongly concave, particularly the dorsal sepal. Lateral sepals about 8 mm. long, 9 mm. wide, broadly triangular, very oblique, obtuse, the basal anterior portion forming a deep pouch-shaped mentum, more or less distinctly five-nerved. Dorsal sepal ± 8.5 mm. long, 5.2 mm. wide below the middle, ovate, obtuse, five-nerved. Petals about 7 mm. long, 1.5 mm. wide, linear, in the upper portion abruptly narrowed to a subacute tip, three-nerved. Lip about 1 cm. long, subequally broad at the apex, connate with the column foot, parallel to the column in natural position, decurved, cuneate-flabellate in outline, four-lobed; lateral lobes conspicuously spreading, cuneate-ligulate, dorsally rounded near the apex, with the anterior margins truncate erose and ciliate, provided near the apex with a central callose thickening; middle lobe two-lobed as far as the callus, the lobules linear, divergent, much shorter and smaller than the lateral lobes, the base hidden by a prominent three-toothed, very fleshy callus. Column very short, stout, thickened above, curving imperceptibly into the foot which is saccate-concave.

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This extraordinary plant differs from *Dendrobium ingratum* J. J. Sm. in being much shorter with generally longer leaves, narrow petals and considerably different lip. *D. piestocaulon* Schltr. is vegetatively somewhat similar, but lacks the strongly zigzag stem and peculiar flowers of this species.

LOBONG, *Clemens 118* (Type), November 1915. Flower purple and yellow; *Clemens 222 A*, November 1915.

14. *Dendrobium* (§ *Sarcopodium*) *tricallosum* A. & S. *sp. nov.* Herba parva, in visu longe repens. Rhizoma luteum, vaginis scariosis imbricantibus vestitum. Pseudobulbi subremoti, ovoidei, diphylli. Folia lanceolata, obtusa, basi rotundata, coriacea, rigida. Inflorescentia inter folia bina oriens. Flores perpauci, pro planta majores. Sepala lateralia oblonga, ad apicem subacutum rotundata, mentum leviter saccatum formantia. Sepalum dorsale late oblongum, apice rotundatum. Petala lanceolato-oblonga, apice rotundata. Labellum expansum obtriangulare, trilobatum; lobi laterales late rotundati; lobus medius triangularis, obtusus, verrucosus; carinae duae parallelae e basi fere ad lobos laterales extendunt ibique in callos pyriformes cum callo simili medio terminant. Gynostemium breve, crassum, prope basim anguste alatum.

Plant apparently long creeping. Rhizome ± 2.5 mm. thick, yellow, shining, more or less sulcate-angulate, divided by nodes about 7 mm. apart, closely invested by scarios, cinnamon-colored, imbricating sheaths that waste away in course of development. Pseudobulbs ± 8 mm. long, 5 mm. broad, about 3 cm. apart, diphyllous, ovoid, yellow, shining, coarsely rugose, irregularly four-angled, reclining on the rhizome. Leaves ± 3 cm. long, 1 cm. broad, lanceolate to ovate-lanceolate, obtuse, minutely and obliquely bilobed, rounded at the complicate base, spreading, rigid, thick and coriaceous, the mid-nerve prominently sulcate

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above and carinate beneath, the margins revolute. Inflorescence rising between a pair of leaves, very short, two- (or three-?) flowered; rachis zigzag. Pedicellate ovary about 1.5 cm. long, slender, slightly twisted and finely grooved. Perianth segments rather thick, pellucid in the dried specimen, undulate. Lateral sepals about 1 cm. long, 4.4 mm. wide, oblong, the anterior margin—near the base—abruptly dilated, rounded to the subacute apex which is dorsally conspicuously carinate, three- to five-nerved. Dorsal sepal about 9 mm. long, 4.6 mm. wide near the base, broadly oblong, rounded at the slightly oblique apex which is dorsally somewhat carinate, concave, three- to five-nerved. Petals about 1 cm. long, 3.7 mm. broad across the middle, lance-oblong, broadly rounded at the apex, three- to five-nerved. Lip sigmoid in longitudinal section, the center channeled and the sides nearly conduplicate particularly at the base of the lamina, when spread out about 9 mm. long, 7.5 mm. broad, obtriangular, deeply three-lobed; claw deeply concave, gradually spreading into the lamina; lateral lobes about 2.5 mm. long, broadly rounded; middle lobe about 3 mm. long, 3 mm. wide at the base, triangular, obtuse, verrucose-thickened; two parallel keels—thickened at the base—extend almost to the parting of the lobes where they terminate in pyriform calli approximate to a similar median callus; the median line carinate below. Column about 5 mm. long, stout, narrowly winged especially near the base.

Dendrobium tricallosum is apparently very similar to *D. labuanum* Lindl., but varies in lip characters. From *D. radicosum* Ridl., it is separable in having more distant pseudobulbs, larger differently shaped leaves and distinct middle lobe of the lip. The markings of the lip are similar to those of *D. longipes* Hook. f.

KINABALU, *Clemens*, November–December 1915.

15. *Dendrobium* (§ *Crumenata*) *tridentatum* A. & S. *sp.*

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nov. Caules nonnulli, approximati, prope basim oblongo-dilatati, graciles, pluriarticulati, vaginis foliorum omnino obtecti. Folia anguste linearia, abrupte rotundata, mucronata, rigida, crassissima et in visu carnosâ. Flores magni, singuli, e nodis superioribus exorientes. Sepala apice cucullata. Sepala lateralia anguste triangulari-lanceolata, sensim acuminata, obliquissima, falcata, mentum leviter saccatum formantia. Sepalum dorsale lanceolato-lineare, acuminatum. Petala linearia, acuta. Labellum rhombiforme, subtrilobatum; lobi laterales leviter triangulares, marginibus anterioribus late sinuatis; lobus medius triangularis, acuminatus; fascia parva, regulariter tridentata infra medium stat. Gynostemium breve crassum, ala trilobata et pede longo latoque praeditum.

Plant about 40 cm. or more tall, very gently arcuate. Roots very long, very sparingly branched, more or less longitudinally sulcate, about 1 mm. thick, occasionally produced from nodes of the stem. Stems several, approximate, entirely invested by tubular leaf sheaths, slender above, dilated near the base into an oblong, one- to three-jointed, rugose pseudobulbous thickening which is up to 3 cm. long, many-jointed, yellow to greenish-brown; internodes about 1.6 cm. long, gradually dilated to each dark-margined node. Leaves ± 5 cm. long, 3.6 mm. wide, narrowly linear, abruptly rounded and sharply mucronate at the apex, narrowed to a sessile base, ascending, rigid, very thick, apparently fleshy in the fresh condition. Flowers large, rising singly from the upper nodes and opposite to the leaves. Pedicels short, invested below by several scarious bracts that become fibrous. Perianth pellucid in the dried specimen. Sepals cucullate at the apex. Lateral sepals about 1.8 cm. long, about 1.3 cm. wide, narrowly triangular-lanceolate, very oblique, somewhat falcate, long acuminate, forming a slightly saccate mentum at the base,

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about nine-nerved. Dorsal sepal about 2 cm. long, 4.6 mm. broad near the base, lance-linear, acuminate, about seven-nerved. Petals about 1.9 cm. long, 3.4 mm. broad above the middle, linear, acute, slightly subfalcate, with only one distinct nerve. Lip about 2.25 cm. long, 1.3 cm. broad a little above the middle, rhombiform, indistinctly three-lobed; lateral lobes shallowly triangular, the anterior margin shallowly and broadly sinuate; middle lobe about 7.5 mm. long, 6.5 mm. broad across the base, sharply triangular, acuminate; a little below the middle there is a short, sharply three-toothed fascia. Column very short and stout, provided with a fleshy three-toothed wing, extended into a long broad column foot which is deeply saccate near the extremity and which is furnished in the anterior part with a small, fleshy, ligulate, nearly free gland.

In general appearance the flower of this plant resembles that of *Dendrobium crumenatum* Sw., but the narrow leaves recall *D. teres* Lindl., which has a very different lip. *D. lawiense* J. J. Sm. differs from the Kinabalu plant in the position of the much longer bulbous stem thickening and in the character of the lip. In vegetative appearance *D. tridentatum* is much like *D. linearifolium* Teijsm. & Binn., but varies rather widely in flower structure.

MAREI PAREI SPUR, *Clemens 257*, November 1915. Flower white.

16. *Dendrobium* (§ *Grastidium*) *villosulum* *Wall.* Cat. (1828) 2006, nomen nudum. Hook. f. *Fl. Brit. Ind.* 5 (1890) 728.

KINABALU, *Haviland, Creagh*. 3500 feet altitude. GURULAU SPUR, above Kiau Ridge, *Gibbs 4012*, February 1910. 5500 feet altitude, on rotting logs.

24. *ERIA* *Lindl.*

Seventy-eight members of this genus have been recorded from Borneo, of which eleven species were previously reported from Mount Kinabalu.

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1. *Eria* (§ *Eriuræ*) *angustifolia* *Ridl.* in Stapf in Trans. Linn. Soc. Ser. 2, 4 (1894) 237.

KINABALU, *Haviland.* 6000 feet altitude.

2. *Eria* (§ *Aeridostachyæ*) *borneensis* *Rolfe* in Gibbs in Journ. Linn. Soc. 42 (1914) 150.

KIAU, *Gibbs 3955*, February 1910. 3000 feet altitude, undergrowth in secondary forest. Flowers brown.

3. *Eria* (§ *Trichotosia*) *brevipedunculata* *A. & S. sp. nov.* Herba leviter arcuata. Caulis vaginis fusco-pilosis foliorum omnino obtectus. Folia disticha, anguste lanceolata, obtusa, oblique bilobata, crasse coriacea. Inflorescentiæ breves, oppositifoliæ, subdensæ. Rachis, bracteæ, floresque extus fusco-pilosa. Sepala lateralialia ovato-triangularia, mentum saccatum formantia, apice valde carinato-incrassato. Sepalum dorsale lanceolatum, apice incrassatum. Petala linearia, falcata, apice rotundata. Labellum in circuitu obovato-spathulatum, plus minusve distincte trilobatum; lobi laterales semiorbiculares; lobus medius reniformis, distincte bilobulus; carinae duæ breves dentiformes in medio laminae et callus farinosus apicem propius stant. Gynostemium breve, latum.

Plant more or less gently arcuate, 41 cm. or more tall. Roots numerous, springing from the base of the stem, fibrous, rather freely branching, finely brown tomentose, up to 1 mm. thick. Stems more or less approximate, entirely enveloped by the leaf sheaths, terete. Leaf sheaths ± 3 cm. long, tubular, thick, striate, densely appressed cinnamon pilose, the hairs more or less disappearing on the older parts, but persisting at the slightly inflated nodes. Leaves 7–13.5 cm. long, up to 1.6 cm. broad, distichous, narrowly lanceolate, more or less narrowed to a very unequally and obscurely bilobed obtuse apex, sometimes oblique, cuneate-narrowed to a sessile base, very thick and coriaceous, rigid,

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ascending, many-nerved. Inflorescences one to three, opposite the bases of the upper leaves, about 2.5 cm. long. Rachis ascending or arcuate, zigzag, densely spreading brown pilose. Bracts distichous, spreading or slightly reflexed, ± 8 mm. long, 4 mm. wide, ovate-lanceolate, acuminate, deeply concave, spreading brown pilose without. Flowers small, sub-dense, densely brown pilose without. Lateral sepals about 4.5 mm. long, 3–3.5 mm. broad, ovate-triangular, dorsally keeled and greatly thickened at the apex, oblique, falcate, forming a saccate mentum. Dorsal sepal about 5 mm. long, 2 mm. wide near the base, lanceolate, concave, thickened at the apex. Petals about 4.75 mm. long, 1 mm. wide, oblong-linear, falcate, obtuse or rounded above, thin, very sparingly long ciliate. Lip three-lobed, 5.5–6 mm. long, 3.5 mm. wide across the lateral lobes, obovate-spatulate in outline; claw rather stout with involute margins, gradually dilated into the sharply reflexed lamina; lateral lobes semi-orbicular, more or less prominent; middle lobe reniform, almost as wide as the lateral lobes, deeply bilobed into two suborbicular lobules about 2 mm. across, a minute blunt apicule in the sinus; a pair of short dentiform keels rise in the center of the lip with a more or less prominent farinose callus in the middle nearer the apex. Column short and broad produced into a stout foot which is almost 3 mm. long.

A wide range of variability in vegetative parts and flowers is manifest in this species. *Clemens 373* shows shorter leaves which are very oblique and bears evidences of four inflorescences, while *Clemens 291* shows inflorescences up to 4 cm. long.

This species is extremely close to the Philippine *Eria lagunensis* Ames, both vegetatively and in the contour of the lip; the Bornean plant, however, has flowers about three-fourths as large with smaller differently shaped keels and longer, narrower bracts.

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From *E. fusca* Bl., *E. brevipedunculata* differs in having a smooth or rather smooth under surface of the leaves even in younger portions and in the smaller, less distinctly lobed lip. *E. unguiculata* J. J. Sm. is distinguished from *E. brevipedunculata* by the small floral dimensions and different lip.

MAREI PAREI SPUR, *Clemens 255* (Type), November 1915. Flower tan and yellow; *Clemens 291*, November 1915. Flower brown and yellow; *Clemens 373*, December 1915. Flower cream color.

4. *Eria* (§ *Dendrolirion*) ***carinosissima*** A. & S. *sp. nov.*
 Rhizoma longe repens, vaginis regularibus remote circumdatum. Pseudobulbi plus minusve clavati, basi vaginis praediti. Folia quinque, lanceolata vel oblongo-lanceolata, disticha, e parte suprema pseudobulbi exorientia. Pedunculi duo, prope apicem pseudobulbi, foliis multo breviores, densissime albo-lanati. Bractee inflorescentiae orbiculares, lanatae. Sepala lateralia lanceolato-ovata, obliqua, reflexa, concava, apice valdissime incrassato. Sepalum dorsale elliptico-oblongum, quam sepala lateralia longius et angustius. Petala oblanceolata, apice late rotundata. Labellum minutum, oblongo-obovoideum. Gynostemium gracile, arcuatum, apodum.

Rhizome long creeping, ± 3.5 mm. thick, terete, woody, smooth, provided at intervals of about 2 cm. with loose rigid infundibuliform sheaths which are 6–7 mm. long. Roots apparently short, thick, fibrous, piercing the sheaths, near them or from the rhizome beneath the pseudobulb, closely pubescent, ± 1 mm. thick. Pseudobulbs up to 6 cm. long, 2 cm. wide, somewhat clavate in the dried specimen, up to five-jointed, smooth, the base surrounded by several thin imbricating sheaths. Leaves five to each pseudobulb, up to 12.8 cm. long, 2.3 cm. wide, produced from the upper part of the pseudobulb, distichous, lanceolate to oblong-lanceolate, coriaceous, prominently seven- to nine-

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nerved, shining above. Peduncles two, about 6 cm. long, situated at or near the summit of the pseudobulb, markedly shorter than the leaves, very slender, arcuate, densely white lanate especially above, only the terminal quarter bearing flowers. Bracts 2–3 mm. long and about as broad, orbicular, lanate on both surfaces; sterile bract solitary, clasping the peduncle 1–2 cm. below the inflorescence; floriferous bracts crowded, reflexed, convex. Flower ± 1.8 cm. from the tip of the dorsal sepal to the tips of the reflexed lateral sepals, 1.7 cm. broad in the dried specimen, fleshy, spreading. Sepals densely white lanate without (somewhat so within). Lateral sepals ± 8 mm. long, 4.2 mm. broad near the base, reflexed, lance-ovate, oblique, concave, apex very strongly thickened, dorsally subearinate, three-nerved. Dorsal sepal ± 9.5 mm. long, 4 mm. wide, elliptic-oblong, very similar to the lateral sepals but less thickened at the apex. Petals about 8 mm. long, 3 mm. wide near the apex, oblanceolate, slightly oblique, broadly rounded and thickened at the apex, three-nerved. Lip minute, very fleshy, ± 2.7 mm. long, 1.6 mm. broad, 1.7 mm. thick through the anterior half, oblong-obovoid, longitudinally grooved through the middle, somewhat complanate on the sides, flattened hemispherical at the apex, narrowed near the base where it is adnate to the column, united with the lateral sepals from its base nearly to its extremity, subquadrate in transverse section. Column about 5 mm. long, slender, arcuate, flattened on the interior lanate surface; androclinium more or less flaring.

A similar but more robust budded specimen, *Clemens 181*, shows long fusiform pseudobulbs ± 16 cm. long, with about five leaves near the summit, one leaf measuring about 14 cm. long, 3 cm. wide.

This peculiar plant is outwardly a close ally of *Eria pulchella* Lindl., but the latter species lacks the extraordinary fleshy

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minute lip, and has a tubercle at the base of the column and a distinct foot.

KIAU, *Clemens 314* (Type), November 1915. Flower salmon; *Clemens 181*, November 1915. 3000 feet altitude. Flower brownish-salmon.

5. *Eria* (§ *Eriuræ*) *cymbidifolia* *Ridl.* in *Journ. Bot.* 36 (1898) 212.

GURULAU SPUR, *Gibbs 4009*, February 1910. 5000 feet altitude, undergrowth in high forest. Flowers pinkish. KIAU, *Clemens 23*, November 1915. Flower purple and cream color; *Clemens 73*, November 1915. 3000 feet altitude. Flower maroon; *Clemens 77*, November 1915. 3000 feet altitude. Flower cream color, edges wine-purple; *Clemens 85*, November 1915. 3000 feet altitude. Flower cream color lined with purple stripes; *Clemens 91*, November 1915. 3000 feet altitude. Buds cream color; *Clemens 145*, November 1915. 3000 feet altitude. Flower cream color and purple; *Clemens 147*, November 1915. 3000 feet altitude. Flower yellow inside, purple and green outside; *Clemens 171*, November 1915. 3000 feet altitude. Brownish exterior and yellow flower parts; *Clemens 185*, November 1915. 3000 feet altitude. Flower rich cream yellow shaded with purple inside. MAREI PAREI SPUR, *Clemens 258A*, November 1915; *Clemens 388*, December 1915. Flower yellow and purple. LOBONG CAVE, *Clemens 117*, November 1915. Flower cream color; *Clemens 118*, November 1915. Fruit; *Clemens 120*, November 1915. 5000 feet altitude. Flower cream color with pink stripes. LOBONG GORGE, *Clemens 269*, November 1915. Flower cream color.

6. *Eria* (§ *Eriuræ*) *farinosa* *A. & S. sp. nov.* Herba gracilis. Caulis vaginis foliorum omnino obtectus. Folia disticha, linearia, apice oblique et obscure bilobata, valde coriacea. Inflorescentiae singulae vel duae, ex internodio supremo exorientes, longae, pergraciles, folia multo excedentes. Rachis densissime albo-tomentosa. Bracteae in sicco unciformes, conduplicatae. Flores minuti. Sepala lateralibus ovata, subacuta, concava. Sepalum dorsale oblongum, obtusum. Petala lineari-oblonga, in parte superiore paulo latiora, late rotundata. Labellum in circuitu orbiculare; unguis brevis, latus; lamina semiorbicularis, leviter bilobata, lobulis utrinque emarginatis; calli duo, anterior ad apicem

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retusum labelli rotundatus farinosus, posterior in medio unguis multo minor. *Gynostemium globosum*, in visu apodum.

Plant rather slender, about 40 cm. tall. Rhizome ± 7 mm. thick, stout, terete, woody, clothed with imbricating scarios sheaths that become fibrous. Roots numerous, fibrous, freely branching, very slender, up to .5 mm. thick. Stem entirely concealed by leaf sheaths, suberect (from the rhizome). Leaf sheaths ± 3.5 cm. long, tubular, striate, chartaceous, bordered by a narrow brown band at the summit. Leaves ± 13 cm. long, 8 mm. broad, the lowest and uppermost smaller, distichous, linear, gradually narrowed to an obtuse apex which is obliquely and obscurely bilobed, complicate at the sessile base, thick, coriaceous, many-nerved on the upper surface but only the mid-nerve prominent beneath. Inflorescences one or two, about 20 cm. long, very slender, suberect, produced from the upper internode and usually much surpassing the leaves. Rachis rather densely white tomentose. Bracts ± 3.5 mm. long, lanceolate, upwardly curved and unciform from a reflexed or spreading base, strongly conduplicate in the dried specimen, glabrous. Flowers minute, approximate, scarcely 6 mm. across. Sepals somewhat tomentose without. Lateral sepals about 2.5 mm. long, scarcely 2 mm. wide, ovate, slightly oblique, somewhat acute and dorsally carinate at the apex, concave, three-nerved. Dorsal sepal about 2.5 mm. long, 1.4 mm. broad, oblong, obtuse, three-nerved. Petals about 2.5 mm. long, 1 mm. wide, linear-oblong, somewhat broader above, broadly rounded at the apex. Lip about 2.5 mm. long and about as broad, orbicular in outline; claw short, broad, abruptly dilated into the lamina, which is semi-orbicular, shallowly bilobed and has an abrupt narrow indentation in the middle of each lateral margin, farinose and thickened except for a broad zone along the lateral margins; just below the retuse apex of the lip there is a large, low, rounded,

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farinose callus and in the center of the claw a much smaller farinose callus. Column globose, apparently connate with the claw of the labellum.

In general appearance this plant closely suggests *Eria oblitterata* Reichb. f., but differs very strikingly in floral characters. *E. padangensis* Schltr. is outwardly somewhat similar to this species, but differs considerably in details of the flower.

The slender delicate aspect of the whole plant and the minute flowers with their thickly farinose lip are characteristic marks.

MAREI PAREI SPUR, *Clemens 283*, November 1915. Flower greenish yellow and purple.

7. *Eria* (§ *Trichotosia*) **ferox** *Bl.* Mus. Bot. Lugd. Bat. 2 (1856) 184.

KINABALU, *Haviland*. 6000 feet altitude. PAKKA, *Gibbs 4279*, February 1910. 9000–10,000 feet altitude, in mossy forest. Flowers brown.

8. *Eria* (§ *Eriuræ*) **floribunda** *Lindl.* in Wall. Cat. (1832) 7408 nomen nudum and in Bot. Reg. (1843) Misc. 43 & (1844) t. 20.

This representative is a form with somewhat triangular tip to the middle lobe of the lip.

KINABALU, *Haslam*, July–August 1916.

9. *Eria* (§ *Hymeneria*) **Gibbsiae** *Rolfe* in Gibbs in Journ. Linn. Soc. 42 (1914) 151.

KIAU, *Gibbs 3960*, February 1910. 3000 feet altitude, in secondary jungle. Flowers yellow.

10. *Eria* (§ *Eriuræ*) **grandis** *Ridl.* in Stapf in Trans. Linn. Soc. Ser. 2, 4 (1894) 237.

KINABALU, *Haslam*, July–August 1916; *Haviland 1157*.¹ 10,000–12,000 feet altitude, very common on the ground under jungle. PAKKA CAVE, *Gibbs 4268*, February 1910. 9500–10,500 feet altitude, in sheltered low

¹ *Haviland 1157* is the type.

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forest, predominating as undergrowth above the cave; *Clemens 112*, November 1915. Flower white and purple-pink.

11. *Eria* (§ *Aeridostachyae*) *kinabaluensis* *Rolle* in Gibbs in Journ. Linn. Soc. 42 (1914) 151.

PAKKA CAVE, *Gibbs 4302*, February 1910. 10,000 feet altitude, undergrowth in scrubby forest. PAKKA, *Gibbs 4227*, February 1910. 9000 feet altitude, epiphytic in low forest. Flowers brown.

12. *Eria* (§ *Hymeneria*) *latiuscula* *A. & S. sp. nov.* Planta robusta, in visu suberecta. Pseudobulbi cauliformes, leviter clavati, in sicco sulcati, vaginis arcte vestiti. Folia prope apicem pseudobulbi, oblongo-lanceolata vel elliptico-lanceolata, ad apicem basimque angustata, subcoriacea. Pedunculi e parte superiore pseudobulbi, bracteis multis praediti. Bractee conspicuae, reflexae vel patentes, ovaes, apice rotundatae. Sepala lateralia latissime triangulari-ovata, obliquissima, obtusa, mentum profunde saccatum formantia. Sepalum dorsale late ovatum, valde concavum, apice late rotundatum. Petala ovalia, apice late rotundata, marginibus leviter irregularibus. Labellum trilobatum, in circuitu spathulato-obovatum; lobi laterales parvi, rotundati, auriformes; lobus medius major, semi- vel suborbicularis; carina transversa inter lobos laterales extendit. Gynostemium breve, crassum, pedale lato unciniformi praeditum.

Plant stout, apparently suberect. Roots long, fibrous, somewhat branching, densely brown tomentose, ± 1 mm. wide. Pseudobulbs up to 26 cm. long, stem-like, narrowly clavate, slightly sinuous, striate-sulcate in the dried specimen, closely invested by scarious sheaths which become fibrous in development. Leaves ± 20 cm. long, 3.3 cm. broad across the middle, three to five, approximate at the summit of the stem, lanceolate, oblong-lanceolate or elliptic-lanceolate, gradually narrowed to each end, sessile at the somewhat complicate base, subcoriaceous, many-

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nerved, prominently seven- to nine-nerved beneath. Peduncles rising from the upper part of the stem, apparently one or two, up to 11 cm. long, erect-spreading to arcuate-reflexed, more or less tomentose, with many bracts especially in the upper portion. Bracts ± 9 mm. long, 5 mm. wide, conspicuous, oval, rounded above, clasping at the base, reflexed or spreading, thin, glabrous or nearly so. Raceme sub-dense. Perianth membranaceous in the dried specimen, segments connivent. Lateral sepals about 5.5 mm. long, 6 mm. wide, very broadly triangular-ovate, strongly oblique, forming a very deeply saccate mentum, obtuse or rounded at the apex, sparingly tomentose without. Dorsal sepal about 6 mm. long, 4 mm. wide, broadly ovate, strongly concave, broadly rounded at the apex. Petals about 5 mm. long, 4 mm. wide across the center, oval, broadly rounded at the apex, slightly irregular on the margins, three-nerved. Lip spatulate-obovate in outline, three-lobed, ± 7 mm. long, 6 mm. wide across the lateral lobes; claw broad, sulcate, merging gradually into the lamina; lateral lobes small, auriform, free portion ± 1.6 mm. long and about as broad; middle lobe much larger, semi- to suborbicular, up to 3 mm. long, 4 mm. broad at the base; a transverse keel, narrowest in the center and broadest above each sinus, extends across the middle of the lip and terminates in the center of each lateral lobe; two low carinae, one starting from the sinus on each side, converge toward the apex. Column very short, scarcely 2 mm. high, continued into a long, broad unciform foot which is about 6 mm. long.

In habit and general appearance, this species is somewhat allied to *Eria confusa* Hook. f. and *E. bractescens* Lindl. From the former it differs in the taller, more slender pseudobulbs, broader leaves and undivided middle lobe of the lip which has a transverse keel. *E. bractescens* is different in its very stout

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pseudobulbs, large flowers and very dissimilar lip. *E. Andersonii* Hook. f. has a bilobed middle lobe with no transverse keel.

KINABALU, *Clemens*, November–December 1915.

13. *Eria* (§ *Trichotosia*) *leiophylla* Lindl. in Journ. Linn. Soc. 3 (1859) 57.

The form represented by this collection has somewhat broader leaves and slightly larger flowers with coarser pubescence than usual.

MAREI PAREI SPUR, *Clemens* 250, November 1915. Inflorescence tan.

14. *Eria* (§ *Aeridostachyae*) *macrophylla* A. & S. sp. nov. Herba robusta. Folia elliptico-oblonga, obtusa vel acuta, parte inferiore in sicco valde conduplicata, crassissima et viridia in visu carnosissima. Pedunculus e pseudobulbo infra folium, ad inflorescentiam rectus, fere nudus, omnino dense fusco-tomentosus. Racemus arcuatus vel nutans. Flores perdensi, extus densissime fusco-tomentosi. Sepala lateralia latissime triangularia, obtusa, obliquissima, mentum conspicue saccatum formantia. Sepalum dorsale oblongo-ellipticum, obtusum, valde concavum. Petala oblongo-falcata, apice late rotundata. Labellum lingulatum, basi concavum, paulum ultra medium levissime subtrilobatum, marginibus undulatis. Gynostemium breve, crassum, in pedem latum extensum.

Plant stout. Pseudobulbs apparently large and stout (cut and imperfect in the type). Leaves one (or more?), apparently rising from near the summit of the pseudobulb, 24.5–27 cm. long, 6.4 cm. broad, elliptic-oblong, obtuse or complicate-acute, strongly conduplicate below (in the dried specimen), very thick and fleshy, the mid-nerve sharply sulcate above and carinate beneath, shining above, duller beneath. Peduncle up to the raceme

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about 22 cm. long, 3–4 mm. thick, rising from the pseudobulb a little below and at the back of the leaf and—at its very base—somewhat dilated and enveloped by sheaths, naked up to the inflorescence with the exception of a few very remote and inconspicuous bracts, densely brown tomentose. Raceme about 10 cm. long, 2 cm. broad, nodding or gently arcuate. Floral bracts ± 1 mm. long, deltoid, rounded at the apex, tomentose beneath. Flowers small, closely approximate, densely brown tomentose, ± 9 mm. from the apex of the dorsal sepal to the base of the mentum (lip upcurved and parallel to the column and foot). Lateral sepals about 3 mm. long, 6 mm. wide, very broadly triangular, obtuse, very oblique, forming a deeply saccate mentum at the base, upper portion somewhat reflexed, dorsal margin very strongly convex, anterior margin slightly concave. Dorsal sepal about 4 mm. long, 2.5 mm. wide, oblong-elliptic, more or less broadly obtuse, strongly concave. Petals about 3.5 mm. long, 2 mm. wide, oblong-falcate, broadly rounded at the apex. Lip about 5 mm. long, 3 mm. broad, decurved in natural position, lingulate, simple, a little above the middle indistinctly subtrilobed, the lower portion somewhat concave with upcurved margins, apex broadly rounded and more or less bluntly apiculate, margins undulate. Column short, stout, extended into a broad foot.

This species is a close ally of *Eria aeridostachya* Reichb. f. and the supposedly identical plant *E. falcata* J. J. Sm., as well as *E. Junghuhnii* J. J. Sm., *E. Whitfordii* Leavitt, and *E. kinabaluensis* Rolfe, but is distinct from all, however, in having a leaf that is generally twice as broad. In detail, it is unlike the first ally in the relatively slender raceme and wider petals; it differs from *E. Junghuhnii* in having glabrous petals and smaller dorsal sepal; *E. Whitfordii* has a larger lip of different texture from

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the Bornean plant; *E. kinabaluensis* has markedly longer lateral sepals than *E. macrophylla*.

KINABALU, *Haslam*, July–August 1916.

15. *Eria* (§ *Eriuræ*) *magnicallosa* *A. & S. sp. nov.* Herba subcrassa. Caulis vaginis foliorum omnino obtectus. Folia disticha, oblongo-lanceolata (laminae superiores ovato-lanceolatae), longe acuminata, obliquissime et obscurissime bilobata, basi complicata, subcoriacea. Pedunculi nonnulli, apice caulis exorientes, graciles, folia multo excedentes, densissime albo-tomentosi. Bractea lanceolatae, subulatae, reflexae, in sicco atrae. Flores densi, parvi, extus albo-tomentosi. Sepala lateralibus oblique ovata, acuta, mentum leviter saccatum formantia. Sepalum dorsale oblongo-ovatum, acutum. Petala spathulato-oblonga, apice rotundata, subacuta. Labellum in circuitu semiorbiculare, trilobatum; lobi laterales triangulares, obtusi; lobus medius reniformis, abrupte apiculatus; calli duo, anterior in medio lobi medii magnus carnosus dorso complanatus, posterior ad basim labelli multo minor trilobatus; carina in sinibus utrinque terminat. Gynostemium breve, in pedem alatum extensum.

Plant rather stout, graceful. Stem entirely concealed by leaf sheaths. Leaves distichous, at intervals of about 2 cm., up to 18.3 cm. long, 1.6 cm. broad (uppermost blades up to 9.8 cm. long and 2.2 cm. wide), generally oblong-lanceolate, long acuminate to a mucronate tip, very unequally and very obscurely bilobed, complicate at the sessile base, subcoriaceous, many-nerved, with revolute margins. Peduncles up to five, rising from the summit of the stem, ± 20 cm. tall, about 1 mm. thick, suberect or gently arcuate, markedly surpassing the leaves, densely white tomentose. Bracts of the inflorescence very numerous, ± 4 mm. long, ovate-lanceolate to narrowly lanceolate, long acuminate,

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terminating in undulate setose tips in the dried plant, strongly reflexed, more or less tomentose beneath, black in the dried specimen. Flowers extending nearly to the base of the peduncle, crowded but often appearing somewhat lax in course of development. Sepals densely white tomentose without, strongly concave. Lateral sepals 4–4.5 mm. long, 2.8 mm. broad, obliquely ovate, thickened at the subacute apex, forming a slightly saccate mentum. Dorsal sepal ± 4 mm. long, 2 mm. broad, oblong-ovate, complicate-acute, thickened at the apex. Petals about 3.75 mm. long, 1.7 mm. broad, spatulate-oblong, subacute. Lip about 4.1 mm. long, 5 mm. wide, deeply three-lobed, semi-orbicular in outline; lateral lobes triangular, broadly obtuse, lateral margins strongly incurved; middle lobe shallowly obtriangular or reniform, the broadly truncated anterior margin in alignment with the apices of the lateral lobes, irregularly undulate, sharply apiculate in the center; a large, dorsally flattened, fleshy callus situated in the center of the middle lobe and—in the dried specimen—overlapping the margin, bearing a smaller callus on the back; at the base of the lip there is a three-lobed farinose callus with the middle lobe much the largest; two keels extend from near the base of the lip to the sinuses between the lobes. Column abbreviated, with a broad winged foot.

In *Clemens 76* occurs one peduncle over 28 cm. long, and in an unnumbered collection of Clemens there is a lanceolate leaf up to 2.55 cm. broad and a stem bearing six peduncles. The single specimen found by Haslam shows a somewhat aberrant form having more numerous peduncles (up to nine), generally narrower petals and a transversely elliptic middle lobe of the lip with a taller, apparently laterally flattened, apical callus.

This species is very close to the Philippine *Eria anceps* Leavitt, but more slender, the internodes shorter, the leaves thin-

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ner in texture, the racemes more numerous and the apical cal-
 lus somewhat different. In some states, *E. oblitterata* Reichb. f.
 somewhat resembles this plant vegetatively, but the lips are very
 unlike. *E. lobata* Reichb. f. also has a very different lip from
E. magnicallosa. The lip of this species recalls that of *E. major*
 Ridl., but that of *E. magnicallosa* has much broader lateral
 lobes, narrow sinuses and different apical callus. (PLATE 92.)

KINABALU, *Clemens*, November–December 1915; *Haslam*, July–August
 1916. KIAU, *Clemens* 32 (Type), November 1915. 3000 feet altitude.
 Flower whitish with pink inside; *Clemens* 76, November 1915. 3000 feet
 altitude. Flower cream-yellow with purple stripes inside.

16. *Eria* (§Eriuræ) *major* *Ridl.* ex Stapf in Trans. Linn.
 Soc. Ser. 2, 4 (1894) 237 in synonym. Ridl. in Journ. Linn. Soc.
 32 (1896) 288. *Eria Scortechinii* *Stapf* l. c., not Hook. f. *Eria*
Kingii *Hook. f.* Fl. Brit. Ind. 5 (1890) 790; Ic. Pl. t. 2066, not
E. Kingii F. v. Muell.

Rolfe sub *E. villosissima* (Journ. Linn. Soc. 42 (1914) 150)
 says of the Bornean plant: “The Malay Peninsula *Eria major*
Ridl. is very different from the original Bornean plant in the
 much shorter leaves, fewer scapes, which are white-pubescent,
 as well as the pedicels and the smaller flowers, and in its quite
 distinct lip. It may be called *E. Ridleyi* Rolfe.”

The Clemens specimen has short leaves and few scapes, like
 the Perak plant, and thus the proposed separation is rendered
 questionable in part.

KINABALU, *Haviland* 1250.¹ 6000 feet altitude; *Clemens*, November–
 December 1915.

17. *Eria* (§Trichotosia) *mollicaulis* *A. & S. sp. nov.* Herba
 robusta. Caulis crassus, vaginis foliorum omnino obtectus. Vagi-
 nae densissime adpresso-pilosae vel velutinosae pilis fuscis. Fo-
 lia disticha, anguste lanceolata vel lineari-lanceolata, acuminata,

¹ Haviland 1250 is the type.

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valde coriacea, rigida, patentia, subtus densissime adpresso-pilosa, adulta supra glabra. Inflorescentiae oppositifoliae, densissime patenti-pilosae. Flores extus valdissime pilosi. Sepala lateralia obliquissime oblonga, acuta, apice dorso valde carinato-incrasata, mentum saccatum formantia. Sepalum dorsale oblongum, subacutum, valde concavum. Petala lineari-spathulata, falcata, apice late rotundata. Labellum in circuitu spathulatum, trilobatum; unguis conduplicatus; lamina suborbicularis, prope basim callis binis papillois et prope apicem callo plus minusve distincto praedita; lobi laterales auriformes; lobus medius reniformis, retusus, apiculatus. Gynostemium clavatum, pubescens, pede longiore donatum.

Plant robust. Stem stout, entirely concealed by closely wrapping leaf sheaths, which are very densely brown (or rusty) appressed-pilose or velutinous, width of sheathed stem about 7 mm.; joints somewhat swollen. Leaves distichous, at intervals of about 4 cm., ± 15 cm. long, 1.75 cm. broad, narrowly lanceolate to linear-lanceolate, long acuminate, cuneately narrowed to a clasping base, thick, coriaceous, rigid, densely appressed brown pilose or velutinous on the lower surface, the older leaves glabrous above (the immature leaves appressed pilose above and beneath), the margins strongly revolute in the dried specimen. Inflorescences ± 10 cm. long, opposite the leaf bases, spreading, decurved in course of development. Rachis very densely spreading rusty pilose, more or less zigzag in development. Bracts up to 1 cm. long, suborbicular when spread out, obtuse, concave, spreading, reflexed in late development, densely spreading pilose beneath. Perianth somewhat connivent. Sepals densely spreading pilose without. Lateral sepals 6–6.5 mm. long, about as broad, very obliquely oblong, acute, dorsally carinate-thickened at the apex, the basal portion forming a deep saccate mentum. Dorsal

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sepal about 7.5 mm. long, oblong, obtuse or subacute, strongly concave. Petals about 6.5 mm. long, 2.3 mm. broad near the apex, linear-spatulate, falcate, broadly rounded above, obtuse or subacute. Lip about 9 mm. long, 5.5 mm. broad above, spatulate in outline, deeply three-lobed; claw long, in natural position saccate at the base then abruptly channeled-conduplicate, when expanded broad and gradually dilated into the reflexed lamina; limb suborbicular, provided near the base with a pair of bilobed, oblong, papillose calli and furnished near the apex with a central, similar, more or less distinct papillose callus; lateral lobes small, auriform, obtuse or acute, separated from the mid-lobe by a narrow sinus; middle lobe reniform, retuse or shallowly bilobed and apiculate, margins undulate. Column about 3 mm. long, clavate, densely hairy, narrowed into a foot which is about 6.5 mm. long and dilated and thickened at the extremity.

Considerable vegetative variability is shown by the collections of this species; in *Clemens 303*, a very advanced form, the racemes markedly surpass the leaves, and in material gathered by Haslam there are short ovate-lanceolate, very fleshy leaves ± 14 cm. long, 3 cm. wide.

There appear to be no authentic species that are very near allies of this plant, but *Eria rubiginosa* Bl., registered sub *Trichotosia rubiginosa* Bl. by Kränzlin in his monograph (Engl. Das Pflanzenreich IV, 50. II. B. 21 (1911) 155) as a doubtful species, seems very close. The vegetative characters, which alone are given in the original description of this species, are identical with the material from Mount Kinabalu.

KINABALU, *Haslam*, July–August 1916. KIAU, *Clemens 66* (Type), November 1915. 3000 feet altitude. Flowers ecru yellow with maroon stripes on tongue, leaf and sheath rusty brown; *Clemens 160*, November 1915. 3000 feet altitude. Flower brown, adhering to fruit. GURULAU SPUR, *Clemens 303*, November 1915. Fruit. SARAWAK, *Native Collector 2615*.

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18. *Eria* (§ *Trichotosia*) *pilosissima* Rolfe in Gibbs in Journ. Linn. Soc. 42 (1914) 152.

LOBONG, *Gibbs 4117*,¹ February 1910. 6000 feet altitude, in high forest. Flowers cream, with red tomentum. MAREI PAREI SPUR, *Clemens 290*, November 1915. Mature flowers greenish brown.

19. *Eria* (§ *Trichotosia*) *rubiginosa* Bl. Mus. Bot. Lugd. Bat. 2 (1856) 184.

Rolfe, in Journ. Linn. Soc. 42 (1914) 152, says: "I have not seen an original specimen of *E. rubiginosa*, Blume, but it came from Borneo, and has lanceolate leaves and a rusty-velutinous stem, not pilose, as in *E. ferox*, Blume, so that n. 4016 may belong here."

GURULAU SPUR, *Gibbs 4016*, February 1910. 5500 feet altitude, on the ridge in primeval jungle.

20. *Eria* (§ *Aeridostachyae*) *verticillaris* Kränzl. in Engl. Bot. Jahrb. 44 (1910) Beibl. 101, 29.

The plant from Mount Kinabalu is a small form with narrow leaves up to 6 mm. broad, sheaths not quite equaling the summit of the stem and short peduncles up to 6 cm. long.

KINABALU, *Haslam*, July–August 1916.

21. *Eria* (§ *Eriuræ*) *villosissima* Rolfe in Gibbs in Journ. Linn. Soc. 42 (1914) 150.

Much of the Clemens material, No. 281 and unnumbered specimens, differs somewhat from the type in having a wider, more spreading lip and a broadly triangular acuminate middle lobe. The material collected by Haslam shows stouter, broader leaves which are up to 2.8 cm. wide and a lip similar to the typical form.

KINABALU, *Clemens*, November–December 1915; *Haslam*, July–August 1916. MAREI PAREI SPUR, *Gibbs 4090*,² February 1910. 7000 feet altitude,

¹Gibbs 4117 is the type.

²Gibbs 4090 is the type.

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in mossy forest. Flowers brown, with a cream-colored and spotted lip; *Clemens* 281, November 1915. Flowers purple, with yellow column; *Clemens* 376, December 1915. 8000–9000 feet altitude. Flowers purple.

25. CERATOSTYLIS *Bl.*

Four members of this genus have been reported from Borneo, but none previously from Mount Kinabalu.

1. *Ceratostylis crassilingua* *A. & S. sp. nov.* Herba nana, gracilis. Caules numerosi, approximati, monophylli, pergraciles, vaginis omnino obtecti. Vaginae lanceolatae, laxae, imbricantes, membranaceae, rubentes. Folium lineare, oblique et obtuse sub-bilobatum, subcoriaceum, breviter petiolatum. Pedunculi perpauci, prope apicem caulis, dense albo-lanati. Sepala lateralia lanceolato-oblonga, basi obliquissima, apice cucullata, mentum saccatum formantia. Sepalum dorsale oblongum, late rotundatum. Petala lineari-oblancoolata, subacuta. Labellum oblanceolato-oblongum, rotundatum, parte anteriore valdissime incrasata, lateribus membranaceis involutis ciliolatis. Gynostemium brachiis oblongis patentibus conspicuis praeditum et pede unci-formi instructum.

Plant dwarf, slender, about 12 cm. tall from the base to the tip of the erect leaf. Roots very numerous, fibrous and intertwining, freely branched, closely pubescent, about .33 mm. thick. Stems numerous and approximate, about 3–4 cm. high, very slender, entirely concealed by loosely imbricating sheaths. Sheaths deltoid to narrowly lanceolate, more or less tubular, scarious, reddish, surpassing the apex of the stem. Leaf rising from the apex of the stem, 6–7 cm. long, 5–6 mm. broad, linear, obliquely and obtusely sub-bilobed, narrowed into a petiole about 1 cm. long, subcoriaceous, the mid-nerve somewhat sulcate above and carinate beneath. Peduncles one to three, about 1 cm. long, one-flowered, produced from the upper part of the stem, slender,

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suberect, not equaling the petiole, densely white lanate, clothed with sheaths at the base. Ovary about 4 mm. long, slender, densely white lanate. Flower almost 7 mm. long, slightly open, pellucid in the dried specimen. Sepals connate at the base. Lateral sepals about 5.5 mm. long, 2-3 mm. wide, lanceolate-oblong, very oblique at the base, the upper margins involute to a cucullate apex, lower part forming a saccate mentum, three-nerved. Dorsal sepal about 5 mm. long, 2 mm. wide, oblong, broadly rounded at the apex, three-nerved. Petals about 5 mm. long, 1.3 mm. broad above the middle, linear-oblong, subacute, one- or indistinctly three-nerved. Lip about 6.2 mm. long, 2.6 mm. wide across the anterior part when extended, oblong-oblong in outline, rounded at the apex, the thin and membranaceous sides ciliolate and involute or revolute, the anterior third very greatly thickened especially through the central axis; near the base are two short, parallel, callose keels; three approximate parallel nerves run from the base to the thickened apex. Column abbreviated, provided above with a pair of spreading oblong, broadly rounded, pellucid arms with involute margins and below with a small unciform foot. Pollinia eight, obliquely ovoid.

Of the more nearly allied species, *Ceratostylis indifferens* J. J. Sm. is perhaps nearest to *C. crassilingua*, but it is much smaller in all its floral parts. *C. lancifolia* Hook. f. appears to be a very close ally, but the lip is quite different. While vegetatively similar to *C. resiana* J. J. Sm., *C. crassilingua* has much larger sepals, narrower petals and a larger lip.

MAREI PAREI SPUR, *Clemens* 260, November 1915. Flower purple.

2. *Ceratostylis longisegmenta* A. & S. *sp. nov.* Herba parva. Caules approximati, monophylli, vaginis laxis scariosis in fibras solutis omnino obtekti. Folium lineare, obliquissime et obscurissime subbilobatum, breviter petiolatum, coriaceum. Peduncu-

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lus uniflorus, dense albo-lanatus. Sepala lateralia lineari-oblonga, late obtusa, basi mentum saccatum formantia. Sepalum dorsale persimile. Petala linearia, obtusa vel subacuta. Labellum in circuitu anguste lanceolatum, trilobatum; lobi laterales leviter triangulares, obtusi, patentissimi; lobus medius subito oblongo-linearis, apice rotundato, parte anteriore valde incrassata. Gynostemium brachiis binis oblongis conspicuis subparallelis et pede unciformi praeditum.

Plant small. Roots very numerous, intertwining, branching, fibrous, closely spreading pubescent, up to .5 mm. thick. Stems approximate, up to 3.35 cm. high, 2 mm. thick, monophyllous, entirely concealed and much surpassed by several imbricating sheaths. Sheaths ± 4 cm. long, deltoid to narrowly lanceolate, long acuminate, scarious, loose, nervose, the mid-nerve dorsally carinate, becoming fibrous. Leaf ± 10.5 cm. long, 1 cm. broad, narrowly oblong or linear, very obliquely and obscurely bilobed at the apex, narrowed to a sulcate petiole ± 1 cm. long, thick and coriaceous, rigid, with the mid-nerve more or less sulcate above and carinate beneath, margins more or less revolute in the dried plant. Peduncle about 3 cm. long, one-flowered, slender, one or two to each stem, rising within the base of a sheath from the side of the stem, shorter than or surpassing the sheaths, densely white lanate. Flower about 1.4 cm. long with segments connivent in natural position. Ovary about 9 mm. long, densely white lanate. Sepals densely white lanate without. Lateral sepals about 11.5 mm. long, 3.5–4 mm. wide, linear-oblong, obtuse, somewhat thickened at the apex, five-nerved, very oblique at the base and forming a saccate mentum. Dorsal sepal very similar. Petals about 1 cm. long, 2 mm. wide, linear, slightly falcate toward the dorsal sepal, obtuse or subacute, slightly thickened at the apex, three-nerved. Lip in outline lanceolate, three-lobed, about

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1.15 cm. long, 5 mm. broad across the lateral lobes; claw very short, deeply concave, gradually dilated into the reflexed lamina; lateral lobes about 3 mm. long measuring from the claw, 1.5 mm. wide, shallowly triangular, outwardly spreading, broadly obtuse, anterior margins ciliate; middle lobe about 6.5 mm. long, 2 mm. broad, abruptly oblong-linear, broadly obtuse, thicker in texture than the side lobes, much thickened at the apex, three-nerved. Column short and broad, about 3 mm. long including the terminal pair of arms; arms erect, slightly spreading, oblong, rounded, about 2 mm. long; foot about as long as the column, near the apex unciform. Anther obconical, dentate at the apex.

Clemens 189 has somewhat shorter leaves, slightly smaller flowers and a more fleshy lip. One stem shows remains of four peduncles. In this specimen the petals do not appear subfalcate.

Ceratostylis longisegmenta is much more slender with the lip very distinct from *C. Wenzelii* Ames and *C. radiata* J. J. Sm. *C. lancifolia* Hook. f. has a well developed scape and a very different labellum.

KIAU, *Clemens 93* (Type), November 1915. 3000 feet altitude. Flower white; *Clemens 189*, November 1915. 3000 feet altitude. Flower white.

3. *Ceratostylis subulata* Bl. Bijdr. (1825) 306.

KIAU, *Clemens 177*, November 1915. 3000 feet altitude; *Clemens 320*, November 1915. Flower cream and purple; *Clemens 70*, November 1915. 3000 feet altitude. Inflorescence old. [Questionably referable to this species.]

26. AGROSTOPHYLLUM Bl.

Seven species of this genus have been recorded from Borneo, with only a flowerless and hence undeterminable specimen collected by Miss Gibbs on Mount Kinabalu in February 1910.

1. *Agrostophyllum globigerum* A. & S. sp. nov. Herba nana. Caulis e basi decumbenti erectus, vaginis foliorum omnino

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obtectus. Vaginae complanatae, valde imbricantes, margine atro conspicuo praeditae. Folia disticha, oblonga, apice late rotundata et oblique bilobata, basi complicata. Inflorescentia terminalis, subglobosa, e racemis bifloris composita. Flores perparvi. Sepala lateralia lanceolato-ovata, cymbiformia, valde carinata, complicato-mucronata. Sepalum dorsale oblongo-ovatum, apice late rotundatum, plus minusve mucronatum. Petala anguste linearia, apice late rotundata. Labellum in visu obovoideo-globosum marginibus incurvis, callo transverso sub medio constrictum. Gynostemium breve, labello circumdatum. Pollinia octo, ovoideo-pyriformia.

Plant small. Stem erect from a decumbent base, about 13.5 cm. in height, entirely invested by closely imbricating leaf sheaths, the sheathed stem clavate in outline. Leaf sheaths laterally flattened, striate-nervose, furnished with a dark scarious border about 1 mm. wide. Leaves up to 6.2 cm. long, 1.4 cm. wide, distichous, oblong, broadly obtuse at the apex with rounded oblique lobules, complicate at the sessile base, coriaceous, rigid, spreading, mid-nerve sulcate above and sharply carinate beneath. Inflorescence a terminal nodding hemispherical or subglobose head, about 2.3 cm. in diameter in the dried specimen, consisting of racemes. Racemes two-flowered, about 1 cm. long, invested by imbricating sheaths. Sheaths about 5 mm. long, tubular-involute in natural position, suborbicular when spread out, pellucid, nervose. Flowers very small. Lateral sepals about 3.8 mm. long, 2 mm. broad, lance-ovate, strongly carinate, complicate-mucronate, cymbiform, saccate at base, slightly oblique. Dorsal sepal about 3.6 mm. long, 1.75 mm. broad, oblong-ovate, broadly rounded and more or less mucronate, concave, one-nerved, subcarinate. Petals about 3.2 mm. long, .7 mm. wide at the base where broadest, narrowly linear, broadly rounded at the

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apex, one-nerved. Lip in natural position obovoid-globose with incurved overlapping margins, ± 3.6 mm. long, constricted below the middle by a short transverse callus forming a hypochil and more deeply saccate epichil; when extended the fleshy limb is apparently flabellate-suborbicular, but it splits on the incurved margins when unrolled. Column about 2.5 mm. long, stout, parallel to and enveloped by the lip, with a conspicuous stigmatic orifice. Anther complanate-hemispherical. Pollinia eight, ovoid-pyriform.

This species is somewhat related to *Agrostophyllum cyathiforme* J. J. Sm., but has much shorter stems and leaves, narrower petals and a differently formed lip.

MAREI PAREI SPUR, *Clemens 241*, November 1915. Flower cream color.

2. *Agrostophyllum saccatum* *Ridl.* in *Journ. Linn. Soc.* 31 (1895) 286.

MAREI PAREI SPUR, *Clemens 276*, November 1915. Flower yellow. KIAU, *Clemens 338*, November 1915. Flower yellow.

27. PODOCHILUS *Bl.*

Nine species of this genus have been reported from Borneo and one species from Mount Kinabalu.

1. *Podochilus sciuroides* *Reichb. f.* in *Bonpl.* 5 (1857) 41.

MAREI PAREI SPUR, *Clemens 225A*, November 1915; *Clemens 253*, November 1915. Flower white.

2. *Podochilus serpyllifolius* (*Bl.*) *Lindl.* in *Journ. Linn. Soc.* 3 (1859) 37 adnot. *Miq. Fl. Ind. Bat.* 3 (1859) 688. *Cryptoglottis serpyllifolia* *Bl.* *Bijdr.* (1825) 297.

DAPATAN and PENIBUKAN RIDGES, *Gibbs 4060*, February 1910. 5000–6000 feet altitude. Epiphyte in mossy forest, with white flowers.

3. *Podochilus tenuis* (*Bl.*) *Lindl.* *Gen. & Sp. Orch.* (1833) 235. *Apista tenuis* *Bl.* *Bijdr.* (1825) 296.

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MAREI PAREI SPUR, *Clemens* 295, November 1915. Flower white; *Clemens* 295, November 1915. Flower white; *Clemens* 405, December 1915. Flower white with pink tips.

28. CHILOPOGON *Schltr.*

This genus has not hitherto been reported from Borneo.

1. *Chilopogon kinabaluensis* A. & S. *sp. nov.* Herba nana. Caules approximati, patentes, suberecti. Folia numerosa, disticha, oblongo-lanceolata, apice rotundato minute bilobulata, basi amplectentia. Inflorescentia terminalis, densa. Segmenta perianthii conniventia. Sepala lateralia ovato-lanceolata, conspicue mucronata, obliqua, mentum saccatum formantia. Sepalum dorsale lanceolatum, minus mucronatum. Petala ligulata, apice rotundata. Labellum expansum ovato-oblongum, lata rotundatum, in parte tertia apicali lamella late bilobata, prope apicem super sinum lamellae tuberculo papilliformi praeditum; carina media incrassata e basi ad lamellam decurrit. Gynostemium breve, latum, quadridentatum.

Plant low, 7–21 cm. tall. Roots slender, fibrous, finely tomentose or glabrate. Stems approximate, spreading, suberect to very slightly arcuate, striate to striate-sulcate, about 1.5 mm. thick. Leaves very variable in size, ± 2 cm. long, 8 mm. broad, numerous, lanceolate, oblong-lanceolate or ovate-lanceolate, distichous, horizontally spreading, at the apex rounded, minutely bilobed and apiculate (the lobules acute), clasping at the base, rigid, subcoriaceous, articulated with short scarious infundibuliform sheaths. Inflorescence terminal, ± 2 cm. long, dense, simple or rarely two-forked, subtended by a few oblong, mucronate, foliaceous bracts. Floral bracts about 4.1 mm. long, 3.5 mm. broad near the base, ovate to ovate-oblong, truncate, mucronate, crisped, erose, membranaceous, three-nerved. Perianth segments connivent. Lateral sepals about 3.5 mm. long, 2 mm. wide at the base, ovate-lanceo-

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late, sharply mucronate, very oblique, forming a saccate mentum, indistinctly three-nerved. Dorsal sepal apparently smaller, about 3.5 mm. long, 1.5 mm. wide near the base, lanceolate, mucronate, concave, indistinctly three-nerved. Petals about 3 mm. long, 1 mm. wide, ligulate, broadly rounded at the apex, apiculate, indistinctly three-nerved. Lip in natural position folded against the column and enclosed by the mentum of the lateral sepals, concave-involute, when expanded about 4 mm. long, 2.4 mm. wide, ovate-oblong, broadly rounded above; anterior portion provided with a broad transverse bilobed plate which on the posterior margin is barbed with long slender hairs, and above the sinus of the plate there is a slender papilliform tubercle; from the base of the lip to the plate runs a stout, median keel. Column about 1.75 mm. long, stout, with four sharp teeth, the central pair of which are longer than the lateral ones; foot broad, membranaceous.

Many variations are manifest in this species; *Clemens 61* shows floral characteristics that approach those of *Chilopogon Merrillii* Ames, especially in having petals which are slightly spatulate, and *Clemens 348* shows small, very delicate plants.

This species differs from the very nearly allied *Chilopogon Merrillii* Ames in the broader truncate and mucronate floral bracts, the smaller petals, the longer pair of central teeth on the column and the color of the flowers. (PLATE 93.)

KINABALU, *Clemens*, November–December 1915. MAREI PAREI SPUR, *Clemens 230* (Type), November 1915. Flower white and yellow with pink stripes on lip; *Clemens 237 A*, November 1915. KIAU, *Clemens 61*, November 1915. 3000 feet altitude. Flower yellow, white, and maroon tongue; *Clemens 348*, November 1915. Flower yellow and white.

29. APPENDICULA *Bl.*

Eighteen members of this genus have been hitherto recorded from Borneo, two of these from Mount Kinabalu.

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1. *Appendicula congesta* *Ridl.* in Stapf in Trans. Linn. Soc. Ser. 2, 4 (1894) 239.

PENOKOK RIVER, *Haviland 1302*. 11,000 feet altitude.

2. *Appendicula divaricata* *A. & S. sp. nov.* Herba in visu robusta. Caules complanati, vaginis foliorum omnino obtecti. Folia numerosa, disticha, elliptica vel oblongo-elliptica, apice basique rotundata, in sicco chartacea. Rami floriferi plus minusve horizontales, vaginis adpressis scariosis obtecti. Rachis fractisinuosa. Bracteae inflorescentiae minutae, ovatae, reflexae. Flores in sicco pellucidi. Sepala lateralia late triangularia, obliquissima, mentum profunde saccatum formantia. Sepalum dorsale multo minus, ovatum, valde concavum. Petala oblonga vel ovato-oblonga, apice rotundata. Labellum oblongum, panduratum, apice rotundato-bilobatum, carina hipocrepiformi instructum. Gynostemium perparvum, pede lato longo unciformi praeditum.

Plant apparently tall and stout, with prominent horizontal or widely spreading branches. Stems strongly complanate, entirely concealed by the sheaths of the leaves, sheathed stems up to 6 mm. thick. Leaf sheaths thin, striate-nervose. Leaves very variable in size (those of the young shoots much smaller), up to 4.3 cm. long, 1.5 cm. broad, numerous, distichous, obliquely spreading, elliptic to oblong-elliptic, rounded above with the apex unequally and indistinctly bilobed with the lobules overlapping, rounded and clasping at the base, thin, chartaceous, many-nerved with the mid-nerve carinate beneath. Floriferous branches about 10 cm. or more long, mostly straight, widely spreading, horizontal or slightly reflexed, densely invested by appressed scariosus nervose sheaths that become fibrous. Racemes about 4 cm. long, apparently sessile at or near the end of the naked branches, flexuous or spreading with a zigzag rachis. Bracts

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of the inflorescence 1.5 mm. or more long, ovate, concave, reflexed in development. Flower medium-sized for the genus, pellucid in the dried specimen. Lateral sepals about 3 mm. long, 5 mm. wide, broadly triangular, acute, very oblique, forming a deep saccate mentum, three-nerved. Dorsal sepal about 3 mm. long, 2 mm. broad, ovate, strongly concave, acute, three-nerved. Petals about 2.6 mm. long, 1.3–1.75 mm. broad, oblong or obovate-oblong, broadly rounded and more or less minutely apiculate at the apex, indistinctly three-nerved. Lip about 6 mm. long, 3 mm. wide near the base and a little narrower near the apex, oblong-pandurate, terminating in a pair of rounded lobes, rounded at the base which is provided with a thin hippocrepiform keel, highest at the base with the parallel arms extending to the anterior portion. Column very short, broadly winged, with a short triangular retuse rostellar process and with a long broad unciform foot.

This species shows numerous variations. In *Clemens 360* occur flower-bearing branches up to 14.5 cm. long having several clustered racemes and one solitary raceme about 10 cm. long; unnumbered material shows one floriferous branch more than 27 cm. long. A collection made by Haslam shows several clustered inflorescences, fascicles of fibrous flexuous tomentose roots which are up to 1 mm. thick and flowers apparently somewhat larger.

The nearest allies of this plant appear to be *Appendicula Elmeri* Ames and *A. rupicola* (Ridl.) Rolfe. The flowers of this species are considerably larger than those of the former with lip of different form. It is distinguished from *A. rupicola* by the shorter leaves which are broader in proportion and by the flowers which are almost twice as large.

KINABALU, *Clemens*, November–December 1915; *Haslam*, July–August 1916. KIAU, *Clemens 137* (Type), November 1915. 3000 feet altitude.

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Flower yellow with purple blotches outside and wine-colored column;
Clemens 360, November 1915. Flower cream color.

3. *Appendicula foliosa* A. & S. *sp. nov.* Herba robusta. Caules vaginis foliorum omnino vestiti. Folia disticha, elliptica vel elliptico-oblonga, obtusa vel in visu subacuta, basi rotundata amplectentia, chartacea, patentia. Inflorescentiae numerosae, laterales et oppositifoliae, interdum terminales. Bractee ovatae, concavae, reflexae. Sepala lateralia latissime triangularia, obliquissima, obtusa, mentum conspicue saccatum formantia. Sepalum dorsale lanceolato-ovatum, obtusum, concavum. Petala linearia vel angustissime lanceolata, apice late rotundata. Labellum in situ naturali spathulatum, parte longa basali carina hippocrepiformi contracta, deinde subito in laminam reflexam suborbicularem dilatatum; in parte anteriore callis duobus carnosis approximatis. Gynostemium breve, rostello conspicuo ovato et pede longo unciformi instructum.

Plant tall, stout. Stem erect and simple, very rarely producing small lateral offshoots, entirely concealed by the sheaths of the leaves. Leaf sheaths striate-sulcate, apparently densely punctate,¹ becoming fibrous in course of development; sheathed stem up to 1 cm. thick. Leaves very numerous, distichous, widely spreading, ± 9 cm. long, 2.5 cm. broad (up to 10.5 cm. long, 3.2 cm. broad), elliptic to elliptic-oblong, obtuse or apparently subacute, indistinctly bilobed at the apex with the lobules overlapping and microscopically erose, rounded at the clasping base, chartaceous, more or less prominently seven- to nine-nerved on both sides, at intervals of ± 2 cm. Inflorescences very numerous, about 5–6 cm. long, lateral and opposite the leaf bases and sometimes terminal also, occasionally two-forked, arcuate-ascending, hori-

¹ The close but irregular dark brown dots that are universal on the sheathed stems and also occur somewhat on the leaves and even on the bracts and flowers of the type material are probably fungous growth.

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zontally spreading or arcuate-reflexed. Peduncle up to the raceme clothed with several imbricating nervose sheaths which become fibrous. Racemes 3-4 cm. long. Bracts ± 5 mm. long, ovate, rounded and erose at the apex, sulcate, concave, scarious, nervose, reflexed, imbricating. Flowers medium-sized for the genus. Lateral sepals about 4 mm. long, 5 mm. wide, very broadly triangular, very oblique, forming a very deeply saccate mentum, rounded at the apex, prominently carinate, the keel terminating below the apex, three-nerved. Dorsal sepal about 3.5 mm. long, 2 mm. wide, lance-ovate, rounded and minutely cucullate above, concave, very indistinctly three-nerved. Petals about 3.3-4 mm. long, 1 mm. broad at the base, linear to very narrowly lanceolate, broadly rounded at the apex, indistinctly three-nerved. Lip in natural position parallel with the column, spatulate with the lower part conduplicate on account of the union of the arms of a fleshy hippocrepiform keel which vanishes into the lamina, then abruptly reflexed and dilated into an orbicular blade with two obliquely converging approximate calli in the middle and a minute tubercular callus in the center of the semicircular anterior margin; when extended the blade is oblong, about 6 mm. long and nearly 4 mm. broad across the anterior part. Column about 3 mm. long, short and stout, with a conspicuous obliquely ascending ovate rostellum and with a long unciform foot which has a narrow keel running down the center.

Vegetative variations are shown by several collections; in *Clemens 63* occurs a leaf 12.8 cm. long and 3.55 cm. broad; *Clemens 222* is a form with very narrow leaves.

Appendicula pendula Bl. has generally narrower leaves and laxer racemes than this plant and also a lip lacking anterior calli. *A. foliosa* is also unlike *A. palustris* J. J. Sm. in its shorter broader leaves, larger bracts and peculiar lip marks. A very close

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ally is the Philippine *A. negrosiana* Ames, which, however, has smaller leaves than the Bornean plant with strict racemes and white flowers.

KIAU, *Clemens 361* (Type), November 1915. Flower cream and yellow; *Clemens 63*, November 1915. 3000 feet altitude. Flower light yellow, maroon on lip. MAREI PAREI SPUR, *Clemens 237*, November 1915. Flower green and yellow. LOBONG, *Clemens 208*, November 1915. Flower white to yellow; *Clemens 222*, November 1915. Flower light green.

4. *Appendicula latibracteata* J. J. Sm. in Bull. Jard. Bot. Buitenzorg 13 (1914) 37.

The specimens collected by Haslam and, to a less extent, those collected by Clemens show leaves varying from elliptic to oblong-elliptic. In these specimens the flowers are slightly smaller than those of the type.

KINABALU, *Haslam*, July–August 1916. 3150 feet altitude. Flower white, odorless, “plant sometimes five feet high.” KIAU, *Clemens 358*, November 1915. Flower cream and purple or maroon. LOBONG CAVE, *Clemens 124*, November 1915. 5000 feet altitude. “Flower purplish green and yellow lip and chin;” *Clemens 129*, November 1915. 5000 feet altitude. Flower with purple exterior, cream color interior. LOBONG ROCK, *Clemens 138*, November 1915. Flower yellow with purple blotches on lip. SARAWAK, *Native Collector 1587*. WESTERN BORNEO, *Nieuwenhuis 1896*¹ (Cult. in Hort. Bogor. sub n. 360 et 1675).

5. *Appendicula linearifolia* A. & S. sp. nov. Herba gracilis. Caules vaginis foliorum omnino obtecti. Folia disticha, lanceolato-linearia, acuminata, apice acriter bidentata, basi amplectentia. Inflorescentiae terminales, interdum laterales, reflexo-arcuatae. Bractee inflorescentiae oblongae vel anguste lanceolatae, concavae, reflexae. Sepala lateralia late triangularia obliquissima, apice rotundata, mentum conspicue saccatum formantia. Sepalum dorsale minus, ovato-ellipticum, apice rotundatum, concavum. Petala oblanceolata, apice obtusa vel rotundata. Labellum in positu naturali spathulato-obovatum, parte inferiore

¹This is the type collection.

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callo carnosio hippocrepiformi contracta, parte anteriore late rotundata, reflexa. Gynostemium rostello semiorbiculari dentato et pede unciformi praeditum.

Plant slender. Stems suberect, complanate, entirely concealed by leaf sheaths, rarely provided with a lateral branch above. Leaf sheaths loose, thin, striate-nervose. Leaves distichous, ± 9 cm. long, 7 mm. wide below the middle, lance-linear, widely spreading, acuminate to the apex which terminates in a pair of sharp narrow unequal teeth with a shorter mucro between, rounded and clasping at the base, many-nerved with three nerves rather conspicuous beneath, chartaceous, at intervals of ± 1.5 cm. Inflorescences ± 5 cm. long, always terminal and sometimes also lateral, puncturing the leaf sheaths toward the upper part of the stem, simple or occasionally two-forked. Peduncle nodding or reflexed-arcuate, thickly invested by scarios, tubular, imbricating sheaths below. Bracts of the inflorescence about 4 mm. long (the lower longer), oblong to narrowly lanceolate, more or less acute, concave, nervose, reflexed-spreading in course of development. Flowers rather small. Lateral sepals about 3 mm. long and about as wide, broadly triangular, very oblique, rounded at the apex, forming a deep saccate mentum, three-nerved, with all the nerves (especially the mid-nerve) bluntly carinate the keels not reaching the apex. Dorsal sepal about 3.4 mm. long, 1.8 mm. broad, ovate-elliptic, rounded at the apex, very strongly concave, three-nerved. Petals about 2.8 mm. long, 1 mm. wide above, oblanceolate, rounded or obtuse at the apex, one-nerved. Lip about 3–3.5 mm. long, spatulate-obovate in natural position; lower half contracted by a fleshy callus, anterior part dilated into a reflexed, broadly rounded limb, which is very slightly re-tuse with a minute tubercular callus in the center of the apex; expanded limb about as broad as long; a stout fleshy hippocrep-

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iform callus extends from near the base to about the center of each lateral margin which it contracts. Column very short fleshy dilated, provided above with a prominent semiorbicular dentate rostellum and a shallowly bilobed androclinium, and below with a prominent unciform foot.

There appear to be several species more or less allied to this plant. *Appendicula maquilingensis* Ames has shorter leaves and very different lip. The narrowly proportioned leaves and dissimilar floral characters separate it from *A. pendula* Bl. and *A. uncatata* Ridl., while *A. dendrobioides* Schltr. varies chiefly in its shorter broader leaves and larger flowers.

KINABALU, *Clemens*, November–December 1915. MAREI PAREI SPUR, *Clemens* 286 (Type), November 1915. Flower yellow; *Clemens* 404, December 1915.

6. *Appendicula longirostrata* A. & S. *sp. nov.* Herba alta, suberecta. Caules vaginis foliorum omnino obtecti. Folia numerosissima, disticha, elliptica vel oblongo-elliptica, apice rotundato-bilobulata, basi amplectentia. Inflorescentiae omnino laterales, multae, breves, pauciflorae. Rachis fracti-sinuosa. Bracteae concavae, distichae. Flores illis *A. magnibracteatae* persimiles. Sepala lateralia triangularia, acuminata, obliqua, mentum profunde saccatum formantia. Sepalum dorsale ovato-lanceolatum, acuminatum, concavum. Petala linearia, apice acuta vel plus minusve rotundata. Labellum in hypochilium et epichilium divisum; hypochilium in situ naturali saccato-conduplicatum, expansum suborbiculare basi profunde saccatum; epichilium reflexum, transverse ovale, plus minusve retusum. Gynostemium rostello longe attenuato bidentato et pede unciformi praeditum.

Plant suberect, tall, to over 60 cm. in height. Stem entirely concealed by leaf sheaths. Leaf sheaths striate-nervose, loose, often tinged with crimson. Leaves very variable in size, about

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3.5–5 cm. long, 1–1.3 cm. wide, very numerous, distichous, spreading, elliptic to oblong-elliptic, rounded above with an unequally bilobed more or less complicate apex with a mucro between the lobules, rounded to a clasping base, subcoriaceous, many-nerved with three nerves rather prominent beneath, at intervals of ± 1 cm. Inflorescences ± 1 cm. long, about three-flowered, very numerous, entirely lateral, single or several in a fascicle, in the middle of the internodes, base concealed by scarious sheaths. Rachis spreading-ascending or reflexed in course of development, strongly zigzag. Bracts about 6 mm. long, ovate, acuminate, strongly concave, distichous, scarious, nervose, much surpassing the pedicellate ovary. Flower very similar to that of *A. magnibracteata* A. & S., but slightly smaller, pellucid in the dried specimen. Lateral sepals about 4.6 mm. long, 3.5–4 mm. wide, triangular, long acuminate to a complicate-mucronate apex, oblique, forming a very deeply saccate mentum, three-nerved, carinate. Dorsal sepal about 4.5 mm. long, 2.5 mm. broad at the base, ovate-lanceolate, acuminate to a complicate apex, concave, three-nerved, carinate. Petals about 4.5 mm. long, 1.25 mm. wide, linear, acute to more or less rounded at the apex, one-nerved. Lip in natural position folded against the column, spatulate with the lower portion or hypochil saccate-conduplicate, the upper portion or epichil abruptly dilated into a reflexed terminal lobe; lamina when expanded about 6 mm. long and 3.5–4 mm. broad; claw short decurved; hypochil deeply saccate at base and when spread out suborbicular with the anterior margins continued into the center of the middle lobe or epichil; middle lobe transversely oval, more or less retuse. Column very short, provided above with a conspicuous long attenuate bidentate rostellum which is about 2.5 mm. long and below with a prominent deeply unciform foot. Pollinia very slender pyriform.

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Appendicula malindangensis (Ames) Schltr. closely resembles this plant vegetatively, but *A. longirostrata* has somewhat smaller leaves, much less numerous racemes, differently formed lip and white instead of dark blue flowers. A close match superficially is the Philippine *A. Wenzelii* Ames, but the Bornean species has much larger flowers of dissimilar form. *A. micrantha* Lindl. has smaller, more spreading leaves and much smaller flowers than this species.

MAREI PAREI SPUR, *Clemens* 387, December 1915. Flower white.

7. *Appendicula magnibracteata* A. & S. sp. nov. Herba valida. Caules vaginis foliorum omnino obtecti. Folia disticha, anguste lanceolata, obtusa, basi amplectentia, coriacea. Inflorescentiae omnino laterales, breves. Rachis valdissime fracti-sinuosa. Bracteae conspicuae, distichae, cymbiformes, lanceolato-attenuatae. Flores illis *A. longirostratae* persimiles. Sepala lateralia triangularia, acuminata, obliqua, mentum profunde saccatum formantia. Sepalum dorsale anguste triangulari-lanceolatum, acuminatum, concavum. Petala lineari-lanceolata, apice obliquo plus minusve acuta. Labellum in hypochilium saccato-conduplicatum et epichilium reflexum divisum; hypochilium expansum suborbiculare, basi sacco conico praeditum; epichilium transverse ovale, retusum, apiculatum. Gynostemium rostello attenuato bidentato et pede valde unciformi praeditum.

Plant stout. Stems more or less arcuate, entirely concealed by the sheaths of the leaves, sheathed stems about 5–6 mm. thick. Leaf sheaths striate-nervose, thin. Leaves distichous, ascending, ±11.5 cm. long, 1.7 cm. wide, narrowly lanceolate or oblong-lanceolate, obtuse with a minutely unequally bilobed mucronate apex, which is more or less complicate in the dried specimen, narrowed to a clasping base, coriaceous, many-nerved with the mid-nerve rather prominent beneath, at intervals of about 2 cm.

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Inflorescences 2.5–3.4 cm. long, rather numerous, entirely lateral, rising from about the middle of the leaf sheaths. Peduncle clothed at the base with several closely imbricating, scarios sheaths. Rachis very strongly zigzag. Bracts about 1.4 cm. long, 6 mm. wide, distichous, lance-attenuate, cymbiform, widely spreading, scarios, rigid-nervose, carinate, surpassing the ovary. Flower very similar to that of *Appendicula longirostrata* A. & S., but slightly larger. Lateral sepals about 5 mm. long, 4.5 mm. broad, triangular, oblique, acuminate to a complicate-mucronate apex; forming a very deeply saccate mentum, three-nerved, carinate. Dorsal sepal about 4.5 mm. long, 3 mm. wide at the base, narrowly triangular-lanceolate, acuminate, concave, three-nerved, carinate. Petals about 4.2 mm. long and 1.65 mm. broad at the base, linear-lanceolate, more or less acute at the oblique apex. Lip in natural position spatulate, parallel to the column, the saccate-conduplicate lower portion or hypochil abruptly dilated into the reflexed terminal portion or epichil; lamina when expanded about 5 mm. long, 3 mm. broad; claw short decurved; hypochil when spread out suborbicular, contracted at the base by the formation of a deep conical sac, the anterior margins terminating in the middle of the epichil; middle lobe or epichil transversely oval, retuse and bluntly apiculate. Column very short, provided above with a conspicuous rostellum about 2.15 mm. long, which is abruptly narrowed from a broad base to a narrow bidentate beak. Foot long, stout, U-shaped.

Clemens 351 has much smaller leaves. Unnumbered material shows leaves up to 13 cm. long and the basal portion of the plant with a cluster of numerous, fibrous, flexuous, rigid roots that are about 1.5 mm. thick.

There is a surprising similarity of flower structure between this plant and *Appendicula longirostrata* A. & S., but the vege-

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tative parts, while showing a general similarity, are extremely unlike in appearance and detail. Apparently it is an altogether distinct species.

KINABALU, *Clemens*, November–December 1915. MAREI PAREI SPUR, *Clemens 282* (Type), November 1915. Flower purple. KIAU, *Clemens 351*, November 1915. Flower purple adhering to fruit.

8. *Appendicula minutiflora* A. & S. sp. nov. Herba subvulnosa. Caules approximati, patentes, vaginis foliorum plus minusve obtecti. Folia numerosa, disticha, rotundato-ovata vel ovato-oblonga, apice late rotundato-bilobulata, basi auriculato-amplexantia, laminae inferiores minores vaginis infundibuliformibus articulatae. Inflorescentiae omnino laterales, perbreves. Flores minuti. Sepala lateraliter late triangularia, obliquissima, acuta, carinata, basi mentum saccatum formantia. Sepalum dorsale lanceolato-ovatum, obtusum vel subacutum, concavum. Petala ligulata vel oblonga, apice late rotundata. Labellum in situ naturali spatulatum, parte inferiore callo hippocrepiformi contracta, parte anteriore semiorbiculari marginibus undulatis; lamina expansa rotundato-ovalis. Gynostemium crassum, pro flore magnum, rostello triangulari bidentato et pede praeditum.

Plant rather stout, about 30.5 cm. tall. Roots very numerous, fibrous, densely white lanate, \pm .5 mm. thick. Stems approximate, spreading, above entirely concealed by leaf sheaths, striate-sulcate, about 2.3 mm. broad in the dried specimen. Leaves numerous, distichous, about 1.5–2.3 cm. long, 1.2 cm. wide, very variable in size (the lowermost very small and the middle blades rather smaller than the lower and upper leaves), round-ovate to ovate-oblong, broadly rounded at the apex which is obtusely bilobed with a shorter mucro in the sinus, deeply auriculate-clasping at base, widely spreading, subcoriaceous, mid-nerve and two lateral nerves somewhat prominent above and carinate below;

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lowermost blades articulated with loose, scarious, infundibuliform sheaths. Inflorescences entirely lateral, about 1 cm. long, few-flowered, much surpassed by the leaves, piercing the sheaths at the middle of the internodes, spreading-ascending. Bracts about 3 mm. long, narrowly lanceolate, acuminate, carinate, the dorsal keel forming a mucronate apex, strongly concave. Flowers minute. Lateral sepals about 2.5 mm. long, about as wide, broadly triangular, very oblique, acute, strongly carinate, somewhat cymbiform above, forming a saccate mentum, three-nerved. Dorsal sepal about 2.5 mm. long, 1.5 mm. broad, lance-ovate, obtuse or subacute, concave, one- or indistinctly three-nerved. Petals about 2 mm. long, 1 mm. broad, ligulate or oblong, broadly rounded above and sometimes mucronate, one-nerved. Lip in natural position spatulate or spatulate-obovate, lower portion contracted by a hippocrepiform callus, upper half semi-orbicular with a minute callus in the middle of the apex, anterior margin undulate; lamina when spread out about 2.3 mm. long, 1.8 mm. broad, sub-orbicular-oval. Column stout, large for the flower, provided above with an ascending triangular bidentate rostellum and below with a relatively long foot.

The species most nearly allied to *Appendicula minutiflora* appear to be *A. cornuta* Bl., *A. cyclopetala* Schltr., *A. lucida* Ridl., *A. micrantha* Lindl., and *A. reflexa* Bl. From all, it is clearly distinct in the very small flowers. The broad leaves and exclusively lateral inflorescences are also characteristic marks of this plant.

KIAU, *Clemens 333*, November 1915. Flower yellow and purple.

9. *Appendicula rupicola* (Ridl.) Rolfe in Gibbs in Journ. Linn. Soc. 42 (1914) 159. *Podochilus rupicola* Ridl. in Journ. Str. Br. Roy. As. Soc. 50 (1908) 142.

Rolfe, l. c., says: "A fruiting specimen agreeing well with this

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Bornean species in habit, hence referred to it with a little uncertainty. The withered segments remain at the apex of some of the fruits, but the lip is missing.”

KOUNG, *Gibbs 4301*, February 1910. 1000 feet altitude in secondary forest.

30. *BROMHEADIA* Lindl.

Five species of this genus have previously been found in Borneo, one of which is a native of Mount Kinabalu.

1. *Bromheadia divaricata* A. & S. *sp. nov.* Herba valida. Caules complanati, vaginis foliorum omnino obtecti. Folia disticha, patentia, elliptica vel oblonga, crasse coriacea, nitentia. Inflorescentia terminalis, ramosissima, latissime divaricata. Racemi numerosi, arcuati. Bractee minimae, distichae, rigidae, dense imbricantes, cymbiformes. Flores magni, spectabiles. Sepala lateralibus oblonga, acuta, subobliqua, apice valde carinata. Sepalum dorsale persimile. Petala oblanceolato-oblonga, tenuiora, acuta. Labellum in circuitu lanceolato-oblongum, trilobatum; hypochilium ellipticum, zona media lata incrassata, lobulis parvis triangularibus terminans; epichilium obovato-oblongum, parte anteriore suborbiculari papilloso-incrassata retusa. Gynostemium crassum.

Plant very stout, apparently tall. Stems complanate, entirely concealed by the leaf sheaths, sheathed stems ± 8.5 mm. broad. Sheaths coriaceous, strongly striate-nervose and more or less rugose in the dried specimen. Leaves about 10–12 cm. long, 2.5–4 cm. broad, elliptic to oblong or occasionally lance-oblong, obtuse with unequal broadly rounded lobules, slightly decurrent at the rounded deeply clasping base, distichous, obliquely ascending, very thick and coriaceous, more or less rugose and apparently very fleshy in the living plant, shining especially above,

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many-nerved with the mid-nerve strongly sulcate above and carinate beneath, the margins revolute in the dried specimen, intervals between the leaves 2–3 cm. Inflorescences usually terminal, angularly much branched and divaricate, up to 20 cm. long and wide, without any common peduncle or the same up to 2 cm. long. Racemes 2.5–7 cm. long, about 6.5 mm. wide, numerous, flexuous or arcuate, crowded with very small, rigid, distichous, densely imbricating, cymbiform bracts, rarely sessile from the uppermost internodes. Flowers large and showy. Sepals fleshy. Lateral sepals about 2.5 cm. long, 9 mm. wide, oblong, slightly oblique, acute, very strongly carinate at and near the apex, thickened at the base, about nine-nerved. Dorsal sepal about 2.35 cm. long, 8 mm. broad, very similar. Petals about 2.25 cm. long, 6.5 mm. broad, thinner in texture, oblanceolate-oblong, oblique, gently falcate, apex rounded but its tip acute, five- to seven-nerved. Lip lance-oblong in outline, three-lobed, about 2.15 cm. long, 1 cm. broad below the middle; hypochil elliptic, about 1.4 cm. long, terminating in very small triangular spreading lobules, with a broad thickened median zone extending from the base indefinitely beyond the center; epichil obovate-oblong, with the anterior half suborbicular, shallowly retuse, papillose-thickened the thickening extending down the middle, margins on each side of the apex strongly involute in natural position. Column about 1.65 cm. long, 4–4.5 mm. broad, fleshy, with a broadly rounded wing above.

Apparently there are no near allies of this plant.

MAREI PAREI SPUR, *Clemens 389*, December 1915. Flower cream color, drops easily.

2. *Bromheadia rigida* *Ridl.* in Stapf in Trans. Linn. Soc. Ser. 2, 4 (1894) 239.

KINABALU, *Haviland 1251*. 6000 feet altitude.

31. ACANTHOPHIPPIUM *Bl.*

Three members of this genus are recorded from Borneo, but none were previously reported from Mount Kinabalu.

1. *Acanthophippium javanicum* *Bl.* Bijdr. (1825) 354.

KIAU, *Clemens* 356, November 1915. Flower purple.

32. PHAJUS *Lour.*

Two species of this genus were hitherto known from Borneo, but none has been reported from Mount Kinabalu.

1. *Phajus Blumei* *Lindl.* Gen. & Sp. Orch. (1831) 127.

Rolfe, in Journ. Linn. Soc. 42 (1914) 153, says: "This has been more or less confused with *P. Wallichii*, Lindl., but the spur of the lip is much shorter than in that, and the sepals and petals invariably white at the back."

KINABALU, *Clemens*, November–December 1915. TAMBUNAN PLAIN, *Gibbs* 3003, February 1910. 2000 feet altitude. KIAU, *Clemens* 130, November 1915. 3000 feet altitude. Flower white and purple, petals brownish inside and white outside; *Clemens* 184, November 1915. 3000 feet altitude; *Clemens* 277 A, November 1915; *Clemens* 346, November 1915. Flower white, cream color and purple; *Clemens* 378, December 1915. Flower yellow, white and purple.

2. *Phajus subtrilobus* *A. & S. sp. nov.* Herba robusta, erecta.

Folia in ramo nonnulla, elliptica, longe et plus minusve subito acuminata, longe petiolata, in sicco membranacea, pedunculum multo excedentia. Pedunculus ramo foliorum approximatus, laxissime florifer. Flores magni, spectabiles. Sepala lateralia oblanceolata, obliqua, acuta, mucronata, carinata. Sepalum dorsale simile, paulo longius et angustius. Petala spathulato-oblanceolata, subfalcata, apice obliquissimo apiculato rotundata. Labelum gynostemio adnatum; lamina transverse suborbiculari-ovalis, medio longitudinaliter incrassata, carinis semiellipticis approximatis in callum papillosum decurrentibus, margine in

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visu subtrilobato, plicatissimo; calcar perbreve, arcuatum. Gynostemium crassum.

Plant stout, apparently erect, the peduncle and leaf shoot subapproximate and invested below by a long lanceolate sheath. Leaves three or four on each shoot, about 35–50 cm. long, 7–15 cm. wide, much surpassing the peduncle, broadly to narrowly elliptic, more or less abruptly long and narrowly acuminate, provided with a long winged sulcate petiole, membranaceous in the dried specimen, with three to five nerves very prominent beneath. Peduncle 30–50 cm. long, stout, suberect from a decumbent base, clothed with several deltoid to narrowly lanceolate, tubular, appressed sheaths. Rachis very remotely four- to ten-flowered, somewhat zigzag, notably narrowed toward the summit. Bracts deciduous, about 3.6 cm. long, 2 cm. wide, elliptic-ovate, acuminate to a cucullate apex, concave. Flower large and spreading, ± 7.5 cm. across, variable in size. Lateral sepals about 4.15 cm. long, 1.4 cm. broad, oblanceolate, oblique, acute, mucronate, carinate, about seven-nerved. Dorsal sepal about 4.3 cm. long, 1.35 cm. broad, similar to the lateral sepals, oblanceolate, carinate, obtuse but somewhat mucronate from the dorsal keel, about seven-nerved. Petals about 4.1 cm. long, 1.25 cm. broad, spatulate-oblanceolate, very slightly falcate, apex rounded very oblique and apiculate, about seven-nerved. Lip adnate to the base of the column for a distance of ± 1 cm.; lamina in outline transversely suborbicular-oval, about 2.5 cm. long, 3 cm. wide, subtrilobed, center of the disc longitudinally thickened and provided in the middle with a pair of approximate, semi-elliptic fleshy keels that converge near the apex into a narrowly lanceolate papillose callus; the margins strongly plicate, but when expanded no demarcation of lobes apparent; lateral lobes appearing semi-obcordate, middle lobe broadly reniform, shallowly re-

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tuse and apiculate; spur very short, 2.5–3.5 mm. long, arcuate, dorso-ventrally complanate, truncate at the apex (in every case pierced by an insect). Column about 2.3 cm. long, stout, dilated above, glabrous, plane or concave on the anterior face, angled at the back, broadly rounded at the apex, stigmatic orifice large and conspicuous.

This plant is very close to *Phajus callosus* Lindl., but differs markedly in the shape of the lip, the markings of the calli and the spur.

KINABALU, *Haslam*, July–August 1916.

33. CALANTHE *R. Br.*

Nine members of this genus were reported from Borneo, of which three were recorded from Mount Kinabalu.

1. *Calanthe cuneata* *A. & S. sp. nov.* Folium ellipticum, acuminatum, ad petiolum vaginantem angustatum, in sicco membranaceum. Pedunculus longus, crassus, folium multo excedens. Rachis pubescens. Bractee lanceolatae, reflexo-patentes. Flores mediocres, extus pubescentes. Sepala lateralia oblongo-oblancoolata, leviter obliqua, acuminata. Sepalum dorsale oblanceolatum, obtusum vel subacutum, concavum. Petala anguste oblanceolata, subacuta. Labellum apici gynostemii adnatum, profunde trilobatum; lobi laterales latissime patentes, oblongi, apice late rotundati; lobus medius cuneatus, retusus, erosus; calcar breve, rectum, extus pubescens. Gynostemium breve, crassum, clavatum, villosum.

Plant stout. Leaves probably several, about 21.5 cm. long, 8 cm. wide, erect-spreading, elliptic, acuminate, narrowed to a sulcate sheathing petiole, membranaceous in the dried specimen, with three to five nerves somewhat prominent beneath. Peduncle stout, much exceeding the leaf, about 85 cm. long including the

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raceme, below sheathed by the petiole, which in turn is enveloped by a lanceolate membranaceous sheath, above suberect or somewhat arcuate, slightly pubescent, provided with tubular lanceolate appressed sheaths which are remote. Raceme 7–10 cm. long, becoming loose with age. Rachis finely pubescent. Floral bracts up to 1.9 cm. long, 6 mm. wide, reflexed-spreading, lanceolate, acuminate. Flowers medium-sized for the genus, becoming long pedicelled and reflexed in course of development. Sepals pubescent without, margins more or less involute. Lateral sepals about 1.05 cm. long, 4.5 mm. wide, oblong oblanceolate, somewhat oblique, acuminate, upper portion somewhat thickened. Dorsal sepal about 1.15 cm. long, 4.4 mm. wide above, oblanceolate to very narrowly elliptic, obtuse or subacute, concave. Petals about 1 cm. long, 3 mm. wide above, narrowly oblanceolate, subacute. Lip adnate to the apex of the column, deeply three-lobed, about 7 mm. long and 1 cm. wide across the horizontally spreading lateral lobes, pluri-tuberculate at the base; lateral lobes about 5 mm. long, 2.5 mm. wide, oblong, broadly rounded at the oblique apex, which is sometimes apiculate; middle lobe about 5–5.5 mm. long and nearly or quite as broad near the apex, cuneate, retuse, anterior portion irregularly papillose-thickened, erose especially on the lateral margins, sparsely pubescent beneath; spur small, about 4.8 mm. long, stout, straight, pubescent without. Column about 3.5 mm. long, stout, clavate, densely pubescent or villous on the upper part.

This plant differs from *Calanthe kinabaluensis* Rolfe in having a far longer scape, shorter raceme and different middle lobe of the lip. It is distinguished from *C. abbreviata* Lindl. by the relatively small flowers and very hairy column.

KINABALU, *Haslam*, July–August 1916.

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2. *Calanthe kinabaluensis* Rolfe in Gibbs in Journ. Linn. Soc. 42 (1914) 156.

LOBONG, Gibbs 4108, February 1910. 5000 feet altitude. Common as undergrowth in primary high forest. Also seen on the ridge above Bundu Tuhan. Flowers orange-yellow.

3. *Calanthe ovalifolia* Ridl. in Stapf in Trans. Linn. Soc. Ser. 2, 4 (1894) 239.

Ridley, l. c., says: "One of the very few species with entire lip."

PENOKOK RIVER, Haviland. 3000 feet altitude.

4. *Calanthe parviflora* Lindl. in Paxt. Fl. Gard. 3 (1852-53) 37.

KINABALU, Haviland. 7000 feet altitude.

5. *Calanthe pulchra* (Bl.) Lindl. Gen. & Sp. Orch. (1833) 250. *Amblyglottis pulchra* Bl. Bijdr. (1825) 371.

The small specimen, *Clemens* 381, shows a curved but not hooked spur.

KIAU, *Clemens* 98, November 1915. 3000 feet altitude. Flower orange, red on inner lip; *Clemens* 126, November 1915. 3000 feet altitude. Terrestrial, flower yellow; *Clemens* 155, November 1915. 3000 feet altitude. Common terrestrial, flower yellow; *Clemens* 302, November 1915. Terrestrial, flower yellow; *Clemens* 402, December 1915. Flower deep yellow. MAREI PAREI SPUR, *Clemens* 381, December 1915. 8000 feet altitude. Flower yellow.

6. *Calanthe tenuis* A. & S. sp. nov. Herba in parte superiore gracilis, erecta. Folium ellipticum, acuminatum, ad petiolum sulcatum vaginantem angustatum, in sicco membranaceum. Pedunculus folium multo excedens, parte inferiore crassa, parte superiore gracili. Racemus densus. Rachis pubescens. Bractee lanceolatae, reflexo-patentes. Flores parvi. Sepala lateralia obovata vel oblanceolato-oblonga, leviter obliqua, obtusa vel subacuta. Sepalum dorsale oblongum, obtusum vel subacutum.

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Petala oblanceolato-lineararia, apice plus minusve obliqua et truncata. Labellum gynostemio adnatum, profunde trilobatum; lobi laterales late patentés, obovati vel obovato-oblongi; lobus medius obcordatus, circa ad medium in lobulos binos suborbiculares divisus, erosus; calcar breve, rectum, extus pilis sparsim praeditum. Gynostemium breve, crassum, clavatum, villosum.

Plant erect, slender above. Leaves probably several, about 25.5 cm. long, 8.5 cm. wide, elliptic, acuminate, narrowed to a long sulcate sheathing petiole, membranaceous in the dried specimen, with three to seven nerves prominent beneath. Peduncle including the raceme up to 83.6 cm. long, much surpassing the leaves, very stout below, tapering to a very slender upper portion, puberulent below, densely pubescent above, provided with lanceolate tubular appressed sheaths which are remote. Raceme about 6 cm. long, dense with about two very remote flowers below. Rachis densely pubescent. Bracts of the inflorescence up to 1.5 cm. long, lanceolate, acuminate, reflexed-spreading. Pedicellate ovaries in development long, finely pubescent. Flowers small for the genus. Sepals pubescent without, upper margins involute. Lateral sepals about 7 mm. long, 3.5–4.8 mm. wide, obovate to oblanceolate-oblong, somewhat oblique, obtuse or subacute, dorsally carinate at the apex, three- to five-nerved. Dorsal sepal about 7 mm. long, 3.3 mm. wide, oblong, obtuse or subacute, dorsally carinate at the apex, three-nerved. Petals about 7 mm. long, 2.2 mm. wide above, oblanceolate-linear, more or less oblique and truncate at the apex, one- or indistinctly three-nerved. Lip adnate to the column at the apex, suborbicular in outline, deeply three-lobed, about 6 mm. long, 8 mm. broad across the lateral lobes, pluri-tuberculate at the base; lateral lobes about 3.8 mm. long, 2.5 mm. broad, widely spreading, obovate to obovate-oblong, broadly rounded above; middle lobe

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about 4.1 mm. long, 5 mm. wide at the apex, obcordate, divided to about the middle into two suborbicular subspreading lobules; disc irregularly papillose-thickened, margins erose; spur about 5.5 mm. long, stout, cylindric, very sparsely hairy without. Column about 3–3.5 mm. long, stout, clavate, densely villous on the upper part.

This species is rather near *Calanthe cuneata* A. & S., from which it differs in the slender raceme, smaller flowers and different middle lobe of lip. It is unlike *C. kinabaluensis* Rolfe in its longer scape, shorter racemes, smaller flowers and very villous column.

KINABALU, *Haslam*, July–August 1916.

7. *Calanthe veratrifolia* R. Br. in Bot. Reg. (1823) t. 720.

Under this species are placed a large number of plants whose flowers show the widest variation, the smaller forms very near *C. Gibbsiae* Rolfe, but all clearly referable to this widely distributed and variable plant.

KINABALU, *Haslam*, July–August 1916. KIAU, *Clemens 42*, November 1915. 3000 feet altitude. Flower white; *Clemens 53*, November 1915. 3000 feet altitude. Flower white; *Clemens 132*, November 1915. 3000 feet altitude. Flower white; *Clemens 343*, November 1915. “Flower white with yellow tooth;” *Clemens 363*, November 1915. Flower white. LOBONG GORGE, *Clemens 301*, November 1915. Flower white.

34. SPATHOGLOTTIS Bl.

Four members of this genus have been found on the island of Borneo, and two species were recorded from Mount Kinabalu.

1. *Spathoglottis aurea* Lindl. in Journ. Hort. Soc. 5(1850) 34.

KINABALU, *Clemens*, October 1915; *Haslam*, July–August 1916. KINATAKI RIVER, *Haviland 1291*. 4000 feet altitude. KIAU, *Gibbs 3957*, February 1910. 3000 feet altitude. Undergrowth in secondary forest. Flower yellow; *Clemens 33*, November 1915. 3000 feet altitude. Flower yellow;

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Clemens 150, November 1915. 3000 feet altitude. Terrestrial, flower yellow. MAREI PAREI SPUR, *Clemens 228*, November 1915. Terrestrial, flower yellow.

2. *Spathoglottis gracilis Rolfe* in Curtis's Bot. Mag. (1894) t. 7366.

KINABALU, *Haviland*. 4000 feet altitude. MAREI PAREI SPUR, Dapatan, *Gibbs 4076*, February 1910. 5000 feet altitude. Undergrowth in mossy forest. Flower yellow.

3. *Spathoglottis plicata Bl.* Bijdr. (1825) 401.

KIAU, *Clemens 344*, November 1915. Flower bright purple.

35. ASCOTAINIA *Ridl.*

One member of this small genus has been recorded from Mount Kinabalu.

1. *Ascotainia borneensis Rolfe* in Gibbs in Journ. Linn. Soc. 42 (1914) 154.

KIAU, *Gibbs 3958*, February 1910. 3000 feet altitude. In undergrowth in secondary jungle. Flowers brown-mauve.

36. BULBOPHYLLUM *Thou.*

Seventy-eight members of this large genus were known to be native of Borneo, of which eight species were reported from Mount Kinabalu.

1. *Bulbophyllum* (§ *Racemosae*) *altispex Ridl.* in Stapf in Trans. Linn. Soc. Ser. 2, 4 (1894) 236.

KINABALU, *Haviland 1143*. 8000 feet altitude. Epiphytic.

2. *Bulbophyllum* (§ *Monanthaparva*) *anguliferum A. & S. sp. nov.* Herba minima. Rhizoma repens. Pseudobulbi in visu approximati, monophylli, pyriformes, obliqui, in sicco rugosi. Folium oblanceolato-lineare, apice rotundato bilobulum, in petiolum brevem angustatum. Scapi numerosi, filiformes. Flos pro planta magnus, in sicco pellucidus. Sepala lateralia triangulari-

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lanceolata, obliqua, acuta et complicata. Sepalum dorsale multo minus, lanceolatum, acuminatum. Petala perparva, lanceolato-oblonga, acuta vel acuminata. Labellum oblongum, obtusum, parte inferiore carina V-formi praeditum. Gynostemium breve, tridentatum, pede gracili instructum.

Plant very small. Roots numerous, fibrous, flexuous, less than .5 mm. thick. Rhizome slender, creeping, concealed by scarious sheaths that become fibrous and by the close succession of apparently approximate pseudobulbs. Pseudobulbs about 4–5 mm. long, pyriform, monophyllous, obliquely reclining, densely rugose in the dried specimen, surrounded by the fibres of sheaths. Leaf about 2.5–3.3 cm. long, 5.4 mm. wide above the middle, oblanceolate-linear, rounded at the apex with somewhat oblique obtuse lobules, gradually narrowed below to a sulcate petiole which is up to 5 mm. long, membranaceous in the dried specimen. Scapes up to 3.5 cm. long, filiform, numerous, glabrous, at the base wrapped with scarious sheaths that become fibrous, the upper part furnished with a pair of infundibuliform, not imbricating sheaths. Pedicellate ovary about 1 cm. long, slender, arcuate. Flower very large for the plant, when expanded about 2 cm. across the lateral sepals and a little wider from the tip of the dorsal sepal to the apex of the lip, thin and pellucid in the dried specimen. Lateral sepals about 1 cm. long, 5.6 mm. wide, triangular-lanceolate, oblique, acute and complicate at the apex, with five prominent nerves. Dorsal sepal much smaller, about 6.5 mm. long, 2.5 mm. wide below, lanceolate, acuminate, concave at the base, prominently three-nerved. Petals about 4.4 mm. long, 1.6 mm. broad, oblong-lanceolate, acute or acuminate, prominently three-nerved. Lip about 1.15 cm. long, 4.6 mm. broad; claw about 1 mm. long, 1.9 mm. wide, sulcate; lamina oblong, obtuse at the apex, seven-nerved, bearing on the upper surface

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a conspicuous thin V-shaped keel the arms of which—starting on each side near the base—converge but diminish in height toward the center, and on the under surface a low fleshy keel that extends from the base of the lip to the junction of the arms of the V-shaped keel. Column short, about 2.5 mm. long, three-toothed at the apex, merging into a long foot which is about 5 mm. long, very slender, extending from the column at an obtuse angle, and has a small fleshy dilation at its base with the anterior portion conspicuously fleshy-thickened.

In habit this plant resembles *Bulbophyllum Elmeri* Ames and *B. exile* Ames, but has approximate pseudobulbs. It is very similar in outward appearance to *B. ovalifolium* Lindl., but it has shorter sepals and much larger petals and lip. This species is distinguished from *B. stabile* J. J. Sm. by larger leaves, shorter dorsal sepal and petals.

The approximate pseudobulbs, the small dorsal sepal and the relatively large oblong lip with its V-shaped keel are characteristic marks.

LOBONG CAVE, *Clemens 133*, November 1915. Flower red inside, brown and yellow outside.

3. *Bulbophyllum* (§ *Racemosae*) *breviflorum* *Ridl.* in Stapf in *Trans. Linn. Soc. Ser. 2, 4* (1894) 236.

KINABALU, *Haviland*. 6000 feet altitude.

4. *Bulbophyllum* (§ *Monanthaparva*) *catenarium* *Ridl.* in Stapf in *Trans. Linn. Soc. Ser. 2, 4* (1894) 235.

KINABALU, *Haviland 1164*. 6500 feet altitude, among wet mosses on shrubs and trees.

5. *Bulbophyllum* (§ *Racemosae*) *caudatisepalum* *A. & S. sp. nov.* Herba gracilis. Rhizoma repens. Pseudobulbi perparvi, vaginis obtecti, crasso-cylindraceuti, monophylli. Folium anguste oblongum, acutum, ad petiolulum sulcatum sensim angustatum,

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coriaceum. Scapus pseudobulbo approximatus, in visu folio brevior, vaginis nonnullis infundibuliformibus late patentibus præditus. Racemus laxiflorus. Bracteae inflorescentiæ anguste deltoideæ, acuminatæ. Flores perparvi, in sicco pellucidi. Sepala lateralialia lanceolato-attenuata apicibus longis caudatis, mentum saccatum formantia. Sepalum dorsale lineari-lanceolatum, attenuatum, concavum. Petala minuta, linearia, acuta vel subacuta. Labellum perparvum, in positu naturali fere in medio decurvum, parte inferiore membranacea lateribus erecto-conduplicatis, parte anteriore ovato-elliptica acuta vel subobtusa; lamina expansa in circuitu anguste deltoidea. Gynostemium minutissimum, brachiis binis anguste triangularibus acuminatis instructum. Pes parte inferiore incrassatus, apice unciformis.

Plant slender. Rhizome creeping, woody, invested by the remains of sheaths which have become lanate fibrous. Roots numerous, fibrous, flexuous, branched, longitudinally sulcate, about .8 mm. thick. Pseudobulbs very small and concealed by marcescent sheaths, about 3.5 mm. high, thick-cylindric, deeply rugose in the dried specimen, monophyllous, about 1.3 cm. distant. Leaf about 13 cm. long, 1.8 cm. broad, narrowly oblong, acute and indistinctly complicate in the dried specimen, gradually narrowed to the petiole, coriaceous, many-nerved with the mid-nerve somewhat sulcate above and conspicuously carinate beneath, margins revolute in the dried plant. Petiole about 4 cm. long, sulcate. Scape approximate to the pseudobulb, enwrapped with the petiole in one or more marcescent sheaths, suberect or gently arcuate, apparently shorter than the leaf but broken off, provided with four or five scarious widely spreading infundibuliform sheaths which are imbricating below and remote above. Raceme loosely flowered. Bracts of the inflorescence about 3.5 mm. long, narrowly deltoid, acuminate, concave, surpassing

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the pedicellate ovary. Flowers very small, pellucid in the dried specimen. Lateral sepals about 6–7 mm. long, 2.3 mm. wide, lance-attenuate with long caudate apices resulting from the involute margins, forming a saccate mentum, three-nerved. Dorsal sepal about 5 mm. long, 1.3 mm. wide, linear-lanceolate, with a similar but shorter attenuate tip, concave below, one- or three-nerved at the base. Petals much smaller, about 2 mm. long, .33 mm. wide, linear, acute or subacute, one-nerved, cellular on the upper margins. Lip in natural position strongly decurved below the middle, the lower portion membranaceous with the sides erect and conduplicate, the anterior portion ovate-elliptic and acute or subobtusate at the apex; lamina when expanded narrowly deltoid in outline, appearing trilobed, about 2.8 mm. long, 1.4 mm. broad across the suborbicular hypochil, bicallose at the base, three-nerved. Column very minute, provided with a pair of parallel narrowly triangular acuminate arms. Column foot thickened in the lower portion, unciform above.

This little plant is very near to *Bulbophyllum polypodioides* Schltr., being almost identical vegetatively, but it is clearly differentiated by its thinner perianth, longer more caudate sepals, narrower petals and smaller lip. This species is distinguished from *B. adenopetalum* Lindl. by its more robust habit, prominent cauline sheaths and apparently efimbriate lip. It differs from *B. puberulum* Ridl. in having a longer narrower leaf and simple column arms. It is distinct from *B. apodum* Hook. f. in lacking a strict scape which is floriferous almost to the base.

LOBONG CAVE, *Clemens 113 A*, November 1915. 5000 feet altitude.

6. *Bulbophyllum* (§ *Sestochilus*) *concauum* A. & S. *sp. nov.*
Herba pro sectione gracilis. Rhizoma repens. Pseudobulbi remoti, cylindranei, monophylli. Folium lineari-oblongum, falcatum, apice in visu acutum, basi cuneatum, breviter petiolatum,

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subcoriaceum. Scapus brevis, uniflorus. Flos mediocris, in sicco pellucidus. Sepala lateralalia late ovata, obliqua, apice acuta et dorso carinata. Sepalum dorsale oblongum, valdissime concavum, acutum. Petala oblonga, obliqua, leviter falcata, acuta. Labellum anguste triangulari-cordatum, valde decurvum, carnosissimum, apice rotundatum. Gynostemium perbreve, crassum, cornubus binis spathulatis decurvis et pede apice unciformi praeditum.

Plant rather slender. Roots few, stout, rigid, apparently unbranched, longitudinally sulcate, ± 1 mm. thick, produced near the pseudobulbs. Rhizome about 2.5 mm. thick, creeping, woody, striate-sulcate in the dried specimen, provided with close but not imbricating sheaths. Sheaths tubular, loose, scarious, up to 9 mm. long. Pseudobulbs about 3.5 cm. distant, about 2.2 cm. high, cylindric or very narrowly pyriform-cylindric, monophyllous, closely rugose in the dried specimen, enveloped by a loose scarious sheath that surpasses the summit of the pseudobulb and becomes fibrous in development. Leaf about 13.5–14.2 cm. long, 1.65–1.95 cm. broad, linear-oblong, somewhat falcate, apex apparently acute but really obtuse and complicate, below cuneate-narrowed to a sulcate petiole 1–2 cm. long, subcoriaceous, many-nerved with the mid-nerve slightly sulcate above and sharply carinate beneath. Scape inclusive of the scarcely perceptible ovary about 5.3 cm. long, one-flowered, provided with two sheaths, the lower infundibuliform and about 1.5 cm. long, the upper loose suborbicular acute, dorsally carinate at the apex and about 7 mm. long. Flower glabrous, pellucid in the dried specimen. Lateral sepals about 1.5 cm. long, 6 mm. wide at the base and 1 cm. wide in the middle, broadly ovate, oblique, acute and dorsally carinate at the apex, with about nine nerves. Dorsal sepal about 1.7 cm. long, 6.1 mm. wide, oblong, very strongly concave or cucullate, acute and dorsally carinate at the apex.

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Petals about 1.5 cm. long, 5 mm. broad, oblong, oblique, sub-falcate, acute and dorsally carinate at the apex, five-nerved. Lip raised on a stout unciform stipe, about 7.5 mm. long, narrowly triangular-cordate, strongly decurved, very fleshy particularly down the middle, the center channeled near the base, apex broadly obtuse, lower margins thin and denticulate. Column very short and stout, about 3 mm. long and somewhat broader, provided above with a pair of parallel, porrect, unciform-spatulate, decurved arms which are about 2.6 mm. long. Column foot stout, about 6 mm. in length along the union with the petals; unciform portion free, about 3 mm. long.

This plant has three rather close relations, *Bulbophyllum cornutum* Reichb. f., *B. membranifolium* Hook. f. and *B. phaeanthum* Schltr. The first species has a much shorter scape than *B. concavum*, flat dorsal sepal and conspicuous divergent side lobes to the lip. *B. membranifolium* has longer leaves, naked pseudobulbs and truncate base to the lip. *B. phaeanthum* differs from the Kinabalu plant in its smaller sepals, apiculate sepals and petals and larger lip.

KIAU, *Clemens 94*, November 1915. 3000 feet altitude. Flower dark wine color.

7. *Bulbophyllum* (§ *Racemosae*) *coriaceum* *Ridl.* in *Stapf* in *Trans. Linn. Soc. Ser. 2, 4* (1894) 235.

KINABALU, *Haviland 1100*. 10,500 feet altitude.

8. *Bulbophyllum* (§ *Racemosae*) *crassicaudatum* *A. & S. sp. nov.* Herba robusta, alta. Rhizoma repens, vaginis densissime imbricantibus vestitum. Pseudobulbi perparvi, monophylli. Folium oblongo-ellipticum, apice complicato obtusum, ad petiolum crassissimum sensim angustatum, valde coriaceum. Scapus folium excedens, suberectus, vaginis laxis tubularibus usque ad inflorescentiam vestitus. Racemus perlongus, densior. Perian-

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thium late patens. Sepala anguste lanceolato-attenuata, apicibus caudatis. Petala minuta, ovata, obtusa vel acuta. Labellum parvum, valde decurvum, marginibus inferioribus erecto-conplicatis, expansum suborbiculare, obtusum, parte anteriore callo carnoso praedita. Gynostemium brachiis binis brevibus triangularibus et pede arcuato instructum.

Plant tall, robust. Rhizome stout, creeping, woody, about 7 mm. thick, concealed by densely imbricating broadly triangular-ovate carinate mucronate sheaths. Roots numerous, stout, fibrous, subrigid, branching, ± 2 mm. thick. Pseudobulbs very small, about 5 mm. high, up to 8 mm. wide, monophyllous, concealed by the sheaths. Leaf about 23.5–28.5 cm. long, 6.4–7.7 cm. wide, oblong-elliptic, apex appearing acute in the dried specimen but in reality complicate and obtuse, gradually narrowed to a sulcate petiole, very thick and coriaceous, many-nerved with the mid-nerve strongly sulcate above and sharply carinate beneath, the margins more or less revolute. Petiole about 11–14 cm. long, very stout, deeply channeled, clothed below with several triangular-ovate to tubular, loose, rigid, carinate sheaths. Scape ± 56 cm. long, surpassing the leaves, erect or nearly so, clothed for about 26–28 cm. (nearly or quite up to the inflorescence) with strict, infundibuliform sheaths that are imbricating below and free above. Rachis striate, glabrous. Bracts of the raceme up to 1.5 cm. long, spreading, tubular-involute, lance-attenuate. Raceme rather dense. Flowers with widely spreading segments, fleshy, cellular-pellucid in the dried specimen. Lateral sepals about 1.1 cm. long, 2.5 mm. wide at the base, lance-attenuate with long caudate apices which are produced by the involute margins, forming a slightly saccate mentum. Dorsal sepal very similar, about 1 cm. long, 2 mm. wide below. Petals minute, about 1.7 mm. long, 1.15 mm. broad,

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ovate, obtuse or acute. Lip minute, with a short saccate claw, in natural position strongly decurved with the lower margins erect and conduplicate, when expanded about 2 mm. long, suborbicular, obtuse, the anterior half mainly occupied by a fleshy oblong callus. Column minute, provided above with a pair of conspicuous triangular acuminate arms with somewhat irregular margins and below with an arcuate foot.

The numbered specimens collected by Clemens show somewhat smaller flowers; *Clemens 99, 154*, and to a less extent *172* show immature plants with somewhat arcuate-flexuous scapes and dense racemes. *Clemens 99* shows a leaf 32.5 cm. long and another 8 cm. broad.

There appear to be several species somewhat similar to this plant, but as especial allies may be mentioned *Bulbophyllum hortense* J. J. Sm., *B. hortensoides* Ames, *B. jareense* Ames, *B. penduliscapum* J. J. Sm. and *B. prianganense* J. J. Sm. *B. hortense* is characterized by shorter scapes, narrower more involute sepals, smaller petals and less conspicuous column arms than *B. crassicaudatum*. *B. hortensoides* has much shorter scapes, narrower leaves and much larger lip than this species. *B. jareense* and *B. penduliscapum* differ from the Kinabalu plant in having elongate petals and prominent lip. *B. prianganense* is a much smaller and more delicate plant with a shorter scape and a larger lip than this species. In habit *B. crassicaudatum* closely resembles *B. odoratum* Lindl.

KINABALU, *Clemens* (Type), November–December 1915. KIAU, *Clemens 99*, November 1915. 3000 feet altitude. Flower greenish; *Clemens 154*, November 1915. 3000 feet altitude. Flower white, evidently immature; *Clemens 172*, November 1915. 3000 feet altitude. Flower cream-white, small orange dots on column; *Clemens 408*, December 1915. Flower white.

9. *Bulbophyllum* (§ *Racemosae*) *cuneifolium* A. & S. sp. nov. Herba parva. Rhizoma gracile. Pseudobulbi minuti, cylin-

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dracei, monophylli. Folium oblanceolatum, apice complicato in visu acutum, in petiolum sensim angustatum, coriaceum. Scapus folio approximatus, vaginis laxis flavis tubularibus obtectus. Bracteae inflorescentiae reflexae, lanceolatae. Flores perparvi. Sepala lateralialia lanceolato-attenuata apicibus caudatis, mentum saccatum formantia. Sepalum dorsale oblongo-lineare, acuminatum. Petala linearia, acuta. Labellum in positu naturali sub medio abrupte reflexum, expansum lingulatum, marginibus lateralibus anterioribus ciliatis. Gynostemium minutum, brachiis binis triangularibus et pede apice uniceiformi instructum.

Plant small. Rhizome slender, woody, somewhat branched, striate, invested by scarious sheaths. Roots rather numerous, fibrous, flexuous, rigid, glabrous, about .75 mm. thick. Pseudobulbs minute, about 3 mm. tall and nearly as broad at the base, thick-cylindric, finely striate-rugose in the dried specimen, monophyllous. Leaf about 6.6 cm. long, 1.9 cm. wide across the upper part, oblanceolate or cuneate, obtuse but complicate and appearing acute at the apex, gradually narrowed to a sulcate petiole ± 2 cm. long, thick and coriaceous, rigid, many-nerved with the mid-nerve more or less sulcate above and sharply carinate beneath. Scape approximate to each leaf, wrapped— together with the base of the petiole— in several scarious sheaths, the portion below the raceme concealed by several imbricating loose tubular yellow scarious sheaths. Bracts of the inflorescence about 2.8 mm. long, reflexed, lance-attenuate, scarious. Rachis striate (broken off near the base). Flowers (only one present) very small, in form resembling those of *Bulbophyllum adenopetalum* Lindl. and *B. flavescens* Lindl. Lateral sepals about 5 mm. long, 1.9 mm. broad, lance-attenuate with long caudate apices produced by the involute margins, forming a saccate mentum, somewhat oblique, three-nerved. Dorsal sepal about 3.7 mm.

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long, 1 mm. broad below, oblong-linear, acuminate with a thickened apex, concave at the base, one- or indistinctly three-nerved at the base. Petals about 1.55 mm. long, .33 mm. wide, linear, acute, one-nerved. Lip sharply reflexed below the middle forming a conduplicate hypochil and ovate epichil, when expanded about 1.8 mm. long, .8 mm. broad, lingulate, acute or subacute, somewhat bicallose at the base, the lateral margins ciliate above, three-nerved. Column minute, provided above with a pair of short, parallel, triangular, acuminate arms and below with a prominent foot which is unciform at the apex.

Of the allied species *Bulbophyllum montigenum* Ridl. has much longer leaves and a different lip; *B. Brookeanum* Kränzl. has much smaller leaves and a slightly smaller flower; *B. kinabaluense* Rolfe is differentiated by shorter leaves and larger yellow flowers; *B. adenopetalum* Lindl. and *B. flavescens* Lindl. have larger flowers than *B. cuneifolium*; and *B. polypodioides* Schltr. has considerably longer leaves and a much larger lip than this species.

The oblanceolate leaves and minute white flowers with caudate lateral sepals and ciliate lip are characteristic marks.

KIAU, *Clemens* 195, November 1915. 3000 feet altitude. Flower white.

10. *Bulbophyllum* (§ *Sestochilus*) *Dearei* Reichb. *f.* in *Flora* 71 (1888) 156.

These specimens show considerably more fleshy and pubescent horns of the lip than usual.

KINABALU, *Haslam*, July–August 1916.

11. *Bulbophyllum* (§ *Racemosae*) *deltoideum* A. & S. *sp. nov.* Herba mediocris. Rhizoma repens. Pseudobulbi minimi, monophylli. Folium anguste elliptico-oblongum, acutum, ad petiolum canaliculatum sensim angustatum, coriaceum. Scapus pseudo-

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bulbo approximatus, irregulariter arcuatus. Racemus tarde laxissimus. Bracteae inflorescentiae lanceolatae, acuminatae. Flores parvi, carnosi. Sepala lateralia lanceolato-triangularia, obliqua, concava, complicato-mucronata, mentum saccatum formantia. Sepalum dorsale oblongum, complicato-mucronatum, concavum. Petala lineari-oblonga, acuta vel subacuta. Labellum in situ naturali leviter decurvum, lateribus inferioribus erecto-conduplicatis, marginibus mediis valde revolutis; lamina expansa anguste deltoidea, acuta. Gynostemium minutum, brachiis binis triangularibus et pede conspicuo tuberculato praeditum.

Plant medium-sized. Rhizome about 5 mm. thick, terete, creeping, woody, closely invested by scarious evanescent sheaths, smooth when naked. Roots very numerous, fibrous, flexuous, up to 1 mm. thick. Pseudobulbs very small and inconspicuous, about 2 mm. high, 4 mm. broad below, thick-cylindric, yellow, monophyllous. Leaf about 15.5–21.5 cm. long, 2.4–3.4 cm. broad, narrowly elliptic-oblong, acute with a more or less complicate apex, gradually narrowed to a sulcate petiole, coriaceous, the mid-nerve more or less sulcate above and sharply carinate beneath, the margins somewhat revolute in the dried specimen. Petiole 8.5–10 cm. long, laterally flattened. Scape approximate to the pseudobulb, usually shorter than the leaf, including the raceme up to 29.5 cm. long, irregularly arcuate, clothed with tubular scarious sheaths which are 1.2–2.5 cm. long, imbricating below and subremote above. Raceme very lax in development. Bracts of the inflorescence up to 5.5 mm. long, lanceolate, acuminate, concave. Flower small, cellular, fleshy. Lateral sepals about 5–6 mm. long, 3–3.5 mm. wide, lance-triangular, oblique, concave, complicate-mucronate, forming a somewhat saccate mentum, three-nerved. Dorsal sepal about 5.2 mm. long, 2.3 mm. wide, oblong, complicate-mucronate, concave, microscopi-

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cally ciliolate, one- or indistinctly three-nerved. Petals about 3.2 mm. long, 1 mm. broad, linear-oblong, acute or subacute, one-nerved, somewhat thickened and microscopically ciliolate on the upper half. Lip minutely clawed, in natural position gently decurved near the middle with the sides of the lower portion erect and conduplicate, the central margins on each side sharply revolute; limb when expanded narrowly deltoid, acute, about 4.55 mm. long, 2.6 mm. wide near the base, with a pair of small approximate calli at the base, the central margins on each side microscopically ciliate. Column inconspicuous, provided above with a pair of sharply triangular arms and below with a prominent foot bearing midway a minute porrect tubercle.

This plant has numerous more or less near allies. It is distinguished from *Bulbophyllum obtusipetalum* J. J. Sm. by smaller sepals, larger petals of different shape and a lip which is nearly twice as large, and from *B. gibbosum* Lindl. by markedly smaller sepals and more fleshy flowers, with a dissimilar tubercle on the column foot. *B. deltoideum* differs from *B. unguiculatum* Reichb. f. in its much larger petals and lip. Minute bracts, long inflorescences and ovate petals characterize *B. saccatum* Kränzl. The Philippine allies, *B. dasypetalum* Rolfe ex Ames, *B. Escriptorii* Ames and *B. marivelense* Ames, lack the proportionately large lip of this species. *B. ebulbe* Schltr. has shorter leaves and petiole and apparently smaller perianth than *B. deltoideum*.

LOBONG CAVE, *Clemens 115*, November 1915. 5000 feet altitude. Flower yellow.

12. *Bulbophyllum* (§ *Racemosae*) *disjunctum* A. & S. *sp. nov.*
Herba venusta. Rhizoma repens, crassum. Pseudobulbi remoti, cylindranei vel anguste pyriformes, monophylli. Folium lineare vel anguste oblongum, acutum, in petiolum sulcatum sensim angustatum, subcoriaceum. Scapus longus, pseudobulbo approxi-

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matus, vaginis nonnullis tubularibus vestitus. Bracteae inflorescentiae lanceolato-attenuatae, patentes. Racemus laxissimus, floribus saepissime oppositis. Segmenta perianthii late patentia, in sicco irregulariter crispata. Sepala lanceolata apicibus longissime caudatis. Petala similia sed minora. Labellum valde decursum, anguste lanceolatum, in medio carinis duabus e prope basim ad partem anteriorem decurrentibus. Gynostemium breve, crassum, tridentatum, dente medio late triangulari et brachiis binis triangularibus subulatis. Pes arcuatus.

Plant graceful. Rhizome about 6 mm. in diameter, creeping, thick, terete, apparently flexuous, woody, closely invested by scarious sheaths. Roots rather numerous, fibrous, flexuous, freely branched, longitudinally sulcate, pubescent or glabrous, about 1 mm. thick. Pseudobulbs about 1.5 cm. in height, thick-cylindric or narrowly pyriform, remote, monophyllous, yellowish, striate or sulcate in the dried specimen. Leaf 16–25 cm. long, 1.85–4 cm. wide, linear to narrowly oblong, more or less oblique and falcate, acute, gradually narrowed to the long petiole, subcoriaceous, many-nerved with the mid-nerve sharply sulcate above and carinate beneath. Petiole up to 15.5 cm. long, very variable in size, deeply sulcate. Scape \pm 50 cm. long, approximate to the pseudobulb, arcuate from a more or less decumbent base, clothed with several loose tubular scarious sheaths which are imbricating below and subremote above, deeply striate in the dried specimen. Raceme very loose and disjointed with remote and usually opposite flowers. Bracts of the inflorescence up to 1.5 cm. long, 2.5 mm. wide at the base, lance-attenuate, spreading. Flowers with widely spreading segments which are irregularly crispate in the dried plant. Lateral sepals about 2.5 cm. long, 3.8 mm. wide at the base, lanceolate, with very long caudate apices formed of the conduplicate halves of the upper por-

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tion, three-nerved. Dorsal sepal very similar, about 2.25 cm. long, 3 mm. wide at the base. Petals similar to the sepals but smaller, about 1.6 cm. long, 1.9 mm. wide below, oblong-lanceolate with very long caudate apex, lower margins hyaline erose, one-nerved. Lip in natural position strongly decurved, when extended about 5.2 mm. long, 2.2 mm. broad at the base, narrowly lanceolate, acuminate, the center longitudinally thickened and provided with a pair of approximate keels which originate in unciform-decurved lamellae near the base and extend nearly to the apex where they fuse. Column about 2.5 mm. long, short and stout, provided with three teeth, an acute broadly triangular central tooth and a pair of triangular arms which terminate in subulate teeth. Foot stout, upcurving.

This species is allied to *Bulbophyllum jareense* Ames and *B. penduliscapum* J. J. Sm., but it possesses narrower leaves and looser racemes of larger flowers. Unlike *B. Korthalsii* Schltr. and *B. leptosepalum* Hook. f., this plant has prominent though sheathed pseudobulbs and long caudate petals. *B. disjunctum* differs from *B. Stella* Ridl. in the very loose racemes, prominent bracts and caudate petals. The conspicuous floral bracts, spreading perianth and simple lip distinguish this species from *B. cleistogamum* Ridl. *B. hamatifolium* J. J. Sm. lacks the distinct pseudobulbs, long caudate petals and simple lip.

MAREI PAREI SPUR, *Clemens* 254, November 1915. Flower cream color with purple tips.

13. *Bulbophyllum* (§ Racemosae) **eximium** A. & S. *sp. nov.*
Herba minuta. Rhizoma pergracile, radicibus numerosis absconditum, vaginis scariosis imbricantibus obtectum. Pseudobulbi minutissimi, monophylli. Folium lineare, acutum, in sicco subcoriaceum, viride carnosissimum, supra sulcatum. Scapi breves, in fasciculo circiter sex in ramo rhizomatis approximati, uniflori.

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Flos in sicco pellucidus. Sepala lateralia late triangulari-falcata, mentum profunde saccatum formantia, complicato-mucronata vel caudata. Sepalum dorsale oblongo-lanceolatum, valde concavum, acuminatum vel complicato-mucronatum. Petala anguste lanceolata, ad apicem obtusum vel acutum angustata. Labellum in positu naturali valde decurvum, lateribus inferioribus erecto-conduplicatis, marginibus anterioribus valde revolutis; lamina expansa lingulata, obtusa. Gynostemium minutum, brachiis binis triangularibus et pede apice unciformi instructum.

Plant dwarf. Roots numerous, fibrous, flexuous, puberulent, about .33 mm. thick. Rhizome very slender, about .6 mm. thick, apparently enmeshed in a mass of roots, branched, flexuous, thickly clothed with ovate-oblong thinly scarious imbricating sheaths that become fibrous. Pseudobulbs minute and very inconspicuous, cylindric, about 2 mm. long, reclining on the rhizome, monophyllous. Leaves numerous, 1.2–2.7 cm. long, up to 4 mm. broad, linear, acute, gradually narrowed to a very short petiole, rigidly spreading-ascending, in the dried specimen thinly coriaceous, in the living or alcoholic plant very thick, fleshy, sulcate above and convex beneath. Scapes about 3.6–4 mm. long, one-flowered, articulated near the base, approximate, about six crowded on branches of the rhizome. Pedicellate ovary about 3.7 mm. long. Flowers of the Racemosae Section. Perianth pellucid in the dried specimen, segments connivent. Lateral sepals about 5.5 mm. long and 4 mm. wide, broadly triangular-falcate and decurved, very oblique, forming a deeply saccate mentum, complicate-mucronate or caudate, three-nerved. Dorsal sepal about 6.5 mm. long, 1.5 mm. wide below, oblong-lanceolate, acuminate or complicate-mucronate, strongly concave, one-nerved. Petals about 5–6.4 mm. long, 1–1.4 mm. wide below the middle, narrowly lanceolate, acuminate to an acute or obtuse apex, gently

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falcate toward the lateral sepals, microscopically ciliate on and pubescent near the upper margins, one-nerved. Lip minutely clawed, in natural position strongly decurved below the middle with the sides of the lower half erect and conduplicate, the anterior portion forming a narrowly elliptic epichil with strongly revolute margins; the lamina when expanded about 5 mm. long, 2.8 mm. broad near the base, lingulate, appearing subtrilobed, obtuse, with a pair of small approximate calli at the base, three-nerved, with the margins — except near the base — minutely ciliate. Column minute, with a pair of short triangular arms. Foot furnished midway with a small more or less tubercular thickening, unciform at the apex.

This minute species is somewhat allied to *Bulbophyllum perpusillum* Ridl., but has much larger leaves, shorter scapes and larger flowers. From *B. absconditum* J. J. Sm. and *B. sarcanthiforme* Ridl., this plant is distinguished by its denser, apparently more fleshy foliage and larger flowers.

KIAU, *Clemens 317*, November 1915. Flower cream color.

14. *Bulbophyllum* (§ *Racemosae*) *Gibbsiae* *Rolfe* in *Gibbs* in *Journ. Linn. Soc.* 42 (1914) 149.

PENIBUKAN RIDGE (also on Marei Parei Spur), *Gibbs 4059*, February 1910. 6000 feet altitude. Epiphyte in mossy forest, flowers white.

15. *Bulbophyllum* (§ *Racemosae*) *kinabaluense* *Rolfe* in *Gibbs* in *Journ. Linn. Soc.* 42 (1914) 148.

LOBONG to PAKKA, *Gibbs 4252*, February 1910. 6000–9500 feet altitude. Epiphyte in mossy forest, flowers yellow.

16. *Bulbophyllum* (§ *Racemosae*) *lanceolatum* *A. & S. sp. nov.* Herba gracilis. Rhizoma repens. Pseudobulbi minuti, cylindracei, monophylli. Folium erectum, anguste lanceolatum vel lineari-lanceolatum, longe acuminatum, ad petiolum sulcatum sensim angustatum, coriaceum. Scapus pseudobulbo approxi-

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matus, folio brevior, vaginis perpaucis tubularibus vestitus. Racemus laxus, multiflorus. Bractee inflorescentiae ovato-lanceolatae, acutae, concavae. Flores parvi, in sicco pellucidi. Sepala lateralia triangulari-lanceolata, falcata, obliqua, complicato-mucronata, mentum profunde saccatum formantia. Sepalum dorsale oblongo-lanceolatum, complicato-mucronatum, valde concavum vel cucullatum. Petala multo minora, rutaeformia vel rhombiformia, obtusa vel subacuta. Labellum in positu naturali medio abrupte reflexum, dimidio inferiore lato membranaceo lateribus erecto-conduplicatis, parte anteriore anguste oblonga crassiore obtusa fimbriata; lamina expansa in circuitu deltoidea, hypochilio suborbiculari. Gynostemium brachiis binis subquadrato-triangularibus apice subulatis instructum. Pes unciformis, parte inferiore incrassata.

Plant slender. Rhizome creeping, woody, conspicuously sulcate in the dried specimen, concealed by the fibrous remains of scarios sheaths, about 2.5 mm. thick. Roots slender, fibrous, flexuous, rather numerous, more or less longitudinally sulcate, about .75 mm. thick. Pseudobulbs minute, about 2 mm. high and wide below, cylindric, striate-rugose in the dried specimen, monophyllous, at intervals of about 5–7 mm. Leaves erect, ±14 cm. long, 1.2 cm. broad, narrowly lanceolate to linear-lanceolate, sometimes very slightly oblique and falcate, long acuminate with an acute apex, gradually narrowed to the petiole, coriaceous, the mid-nerve indistinctly sulcate or invisible above and conspicuously carinate beneath. Petiole 2–3.5 cm. long, sulcate, enwrapped — together with the base of the scape — in a scarios sheath that becomes fibrous. Scape ±13 cm. long, approximate to the pseudobulb, suberect to gently arcuate or flexuous, shorter than the leaf, provided with a very few loose tubular scarios sheaths which are short and imbricating below and remote

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above. Raceme \pm 8 cm. long, loose, many-flowered. Bracts of the inflorescence about 2.4 mm. long, 1.2 mm. broad, ovate-lanceolate, acute, concave, one-nerved. Flowers small, pellucid in the dried specimen. Perianth segments connivent. Lateral sepals about 4.5–5 mm. long, 2.5 mm. wide, triangular-lanceolate, falcate, oblique, complicate-mucronate, three-nerved, forming a deeply saccate mentum. Dorsal sepal about 4.5–5 mm. long, 1.6 mm. broad, oblong-lanceolate, complicate-mucronate, strongly concave or cucullate, three-nerved. Petals much smaller, about 2 mm. long, .8 mm. wide, rutaeform or rhombic, obtuse or subacute, one-nerved, pubescent on the upper half. Lip in natural position sharply reflexed in the middle, the lower half broad membranaceous with erect conduplicate sides, the upper half narrowly oblong, obtuse fimbriate; lamina when expanded deltoid in outline, appearing trilobed, about 3 mm. long, 1.9 mm. broad across the suborbicular hypochil, bicallose at the base, with three approximate nerves. Column minute, provided with a pair of subquadrate-triangular arms which terminate in subulate teeth. Column foot unciform, below conspicuously fleshy-thickened and convex.

In vegetative character, this species closely resembles *Bulbophyllum lancifolium* Ames, but it has infinitely smaller flowers. (PLATE 95.)

GURULAU SPUR, *Clemens* 305, November 1915. "Flower cream color with brown tooth."

17. *Bulbophyllum* (§ *Monanthaparva*) *latisepalum* A. & S. *sp. nov.* Herba nana. Rhizoma repens, gracile. Pseudobulbi minuti, cylindranei, monophylli. Folium oblanceolatum vel anguste oblanceolatum, apice rotundato bilobulum, ad basim sensim angustatum, coriaceum. Scapi singuli vel bini, uniflori, breves, filiformes. Flos pro planta magnus, in visu pellucidus. Sepala

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lateralia obovato-oblonga, complicato-acuta. Sepalum dorsale multo minus, lanceolatum, longissime acuminatum. Petala minuta, oblonga, abrupte acuta. Labellum sub medio leviter reflexum marginibus inferioribus involutis, expansum oblongum, apice rotundato levissime retusum, parte anteriore papillis raris praedita. Gynostemium minutum, brachiis binis deltoideis acuminatis et pede recto praeditum.

Plant minute. Rhizome very slender, creeping, deeply rugose, partially surrounded by the long fibres of sheaths. Roots rather sparse, fibrous, flexuous, about .4 mm. thick. Pseudobulbs 4–5 mm. distant, cylindrical, about 2.5 mm. long, obliquely reclining, monophyllous. Leaf up to 2.2 cm. long, 4.5 mm. wide, oblanceolate to narrowly oblanceolate, apex rounded and minutely bilobed, gradually narrowed below to a short petiole, coriaceous, the mid-nerve sulcate above and carinate beneath. Scapes solitary or in pairs, one-flowered, about 1.9 cm. long, filiform, the decumbent base clothed with sheaths that become fibrous, provided with a minute infundibuliform sheath just below the flower. Flower comparatively large, pellucid in the dried specimen. Lateral sepals about 1 cm. long, 4.5 mm. broad above the middle, obovate-oblong, complicate-acute, five-nerved. Dorsal sepal about 6.5 mm. long, 1.8 mm. broad near the base, much smaller than the lateral sepals, lanceolate, very long acuminate, concave at the base, three-nerved. Petals minute, about 2.4 mm. long, 1.2 mm. wide, oblong, abruptly acute at the apex, three-nerved. Lip in natural position gently reflexed with the lower margins incurved below the middle, when expanded about 7 mm. long, 3.5 mm. wide above the middle, oblong, rounded and very shallowly and obscurely retuse at the slightly thickened apex, anterior portion with scattered papillae, about seven-nerved. Column minute, with a pair of short arms which are deltoid acumi-

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nate. Foot stout, straight, with a very minute slender tubercle at the base. Anther ellipsoid broadened into two divergent semi-orbicular membranaceous wings.

This little plant has numerous more or less close allies. It differs from *Bulbophyllum chryseum* Ames in its smaller vegetative proportions, broad lateral sepals and lip and much smaller dorsal sepal and petals. It is distinguished from *B. halconense* Ames by shorter broader lateral sepals, notably smaller dorsal sepal and larger lip. *B. latisepalum* has much larger flowers than *B. sensile* Ames, differently shaped sepals and a simple lip. *B. montense* Ridl. has narrower leaves, taller scapes and flowers which are nearly twice as large as those of *B. latisepalum*.

KINABALU, *Clemens*, November–December 1915.

18. *Bulbophyllum* (§ *Racemosae*) *longimucronatum* A. & S. *sp. nov.* Herba minor. Rhizoma repens. Pseudobulbi parvi, crasso-cylindracei, monophylli. Folium ellipticum, obtusum, ad petiolum sulcatum cuneato-angustatum, subcoriaceum. Scapus pseudobulbo approximatus, arcuato-flexuosus, vaginis nonnullis tubuliformibus vestitus. Racemus laxiflorus. Bractee inflorescentiae lanceolatae, longe acuminatae. Flos in sicco pellucidus. Sepala lateralia late triangularia, cauda longa subito terminantia, mentum profunde saccatum formantia. Sepalum dorsale lanceolatum, cauda brevior. Petala multo minora, linearia, acuta. Labellum in positu naturali valde decurvum marginibus conspicue revolutis, expansum cordatum obtusum basi bicallosum. Gynostemium breve, crassum, brachiis binis subulatis et pede longo apice unciformi praeditum.

Plant rather small. Rhizome woody, creeping, concealed by scarious sheaths. Roots numerous, fibrous, flexuous, more or less branched, longitudinally sulcate, apparently glabrous, about .75 mm. thick. Pseudobulbs very small, about 3 mm. high, 6 mm.

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wide at the base, thick-cylindric, rugose in the dried specimen, monophyllous, entirely concealed by the fibrous remnants of sheaths. Leaf about 13 cm. long, 4.4 cm. wide in the middle, elliptic, obtuse, cuneate-narrowed to the petiole, subcoriaceous, the mid-vein indistinctly sulcate above and strongly carinate beneath. Petiole about 3 cm. long, sulcate. Scape approximate to the pseudobulb, about 15 cm. long, arcuate-flexuous, striate in the dried specimen, provided with several tubular, scarios sheaths that are short and imbricated at the base, free to subremote above. Raceme loosely flowered. Bracts of the inflorescence about 6-7 mm. long, lanceolate, long acuminate, scarios, equaling or surpassing the pedicellate ovary. Flower pellucid in the dried specimen. Lateral sepals about 1.2 cm. long, 6 mm. wide, very broadly triangular below, oblique, three-nerved, forming a deeply saccate mentum, terminating above in an abrupt long cellular cauda which is about 6-7 mm. long. Dorsal sepal about 1 cm. long, 2.45 mm. wide at the base, lanceolate, terminating in an abrupt cellular cauda which is about 5 mm. long, one-nerved. Petals much smaller, about 4 mm. long, 1.2 mm. wide, linear, acute, one-nerved. Lip in natural position strongly decurved with the margins conspicuously revolute, when expanded about 3.75 mm. long from base to apex or 4.6 mm. long including the semi-orbicular basal auricles, 3.8 mm. broad near the base, cordate, obtuse, provided at the base with a pair of small approximate calli, three-nerved with the mid-nerve very prominent, the apical portion microscopically papillose. Column short, stout, about 2 mm. high, provided above with a pair of parallel subulate arms and below with a long foot which is unciform at the apex. Anther shallowly hemispherical, glabrous.

There are several allies of this plant, the nearest *Bulbophyllum leptosepalum* Hook. f., which has much narrower leaves,

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crowded pseudobulbs, uniformly white flowers and the bracts of the scape imbricating.

The minute pseudobulbs, broad leaves and long caudate sepals characterize this plant.

KIAU, *Clemens* 56, November 1915. 3000 feet altitude. Flower yellow, white and orange.

19. *Bulbophyllum* (§ *Racemosae*) *magnivaginatatum* A. & S. sp. nov. Herba robusta. Rhizoma repens, crassum. Pseudobulbi perparvi, crasso-cylindracei, monophylli. Folium oblongum vel oblanceolato-oblongum, apice late rotundatum, ad petiolum sulcatum crassum angustatum, coriaceum. Scapus pseudobulbo approximatus, vaginis duabus magnis laxis infundibuliformibus instructus. Racemus dense multiflorus. Bractee inflorescentiae lanceolatae, acuminatae. Flores perparvi. Sepala lateralia oblique triangulari-lanceolata, complicato-mucronata, mentum profunde saccatum formantia. Sepalum dorsale oblongum, obtusum vel acutum, valde concavum. Petala lanceolato-oblonga, apice late rotundata. Labellum in positu naturali valde decurvum, parte inferiore membranacea lateribus erecto-conduplicatis, dimidio anteriore elliptico carnosio convexo; lamina expansa lingulata obtusa. Gynostemium minutum, brachiis binis triangularibus abrupte subulatis praeditum. Pes tuberculatus, unciformis.

Plant stout. Rhizome stout, terete, creeping, woody, about 7.5 mm. thick, invested by close scarious evanescent sheaths. Roots very numerous, fibrous, flexuous, longitudinally sulcate, finely verrucose, about 1 mm. thick. Pseudobulbs very small, about 3.5–4 mm. high, 6 mm. broad at the base, thick-cylindric, monophyllous, inconspicuously striate-rugose, yellowish. Leaf about 24–26 cm. long, 3.9–5.25 cm. wide, oblong to oblanceolate-oblong, broadly rounded above, cuneate-narrowed to the petiole, coriaceous, with the mid-nerve sulcate above and conspicu-

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ously carinate beneath. Petiole about 11–13 cm. long, stout, sulcate, the lower part enveloped — together with the approximate scape — in one or more tubular scarious sheaths. Scape up to more than 44 cm. long, at maturity equaling or surpassing the leaf, provided with two remote large inflated infundibuliform sheaths which are up to 7.4 cm. long, the upper of these appearing looser and more prominent with the apex sheathing the base of the rachis. Raceme more or less arcuate, rather densely many-flowered. Bracts about 3–4 mm. long, lanceolate, acuminate, subequal to or surpassing the pedicellate ovary. Flowers small. Lateral sepals about 4.5–5 mm. long, 3–3.5 mm. broad, obliquely triangular-lanceolate, complicate-mucronate, forming a deeply saccate mentum, very indistinctly three-nerved with only the mid-nerve prominent. Dorsal sepal about 4.5 mm. long, 1.6 mm. wide, oblong, obtuse or acute, strongly concave, one-nerved. Petals about 3.1 mm. long, 1 mm. wide in the middle, lance-oblong, broadly rounded at the apex, one-nerved. Lip in natural position strongly decurved, the lower half membranaceous with sides erect and conduplicate, the anterior half elliptic fleshy convex with revolute margins ; lamina when expanded lingulate, appearing subtrilobed, about 4–4.5 mm. long, 2.5 mm. broad across the lower part, broadly obtuse, three-nerved with the lateral nerves often somewhat carinate-thickened at the base. Column minute, provided with a pair of triangular arms which terminate abruptly in subulate or acuminate points. Column foot unciform, furnished midway with a conspicuous porrect tubercle.

Some specimens collected by Clemens are less mature and manifest wide vegetative variation, being smaller and having thicker leaves.

This species has numerous allies, but differs from all in having

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two very large conspicuous tubular-inflated sheaths on the scape. It is vegetatively larger and stouter than *Bulbophyllum gibbosum* Lindl., and has different petals. It is distinguished from *B. obtusipetalum* J. J. Sm. by the much longer peduncle below the raceme and by its smaller flowers. It differs from *B. saccatum* Kränzl. in the longer petioles, broader leaves and larger lip.

KINABALU, *Clemens*, November–December 1915; *Haslam*, July–August 1916. KIAU, *Clemens* 36 (Type), November 1915. 3000 feet altitude. Flower cream color and yellow; *Clemens* 48, November 1915. 3000 feet altitude. Flower yellow with orange column; *Clemens* 325, November 1915. Flower yellow; *Clemens* 352, November 1915. Flower cream color with red column.

20. *Bulbophyllum* (§ *Racemosae*) *minutiflorum* A. & S. *sp. nov.* Herba perparva. Rhizoma repens, teres. Pseudobulbi minutissimi, monophylli. Folium lineare, subacutum vel obtusum, in petiolum gracilem sulcatum contractum, crasse coriaceum, in sicco rigidum. Scapus pseudobulbo approximatus, tarde folium excedens, vaginis nonnullis membranaceis tubulatis praeditus. Racemus laxiflorus. Bractee inflorescentiae anguste lanceolatae, patentes. Flores minuti. Sepala lateralia triangulari-lanceolata, falcata, obliqua, complicato-mucronata, mentum saccatum formantia. Sepalum dorsale oblongum, complicato-mucronatum, valde concavum. Petala oblanceolato-oblonga, obtusa vel raro subacuta. Labellum in situ naturali valde decurvum, parte inferiore membranacea lateribus erecto-conduplicatis, dimidio anteriore subcarnoso late elliptico; lamina expansa ovato-lingulata, obtusa. Gynostemium minutum, brachiis binis triangulari-lanceolatis acuminatis et pede unciformi instructum.

Plant very small. Rhizome terete, woody, creeping, somewhat branched, invested by close scarious sheaths that become fibrous, about 3.4 mm. thick. Roots very numerous, fibrous, flexuous, about .5 mm. thick. Pseudobulbs minute, about 1 mm. high,

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cylindric, monophyllous, at intervals of 7–9 mm. Leaf about 7.5–8.5 cm. long (rarely 5 cm. long), 8–9 mm. wide, linear, obtuse or subacute, sometimes somewhat complicate at the apex, contracted into a petioled base, thick and coriaceous, rigid, many-nerved with the mid-nerve more or less sulcate above and carinate beneath. Petiole about 3.2 cm. long, slender, sulcate. Scape approximate to the pseudobulb, in course of development surpassing the leaf, about 14–16 cm. tall, slender, striate in the dried specimen, provided with about four loose tubular membranaceous sheaths which are imbricating below and free above. Raceme loose in development. Rachis up to 8 cm. long. Bracts of the inflorescence about 3–4.5 mm. long, narrowly lanceolate, spreading, surpassing the pedicellate ovary. Flowers very small. Lateral sepals about 3–4 mm. long, 2 mm. broad, triangular-lanceolate, falcate, oblique, forming a saccate mentum, complicate-mucronate at the apex, one- or indistinctly three-nerved. Dorsal sepal about 2.5–3 mm. long, 1.1–1.5 mm. wide, oblong, complicate-mucronate, strongly concave, one-nerved. Petals about 1.75 mm. long, .5 mm. broad above the middle, oblanceolate-oblong, obtuse or rarely subacute, prominently one-nerved. Lip in natural position strongly decurved below the middle, the lower portion membranaceous with erect conduplicate sides, the anterior half forming a sub-fleshy broadly elliptic epichil with revolute margins; limb when expanded about 2.5 mm. long, 1.5 mm. broad near the base, ovate-lingulate, obtuse, appearing subtrilobed, three-nerved. Column minute, provided with a pair of parallel triangular-lanceolate acuminate arms and an unciform foot.

This plant most closely resembles *Bulbophyllum Gibbsiae* Rolfe and *B. linearifolium* King and Pantl. It is distinguished from the former by the uniformly broader coriaceous leaves and

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relatively longer scapes; it differs from the latter in having shorter narrower leaves and a much longer flowerless part of the peduncle. In its small flowers, this plant differs from the allied Philippine group represented by *B. Clemensiae* Ames, *B. Escriptorii* Ames, and *B. marivelense* Ames.

KINABALU, *Haslam*, July–August 1916.

21. *Bulbophyllum* (§ *Monanthaparva*) *montense* *Ridl.* in Stapf in *Trans. Linn. Soc. Ser. 2, 4* (1894) 234.

KINABALU, *Haviland 1099*. 11,000 feet altitude. Epiphytic, sepals and petals veined orange yellow.

22. *Bulbophyllum* (§ *Racemosae*) *montigenum* *Ridl.* in Stapf in *Trans. Linn. Soc. Ser. 2, 4* (1894) 235.

KINABALU, *Haviland 1252*. 6000 feet altitude.

23. *Bulbophyllum* (§ *Racemosae*) *odoratum* *Lindl.* *Gen. & Sp. Orch.* (1830) 54.

In most of the Bornean specimens the sepals are ovate-lanceolate and the buds sometimes marked “yellow,” while the entire plant is stouter than the typical form; but J. J. Smith in *Fl. Buitenzorg 6* (1905) 424, says of this species, “Die Exemplare von Borneo sind meistens kräftiger als die javanischen und haben orangefarbige Blütenknospen.”

KINABALU, *Clemens*, November–December 1915. KIAU, *Clemens 21*, November 1915. 3000 feet altitude. Flower white, bud yellow; *Clemens 97*, November 1915. 3000 feet altitude. Flower white. SARAWAK, *Native Collector 23*. SARAWAK, Lio-Matu Baram, *Native Collector 2756*, October 1914. Flower white.

24. *Bulbophyllum* (§ *Racemosae*) *pergracile* *A. & S. sp. nov.* Herba parva, pergracilis. Rhizoma gracile, repens. Pseudobulbi minutissimi, subapproximati, monophylli. Folium anguste lineare, acutum vel raro obtusum, in petiolum indistinctum sulcatum angustatum, subcoriaceum. Scapus pseudobulbo approxi-

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matus, perbrevis, vaginis nonnullis laxis tubularibus instructus. Racemus laxiflorus. Bractee inflorescentiae lineari-lanceolatae. Flores perparvi. Sepala lateralia lanceolato-attenuata apicibus caudatis. Sepalum dorsale simile sed minus. Petala perparva, oblongo-lineararia, obtusa. Labellum parvum, in positu naturali decurvum, dimidio inferiore membranaceo lateribus erecto-con-
duplicatis, parte anteriore elliptica obtusa; lamina expansa triangulari-lingulata, ciliata. Gynostemium minutum, brachiis triangularibus acuminatis et pede gracili praeditum.

Plant small, very slender. Rhizome slender, about 2–2.5 mm. thick, creeping, woody, sulcate in the dried specimen, invested by scarious sheaths that become fibrous. Roots numerous, fibrous, flexuous, finely puberulent, sometimes longitudinally sulcate, about .4 mm. thick. Pseudobulbs very minute, about 1–1.5 mm. in height, cylindric, subapproximate, reclining, monophyllous, sulcate-rugose in the dried plant. Leaf about 8–11 cm. long, 5–8.5 mm. broad, narrowly linear, often more or less falcate, acute and minutely complicate or rounded at the apex, gradually narrowed into an indistinct sulcate petiole, subcoriaceous, the mid-nerve more or less sulcate above and carinate beneath. Scape approximate to the pseudobulb, about 3.5 mm. long, arcuate or flexuous, provided with several loose tubular membranaceous sheaths, invested below—together with the base of the petiole—by several loose tubular imbricating scarious sheaths. Raceme loose, up to ten-flowered. Bracts of the inflorescence about 2.5–3 mm. long, linear-lanceolate, surpassing the pedicellate ovary. Flowers very small. Perianth segments connivent. Lateral sepals about 5 mm. long, 1.3 mm. wide at the base, lance-attenuate with long caudate apices, one- or indistinctly three-nerved. Dorsal sepal similar, about 4 mm. long, .8 mm. wide, concave below. Petals very small, about 1.25 mm. long, .35 mm.

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broad, oblong-linear, obtuse, one-nerved. Lip small, in natural position decurved, the lower half membranaceous with erect conduplicate sides, the anterior half elliptic, obtuse; limb when extended triangular-lingulate, appearing subtrilobed, about 1.7 mm. long, 1 mm. broad near the base which is bicallose, the margins ciliate in the middle of each side. Column minute, provided with a pair of parallel prominent triangular acuminate arms and a slender foot.

The type seems to be rather immature, but resembles a plant collected by Haslam with leaves about 7 cm. long and a suberect scape about 6.5 cm. long; the flowers, while apparently identical, are too imperfect for sure diagnosis.

In floral structure, this species resembles a diminutive example of *B. adenopetalum* Lindl., but the foliage is much narrower.

KIAU, *Clemens* 326, November 1915. Flower yellow.

25. *Bulbophyllum* (§ *Racemosae*) *reflexum* A. & S. *sp. nov.*
Herba gracilis. Pseudobulbi approximati, cylindracei, in sicco striati, monophylli. Folium elliptico-oblongum, probabiliter acutum vel subacutum, in petiolum sulcatum cuneato-angustatum, coriaceum. Scapus pseudobulbis approximatus, suberecto-flexuosus. Racemus subito reflexus, floribus densis. Bracteae minutae. Flores perparvi. Sepala lateralia falcato-ovata, obliquissima, apice subacuta. Sepalum dorsale triangulare, acutum vel obtusum, valde concavum, apice revolutum, ciliatum. Petala lanceolata, sensim acuminata, dimidio anteriore conspicue ciliato. Labellum valde decurvum, expansum ovatum, obtusum, carnosissimum, dense papillosum, ciliatum. Gynostemium minutum, brachiis binis subulatis et pede brevi arcuato praeditum.

Plant slender. Rhizome stout, woody, creeping, about 6 mm. thick. Roots numerous, fibrous, flexuous, longitudinally sulcate, about .6 mm. thick. Pseudobulbs up to 1.4 cm. long, approxi-

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mate, cylindrical, closely striate in the dried specimen, monophyllous, invested by sheaths that become fibrous. Leaf about 12 cm. long, 3 cm. broad, elliptic-oblong, appearing acute at the imperfect complicate apex, cuneately narrowed to a sulcate petiole about 3.5 cm. long, coriaceous, many-nerved with the mid-nerve sulcate above and carinate beneath. Scape approximate to the pseudobulbs, suberect-flexuous, about 22 cm. tall up to the raceme, 1.5 mm. thick, terete below, striate above in the dried specimen, provided with two small remote tubular appressed scarious sheaths. Rachis sharply reflexed, blackish-brown, glabrous. Raceme very dense, about 4.7 cm. long, 7 mm. broad. Bracts minute, about .6 mm. long, less than half the length of the pedicellate ovary. Flowers very small, glabrous. Lateral sepals about 4–4.2 mm. long, 2 mm. broad at the base and a little wider across the middle, ovate-falcate and decurved, very oblique, obliquely rounded to a subacute apex, three-nerved, somewhat ciliolate. Dorsal sepal about 3.5–4 mm. long, 3.2 mm. wide at the base, triangular, acute or obtuse, strongly concave, ciliate especially above, revolute at the apex. Petals about 3.1 mm. long, 1 mm. wide, lanceolate, long acuminate to a caudate apex, markedly ciliate on the anterior half, one-nerved. Lip strongly decurved below the middle, when expanded ovate, about 2–3 mm. long, 1.75–2 mm. broad, very fleshy and densely papillose, apex obtuse or subacute, ciliate, channeled in the middle toward the base, margins revolute, the central area on the under surface thickened and medianly channeled. Column minute, furnished above with a central fleshy suborbicular tooth and a conspicuous pair of parallel arms which rise as subulate points from irregular basal dilations. Column foot short, stout, arcuate.

The nearest relative of this plant is *Bulbophyllum Merrittii* Ames, from which it varies in having wider sepals, far different

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petals and much larger lip. *B. recurvum* Lindl. has pendulous scapes and a differently formed flower with obovate petals.

KIAU, *Clemens* 384, December 1915. "Flower white with black tooth."

26. *Bulbophyllum* (§ *Racemosae*) *rhizomatosum* A. & S. *sp. nov.* Herba gracilis. Rhizoma longissimum, repens, gracile, vaginis scariosis vel fibris vaginalium obtectum. Pseudobulbi minuti, reclinati, cylindracei, monophylli. Folium ellipticum vel elliptico-oblongum, acutum vel acuminatum, in petiolum per brevem angustatum, subcoriaceum. Scapi e basi pseudobulbi vel e rhizomate medio inter pseudobulbos exorientes, folia multo superantes, vaginis perpauca tubularibus inconspicuis remotis praediti. Racemus laxiflorus. Perianthium in sicco pellucidum. Sepala lateralia late triangularia, apicibus longe caudatis subito terminantia, mentum saccatum formantia. Sepalum dorsale lanceolatum, apice caudato. Petala minuta, ovata, acuta. Labelum in situ naturali decurvum lateribus inferioribus erecto-conduplicatis, lateribus anterioribus valde reflexis; lamina expansa oblonga simplex obtusa vel subacuta, parte inferiore subtus carinato-incrassata. Gynostemium minutum, pede apice unci-formi instructum.

Rhizome very long and creeping (or pendant?), slender, terete, about .75 mm. thick, concealed by scariosus imbricating sheaths that become fibrous or by the copious fibres of sheaths. Roots numerous in the lower portion, sparse and scattering above, very slender, fibrous, long, somewhat branched, finely puberulent, about .25-.3 mm. thick. Pseudobulbs minute, about 2.5-3.5 mm. long, cylindric, finely rugose in the dried specimen, reclining, monophyllous, surrounded by the long fibres of sheaths. Leaf about 3.7-6.25 cm. long, 1-1.5 cm. wide (the immature leaves much smaller), elliptic to elliptic-oblong, acute or acuminate, cuneate-narrowed to a very short sulcate petiole,

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rigid, subcoriaceous, the mid-nerve sulcate above and carinate beneath, obliquely spreading from the rhizome. Scapes much surpassing the leaves, ± 10 cm. long, ascending-spreading, rising from the bases of the pseudobulbs or from the rhizome midway between the pseudobulbs, clothed at the base with several closely imbricating scarios sheaths and above with about two remote slender tubular scarios sheaths. Raceme loosely flowered. Bracts of the inflorescence mostly deciduous, lance-attenuate, scarios. Flowers small. Perianth pellucid in the dried specimen, sepals with spreading caudate tips. Lateral sepals about 7 mm. long, 3 mm. wide, broadly triangular below, oblique, forming a saccate mentum, indistinctly three-nerved, terminating in a rather abrupt slender cauda which is about 4.5 mm. long. Dorsal sepal about 6 mm. long, 1.5 mm. broad at the base, lanceolate with a long caudate apex, concave at the base, one- or indistinctly three-nerved. Petals minute, about 1.55 mm. long, 1.2 mm. broad at the base, ovate, acute, one-nerved. Lip minutely clawed, in natural position decurved with the sides of the lower portion erect and conduplicate, the sides of the anterior part strongly reflexed, with the upper surface convex; lamina when expanded oblong, simple, obtuse or subacute, about 3.5 mm. long, 1.4 mm. wide, the lower portion of the under surface conspicuously carinate-thickened in the median line. Column very minute, furnished with a foot that is thickened below and unciform above.

This unusual species closely resembles *Bulbophyllum philippinense* Ames in habit and foliage, but differs from it in having smaller pseudobulbs, relatively elongate loosely flowered scapes and larger flowers. In habit it resembles *B. longerepens* Ridl., but possesses much smaller pseudobulbs, larger leaves, different petals and lip.

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LOBONG CAVE, *Clemens 106*, November 1915. 5000 feet altitude. Flower yellow.

27. *Bulbophyllum* (§ *Racemosae*) *sigmoideum* A. & S. *sp. nov.* Herba mediocris. Rhizoma repens. Pseudobulbi minutissimi, crasso-cylindracei, monophylli. Folium oblongum, apice rotundatum, ad petiolum sulcatum angustatum, crasse coriaceum. Scapus pseudobulbo approximatus, suberecto-arcuatus, folium excedens, vaginis nonnullis infundibuliformibus foliaceis instructus. Bracteae inflorescentiae lanceolatae, acuminatae. Racemus tarde laxiflorus. Flores carnosi, in sicco pellucidi. Sepala lanceolato-attenuata, apicibus longis caudatis terminantia. Petala perparva, oblongo-lanceolata, obtusa et minute apiculata. Labellum in positu naturali sigmoideum, in medio abrupte decurvum, apice leviter resurgens, parte inferiore membranacea lateribus erecto-conduplicatis, dimidio anteriore angustissime elliptico carnosissimo acuto; carina tenuis subtus extendit. Gynostemium perbreve, brachiis binis brevibus triangularibus et pede unciformi tuberculato praeditum.

Plant medium-sized. Rhizome creeping, woody, terete, 3–4 mm. thick, invested by scarious sheaths that become fibrous. Roots numerous, fibrous, flexuous, about .7 mm. thick. Pseudobulbs minute, about 1 mm. high, 3 mm. broad below, about 7–8 mm. distant, monophyllous, concealed by the fibrous remnants of sheaths. Leaf 9–14.5 cm. long, 2.6–3.4 cm. wide, oblong, rounded at the apex, cuneate-narrowed to the petiole, thick and coriaceous, the mid-nerve more or less sulcate above and carinate beneath. Petiole 2–4.7 cm. long, rather stout, sulcate. Scape approximate to the pseudobulb, suberect or gently arcuate, surpassing the leaf, about 20 cm. long, provided with four or five foliaceous spreading infundibuliform sheaths which are imbricating below and successively more remote above, upper portion

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furnished with one or more sterile bracts which are rarely opposite. Bracts of the inflorescence about 9 mm. long, 3 mm. wide below, lanceolate, long acuminate, concave, three-nerved, much exceeding the pedicellate ovary. Raceme loosely about twenty-flowered. Perianth segments connivent. Flowers fleshy, translucent in the dried specimen. Lateral sepals about 1 cm. long, 3 mm. wide below, lance-attenuate with the involute margins producing long caudate apices, forming a saccate mentum below, one- or indistinctly three-nerved. Dorsal sepal similar, about 8.5 mm. long, 1.5 mm. wide near the base, concave below. Petals minute, about 2 mm. long, .7 mm. broad, oblong-lanceolate, obtuse and minutely apiculate, one-nerved. Lip minutely clawed, in the natural position sigmoid, about 3 mm. long, abruptly decurved in the middle with the apex slightly upcurved, the basal portion membranaceous with the sides erect and conduplicate, the anterior half very narrowly elliptic, acute, very thick and fleshy; limb when expanded trilobed, margins particularly of the epichil ciliolate, hypochil about 2.4 mm. broad, orbicular, concave, medianly thickened and sulcate, bicallose at the base, a keel extending across the concavity on the lower surface. Column very small, furnished with a pair of short triangular acuminate arms and a gently unciform foot which is provided with an erect or upcurved slender tubercle near the base.

Clemens 168 shows an obtusely pointed leaf measuring about 15 cm. long and a scape about 26 cm. long. In *Clemens 327* there is a subacute leaf about 15.5 cm. long, and in *Clemens 354* the leaves average smaller than the type, especially in width (about 2 cm. broad). It is a noticeable fact that the flowers of all the collections usually have strongly connivent segments and are thus apparently immature.

In habit this species suggests *Bulbophyllum dasypetalum* Rolfe

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ex Ames and *B. Vanoverberghii* Ames, but it possesses laxer racemes and longer caudate sepals. This plant is distinct from *B. adenopetalum* Lindl. in its robust habit, smaller petals and far different lip. It differs from *B. Korthalsii* Schltr. in having minute pseudobulbs, broader leaves and markedly smaller sepals. It is differentiated from *B. flavescens* Lindl. by broader leaves, different petals and lip.

KIAU, *Clemens 168*, November 1915. 3000 feet altitude. Flower yellow to yellowish-green; *Clemens 327*, November 1915. Flower yellow; *Clemens 354*, November 1915. Flower cream color at base, white tips. GURULAU SPUR, *Clemens 316* (Type), November 1915. Flower cream color (?).

28. *Bulbophyllum* (§ *Racemosae*) *venustum* A. & S. sp. nov. Herba crassa, venusta. Rhizoma longe repens, teres, tarde nudum. Pseudobulbi minutissimi, crasso-cylindracei, monophylli, flavi. Folium oblongum vel ellipticum, apice rotundatum, in petiolum sulcatum contractum, crasse coriaceum. Scapus pseudobulbo approximatus, folium multo superans, vaginis nonnullis tubularibus instructus. Racemus laxiflorus, in visu secundus. Bractee inflorescentiae anguste lanceolatae, longe acuminatae, ovarium pedicellatum excedentes. Sepala lateralia triangulari-lanceolata, leviter falcata, sulcata, complicato-mucronata, conspicue carinata, mentum saccatum formantia. Sepalum dorsale oblanceolato-oblongum, complicato-acutum, valde angulato-sulcatum, apice carinatum. Petala multo minora, oblanceolato-lineararia, acuta vel obtusa. Labellum carnosum, in situ naturali sub medio leviter decurvum, lateribus inferioribus erectis, parte anteriore elliptico-ovata convexa; lamina expansa ovato-oblonga, acuta vel obtusa. Gynostemium minutum, brachiis binis triangularibus acuminatis et pede crasso arcuato tuberculato praeditum.

Plant stout, graceful. Rhizome long creeping, woody, terete,

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flexuous, about 2–3 mm. thick, naked at flowering time but showing traces of scarious sheaths, more or less sulcate and smooth in the dried specimen. Roots fibrous, flexuous, more or less fascieled, numerous under the pseudobulb, subrigid, more or less longitudinally sulcate, about .7 mm. thick. Pseudobulbs minute, about 1–2 mm. high, 3–5 mm. wide at the base, thick-cylindric, monophyllous, yellow, 4.5 to over 9 cm. distant. Leaf about 8 cm. long, 2 cm. wide (rarely 10.7 cm. long, 1.7 cm. wide; the immature blades very small), oblong to elliptic, broadly rounded above, rather abruptly cuneate-narrowed to the petiole, thick and coriaceous but pellucid in the dried specimen, apparently fleshy in the living plant, the margins revolute, many-nerved with the mid-nerve more or less sulcate above and carinate beneath. Petiole stout, sulcate, variable in length, 1.6–3 cm. long. Scape approximate to the pseudobulb, much exceeding the leaves, about 19 cm. long (up to 23 cm. long), suberect to gently flexuous or arcuate, provided with several tubular membranaceous sheaths. Raceme loose, apparently secund, about twenty-flowered. Bracts of the inflorescence up to 7.5 mm. long, narrowly lanceolate, long acuminate, concave, one-nerved, surpassing the pedicellate ovary, ascending-spreading. Flowers nodding in development, segments slightly spreading, perianth pellucid in the dried plant. Lateral sepals about 7–8 mm. long, 3 mm. wide, triangular-lanceolate, gently falcate, sulcate, strongly complicate-mucronate, conspicuously carinate especially at the apex, forming a saccate mentum, one- or indistinctly three-nerved. Dorsal sepal about 6–7 mm. long, 2.3–2.7 mm. wide above the middle, oblanceolate-oblong, complicate-acute, dorsally carinate at the apex, strongly angulate-sulcate, one- or indistinctly three-nerved. Petals much smaller, about 3.3 mm. long, 1 mm. broad above the middle, oblanceolate-linear, very slightly falcate, acute

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or obtuse, one-nerved, minutely ciliolate and papillose above. Lip minutely clawed, rather fleshy in texture, in natural position gently decurved below the middle with the lower sides erect and subconduplicate, the anterior portion elliptic-ovate, acute or obtuse with lateral margins somewhat decurved; limb when expanded ovate-oblong, appearing subtrilobed, about 4.5 mm. long (rarely 5.2 mm. long), 2.4 mm. wide below, a pair of small approximate fleshy calli at the base extending longitudinally down the lip as fleshy indistinct ridges, three-nerved. Column minute, provided with a pair of short triangular acuminate arms. Foot stout, arcuate, with a prominent porrect tubercle that terminates a fleshy ridge extending from the base.

This species is very near to *Bulbophyllum coriaceum* Ridl., but it differs in its remote pseudobulbs, markedly longer and somewhat wider leaves, much taller scapes bearing more flowers and unthickened margins of the lip. From *B. kinabaluense* Rolfe it is distinct in the much larger leaves and flowers.

PAKKA, *Clemens 113*, November 1915. Flower yellow.

29. *Bulbophyllum* (§ *Sestochilus*) *vinaceum* A. & S. *sp. nov.* Herba subcrassa. Rhizoma repens, valde flexuosum, teres. Pseudobulbi remoti, angustissime cylindranei, monophylli. Folium oblongum, obtusum vel acutum, ad petiolum sulcatum cuneato-angustatum, coriaceum. Scapus uniflorus. Flos in sicco pellucidus, purpureotinctus. Sepala lateralia lanceolato-falcata et decurva, obliqua, acuta, basi saccata. Sepalum dorsale lanceolato-ovatum, acutum, concavum. Petala oblongo-lanceolata, apice complicato-acuta. Labellum in pede circinnato nudo gynostemii elevatum, cordatum, subtus callo lato carnosum valde decurvum. Gynostemium breve, crassissimum, inerme, ala carnosum instructum.

Plant rather stout. Rhizome creeping, terete, strongly flex-

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uous, about 3 mm. thick, closely invested by the fibrous remnants of scarios tubular sheaths. Roots fibrous, rather sparse but fascicled beneath the pseudobulbs, very long, simple or sparingly branched above, more or less longitudinally sulcate, densely and finely pubescent, about .8 mm. thick. Pseudobulbs apparently remote, about 3 cm. long, very narrowly cylindric, somewhat oblique, rugose-striate in the dried specimen, monophyllous, surrounded by the fibres of sheaths, approximate to an old much more slender pseudobulb about 2 cm. long. Leaf about 14.4 cm. long, 2.6 cm. wide, oblong, acute or obtuse (tip broken off), cuneate-narrowed to a sulcate petiole about 2.5 cm. long, coriaceous, the mid-nerve somewhat sulcate above and prominently carinate beneath. Scape one-flowered (detached). Flower about 3.3 cm. across when expanded, purple tinged. Lateral sepals about 1.8 cm. long, 1.05 cm. wide near the base, lance-falcate and decurved, oblique, acute, dorsally carinate at the apex, saccate at the base, about nine-nerved. Dorsal sepal about 2.25 cm. long, 1.15 cm. broad, lance-ovate, acute and dorsally somewhat thickened at the apex, concave, about nine-nerved. Petals about 1.65 cm. long, 6 mm. wide at the base where broadest, oblong-lanceolate, complicate-acute and dorsally carinate at the apex, very slightly falcate, five- to seven-nerved. Lip raised on the free portion of the foot, in natural position semicircular-decurved by a broad longitudinal fleshy papillose medianly channeled ridge extending on the under surface from base to apex, cordate, subacute or obtuse, about 6 mm. long from the center of the base to the apex or 7 mm. long including the semi-orbicular basal auricles, 6 mm. broad below, lower margins ciliolate. Column about 3.5 mm. long, very stout with a broad fleshy wing merging with the foot. Foot broad, clavate, terminating in a free circinnate stipe. Anther hemispherical, two-celled, granular-roughened.

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This plant has several more or less close allies. It is unlike *Bulbophyllum maculosum* Ames in color of flower, unarmed column and dissimilar lip. *B. vinaceum* is separable from *B. dagamense* Ames by its smaller thicker leaf, much broader dorsal sepal and different lip, and from *B. cornutum* var. *ecornutum* J. J. Sm. by its much larger flower which is of another color. Narrower leaves and very unlike lip distinguish it from *B. patens* King.

MAREI PAREI SPUR, *Clemens* 240, November 1915. Flower purple.

30. *Bulbophyllum* (§ *Monanthaparva*) *vinculibulbum* A. & S. *sp. nov.* Herba nana. Rhizoma longe repens, moniliforme, pseudobulbis horizontalibus obtectum. Pseudobulbi approximati, cylindracei, monophylli. Folium ellipticum vel elliptico-oblongum, apice rotundato bilobulum, ad basim cuneato-angustatum, coriaceum. Scapi singuli, filiformes, uniflori, bractea infundibuliformi terminantes. Pedicellus pergracilis, arcuatus. Flos pro planta grandis, in sicco membranaceus. Sepala lateralia oblongo-lanceolata, acuta. Sepalum dorsale simile sed minus. Petala minuta, spathulato-oblonga, apice late rotundata. Labellum perparvum, decurvum, lateribus inferioribus erecto-conduplicatis, parte anteriore ovata late rotundato-truncata. Columna brevis brachiis binis subulatis. Pes basi inflatus, abrupte in partem liberam angustatus.

Plant dwarf. Rhizome long creeping, somewhat branched, appearing moniliform from the approximate horizontal pseudobulbs. Roots $\pm .5$ mm. thick, fibrous, flexuous, rather numerous. Pseudobulbs 7.5–9.5 mm. long, horizontally cylindrical or elongate-ovoid, connected by a minute portion of the rhizome, monophyllous, striate-rugose, surrounded at the base by the fibres of sheaths. Leaf up to 1.35 cm. long and 5.5 mm. broad, elliptic or elliptic-oblong, rising from the upper end of the pseudobulbs,

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bilobulate at the rounded apex, cuneate-narrowed at the base, indistinctly petioled, coriaceous, translucent in the dried specimen, the mid-nerve carinate beneath. Scapes, up to the bract, about 3.5–4.5 cm. high, filiform, apparently one-flowered (flowers detached), rising singly from the base of the pseudobulbs, the decumbent base invested by a scarious sheath or fibres of sheaths, bearing a minute infundibuliform bract at the summit. Pedicellate ovary very slender, arcuate, up to 2.1 cm. long. Flower large for the plant, membranaceous in the dried specimen. Lateral sepals ± 1.3 cm. long and 4.3 mm. wide below the middle, oblong-lanceolate, acute, minutely cellular on the margins, four-nerved. Dorsal sepal similar but smaller, ± 1 cm. long and 3 mm. wide, acute, three- to five-nerved. Petals minute, about 2.2 mm. long and 1 mm. wide above the middle, spatulate-oblong, broadly rounded at the apex, one-nerved. Lip very small, fleshy, elevated on the naked end of the column foot, in natural position strongly decurved just below the middle and about 3.5 mm. long, the sides of the basal portion erect and conduplicate, the anterior portion ovate with a broad more or less truncate apex; limb when extended oblong-obovate, about 3.5 mm. long and 2.3 mm. broad above the middle, truncate at the base, five-nerved. Column short, stout, furnished with a pair of prominent parallel subulate arms and provided with a foot which is stout and inflated at the base tapering abruptly to a short slender free stipe. Pollinia two, obliquely complanate-ovoid.

In general habit this little plant simulates *Bulbophyllum corticicola* Schltr. but it has longer pseudobulbs, scapes more than twice as long and larger sepals. In respect to flower structure only, this species resembles *B. montense* Ridl.

The peculiar rope-like rhizome, the large sepals and the minute petals and lip are diagnostic characters.

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PAKKA CAVE to LOBONG, *Topping 372 (Bur. Sci. 1722)*, November 1915. Epiphyte. Flower reddish-orange with darker stripes on back of perianth.

37. *THELASIS Bl.*

Six species of this genus are recorded from Borneo but none previously from Mount Kinabalu.

1. *Thelasis carnosa A. & S. sp. nov.* Herba crassa. Rhizoma repens. Radices fasciculatae. Pseudobulbi angustissime cylindracei, vagina obtecti, monophylli. Folium in sicco anguste lineare, canaliculatum, plus minusve falcatum, viride probabiliter subcylindraceum. Scapus folium multo excedens, suberectus, vaginis nonnullis tubularibus praeditus. Racemus densissimus. Bractee inflorescentiae latissime triangulares, subito acutae, patentes. Flores minuti; perianthium tubulari-connivens. Sepala lateralia oblonga, obtusa, carinata, carnosissima. Sepalum dorsale membranaceum, oblongum, obtusum, apice multo incrassatum. Petala spathulata, apice late rotundata, membranacea. Labellum carnosum in parte superiore praesertim, anguste deltoideum marginibus lateralibus involutis, apice rotundato. Gynostemium minutum, processu rostellii lanceolato bidentato instructum. Anthera anguste triangulari-lanceolata.

Plant stout. Rhizome creeping, slender, deeply sulcate, about 4–5 mm. wide in the dried specimen, entirely concealed by scarious imbricating sheaths. Roots numerous in fascicles, fibrous, deeply sulcate and angled in section, about .8 mm. thick. Pseudobulbs 1.5–2 cm. distant, about 1.4–2 cm. high, narrowly cylindrical and stem-like, closely sulcate-striate in the dried specimen, monophyllous, concealed by a tubular foliaceous sheath. Leaf 16–21.1 cm. long, very narrowly linear, more or less falcate, coriaceous, abruptly acute, with a deep groove extending from the base to the apex, apparently fleshy and subcylindric in the living

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specimen. Scape conspicuously surpassing the leaf, about 30 cm. high, 2–2.5 mm. thick below, suberect from a decumbent base, provided with several tubular sheaths which are approximate or imbricating below and very remote above. Raceme very dense, about 1.9–4.2 cm. long, 1 cm. wide when floriferous. Bracts of the inflorescence about 2.6 mm. long, 3.4 mm. wide, very broadly triangular, narrowed to an abruptly acute apex, concave with finely uneven margins, deflexed in development. Flowers minute, perianth tubular-connivent, segments connate below. Lateral sepals about 3–3.5 mm. long, 1.3 mm. wide, oblong, obtuse, concave, very thick and fleshy, carinate especially at the apex, triquetrous in transverse section, one-nerved. Dorsal sepal membranaceous, about 2.6 mm. long, 1.15 mm. broad, oblong, obtuse, fleshy-thickened and concave-conic at the apex, one-nerved. Petals about 2.2 mm. long, .8 mm. broad above, spatulate, broadly rounded at the apex, slightly thickened above, one-nerved. Lip about 2.7 mm. long, 1.4 mm. wide near the base, very fleshy particularly above, oblong-deltoid, rounded at the apex, with the lateral margins involute forming a tube, when spread out as far as possible without rupture deltoid, three-nerved. Column minute, provided with an erect, lanceolate, sharply bidentate rostellar process. Anther about 1.5 mm. long, narrowly triangular-lanceolate, long acuminate, with eight small pollinia.

This species is closely allied to *Thelasis Cebolleta* J. J. Sm., but it is consistently larger throughout.

KIAU, *Clemens* 88, November 1915. 3000 feet altitude. Flowers cream color.

2. *Thelasis variabilis* A. & S. *sp. nov.* Herba gracilis. Pseudobulbi biarticulati, vagina folio terminanti arcte obtecti, monophylli. Folium elliptico-oblongum, acutum, ad basim conduplicatam angustatum, chartaceum. Scapi folium multo excedentes,

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duo pseudobulbo approximati, leviter flexuosi, vaginis nonnullis tubularibus inconspicuis instructi. Bractee inflorescentiae late triangulares, subito caudatae, late patentees. Flores minuti; perianthium connivens. Sepala lateralia triangulari-ovata, acuta, valde concava. Sepalum dorsale persimile sed paulo majus. Petala elliptico-oblongata, obtusa vel subacuta. Labellum in positu naturali deltoideum marginibus involutis, expansum ovatum, apice late rotundatum. Gynostemium minutum, processu rostellii bifido instructum.

Plant slender, graceful. Roots numerous, fibrous, flexuous, inner portion conspicuously sulcate, ± 7 mm. thick. Pseudobulb two-jointed, closely invested by a sheath that is articulated above and apparently terminates in a leaf-blade; lower portion about 1.4–2.2 cm. high, ovoid to pyriform-cylindric, finely rugose in the dried specimen; upper portion about 1.3–2 cm. high, narrowly cylindric, finely striate, monophyllous. Leaf 10.7–20 cm. long, 2.1–3.1 cm. broad, elliptic-oblong, acute at the apex, narrowed to a conduplicate base, chartaceous, many-nerved, the mid-nerve somewhat carinate beneath. Scapes about 21–36.5 cm. high, two approximate to each pseudobulb, much surpassing the leaf, spreading, gently flexuous or arcuate, provided with several inconspicuous tubular sheaths that are sometimes imbricating below, remote above. Raceme up to 14.5 cm. long, about 1.5 cm. wide, densely many-flowered above, looser below. Bracts of the inflorescence rigidly spreading, about 4 mm. long, 3 mm. wide below, broadly triangular, with an abrupt caudate point, lower margins erose, one-nerved. Flowers very small, about 3.2 mm. long, perianth connivent. Ovary elliptic, about 5 mm. long. Lateral sepals about 3 mm. long, 1.8 mm. broad, triangular-ovate, acute and minutely complicate at the apex, strongly concave, one-nerved. Dorsal sepal very similar, about 3.2 mm. long, 2 mm.

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broad, strongly concave, three-nerved. Petals about 3 mm. long, 1.25 mm. broad, elliptic-oblongate, obtuse or subacute, one-nerved. Lip with a very short broad claw, in natural position deltoid with involute lateral margins, when spread out ovate, broadly rounded at the apex, about 2 mm. long, 1.7 mm. broad near the slightly thicker base, three-nerved. Column minute with a sharply bifid rostellar process.

Another collection, *Clemens 109*, shows one plant with a short portion of a slender, sheath-concealed rhizome between subapproximate pseudobulbs as well as an enveloping sheath produced into a blade. There is also a diminutive plant with leaf about 4.7 cm. long and scape about 11 cm. tall. In this collection the ovaries are not so well developed and the flowers are slightly larger, but apparently the plants are less mature than the type.

This species is more or less allied to *Thelasis obtusa* Bl., but it is easily separable because of the differently proportioned leaves, longer scapes and larger flowers. It differs from *T. bifolia* Hook. f. in having a three-nerved lip and bifid rostellum.

KIAU, *Clemens 84* (Type), November 1915. 3000 feet altitude. "Green buds" — ovaries. LOBONG CAVE, *Clemens 109*, November 1915. 5000 feet altitude. Flower yellow and green.

38. PHREATIA *Lindl.*

Four species of this genus were hitherto recorded from Borneo, of which two were reported from Mount Kinabalu.

I. *Phreatia Amesii* *Kränzl.* in Engl. Pflanzenreich IV. 50. II. B. 23 (1911) 16. *Phreatia Myosurus* *Ames* *Orch.* 2 (1908) 203 excl. synonym. fide *Kränzl.*

This plant is a little stouter and the claw of the lip very slightly more oblong than the Philippine specimens.

KINABALU, *Haslam*, July–August 1916.

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2. *Phreatia densiflora* Lindl. Gen. & Sp. Orch. (1830) 64.

KINABALU, *Gibbs 4123*, February 1910. 6000 feet altitude, in high forest. Flowers white. LOBONG, above Lobong, *Gibbs 4123*, February 1910. 5000 feet altitude.

3. *Phreatia minutiflora* Lindl. in Journ. Linn. Soc. 3 (1859) 62.

KINABALU, *Haslam*, July–August 1916.

4. *Phreatia monticola* Rolfe in Gibbs in Journ. Linn. Soc. 42 (1914) 152.

KIAU, *Gibbs 3959*, February 1910. 3000 feet altitude. Epiphyte, growing in large bunches in secondary forest. Flowers white.

39. *EULOPHIA* R. Br.

Four members of this genus have been previously reported from Borneo, of which one was recorded from Mount Kinabalu.

1. *Eulophia ovalifolia* A. & S. *sp. nov.* Herba gracilis. Rhizoma repens, moniliforme. Radices paucae, rigidae, crassae, lanuginosae. Folium late ellipticum, acuminatum, ad petiolum sensim angustatum, in sicco membranaceum. Petiolus conspicuus. Scapus folium multo excedens, suberectus, vaginis nonnullis tubularibus praeditus. Racemus gracilis, arcuatus. Bractee inflorescentiae lineari-attenuatae, scariosae, flores excedentes. Flores parvi. Perianthium tubulare, in sicco membranaceum. Sepala petalaeque similia. Sepala lateralia lineari-falcata, acuminata. Sepalum dorsale lineare, acutum. Petala anguste falcato-lanceolata, acuminata. Labellum in situ naturali tubulari-involutum, expansum in circuitu ovatum trilobatum; lobi laterales parvi, oblongo-ovati, acuti, carinis binis brevibus inter lobos; lobus medius oblongo-obovatus, obtusus, erosus, basi callo trilineato praeditus; calcar scrotiforme. Gynostemium majus conspicuum, pede apice dilatato instructum. Pollinia duo, ovoidea, complanata.

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Plant slender for the genus, about 28 cm. tall. Rhizome creeping, woody, composed of a moniliform series of approximate corms or pseudobulbous thickenings, closely invested by the long fibres of sheaths. Roots rather few, stout, rigid, fibrous, flexuous, unbranched, densely lanuginose, longitudinally sulcate, about 2 mm. thick. Leaves about 17 cm. long, 6.5 cm. wide, broadly elliptic, acuminate, gradually narrowed to the petiole, erect, membranaceous in the dried specimen, many-nerved with seven nerves prominent beneath. Petiole \pm 4 cm. long, surrounded and surpassed by the long fibres of sheaths. Scape much exceeding the leaf, about 33 cm. high, sub-erect from a decumbent base, provided with several tubular scarios sheaths which are short loose and imbricating below, longer closer and very remote above, striate in the dried plant, upper portion provided with about two linear scarios bracts. Raceme about 5.8 cm. long, slender, arcuate or nodding, rather compact. Lower bracts of the inflorescence about 1.75 cm. long, 2.2 mm. wide, linear-attenuate, scarios, ascending, much exceeding the flowers. Flowers very small for the genus, perianth tubular, pellucid in the dried specimen. Sepals and petals similar, the paired members somewhat varying. Lateral sepals about 7 mm. long, 1.4 mm. wide at the base, sometimes broader across the middle, linear-falcate and decurved, long acuminate, with one nerve prominent. Dorsal sepal about 7 mm. long, 1.5 mm. wide across the middle, linear, more or less gently falcate, acute, one-nerved. Petals about 7 mm. long, 1.75 mm. broad in the middle, narrowly falcate-lanceolate, acuminate, one- or indistinctly three-nerved. Lip forming with the lateral sepals a sac or short spur, lamina in natural position tubular-involute, when expanded three-lobed, ovate in outline, about 5.5 mm. long, 4.5 mm. broad across the lateral lobes; lateral lobes spreading, small, oblong-ovate, acute, oblique, at the base of each a membra-

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naceous semi-orbicular erect keel separated by a deep channel; middle lobe about 4.35 mm. long, 3.15 mm. wide above the middle, oblong-obovate, obtuse at the apex, erose, provided in the center of the lower half with a three-ribbed fleshy longitudinal callus, a broad central thickening extending toward the apex; spur or sac about 1.5–2 mm. long, scrotiform. Column about 3.5 mm. long, 1.15 mm. broad above, flat or slightly concave on the anterior face, convex on the posterior surface, stigmatic orifice large and conspicuous, a broad dilated foot adnate to the lateral sepals. Pollinia two, ovoid, flattened on one surface.

In habit this plant recalls *Eulophia macrostachya* Lindl., but the flower is far different. Unlike *E. explanata* Lindl., this species has apparently a fully expanded leaf at flowering time, relatively long column and far different lip.

The oval leaf and small flowers well characterize this species.

KIAU, *Clemens 93*, November 1915. 3000 feet altitude. Flower greenish with cream colored column.

2. *Eulophia squalida* Lindl. in Bot. Reg. (1841) Misc. 77.
Cyrtopera squalida Reichb. f. in Bonpl. 5 (1857) 38.

KAMBORANGAH, *Gibbs*, February 1910. KINABALU, *Clemens*, November–December 1915; *Haslam*, July–August 1916. BUNDU TUHAN, *Gibbs 4319*, February 1910. 2500 feet altitude. Terrestrial in secondary jungle. KIAU, *Clemens 149*, November 1915. 3000 feet altitude. Flowers purple without; *Clemens 345*, November 1915. Flowers purple and yellow; *Clemens 371*, December 1915. Flowers purplish.

40. GRAMMATOPHYLLUM Bl.

Although two species of this genus were previously found in Borneo, none was reported from Mount Kinabalu.

1. *Grammatophyllum kinabaluense* A. & S. *sp. nov.* Herba robusta. Pseudobulbi in visu magni et latissime ovoidei. Folia vaginis brevibus late triangularibus articulata, lineari-ligulata, ad apicem acutum sensim angustata, coriacea. Pedunculus crassus.

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Racemus laxiflorus. Bracteae inflorescentiae patentes, oblongo-ovatae, valde concavae, obtusae. Pedicelli perlongi, distantes. Flores magni, spectabiles; perianthium patens. Sepala oblongo-ovalia, apice late rotundata. Petala late ovalia vel suborbiculari-ovalia. Labellum multo minus, flabellato-subquadratum, trilobatum, in medio fasciculo carinarum trium parvarum; lobi laterales triangulares, obtusi; lobus medius ovato-lingulatus vel ovato-triangularis, apice late rotundatus. Gynostemium crassum, arcuatum.

Plant very large and stout. Pseudobulbs apparently large and very broadly ovoid. Leaves ± 52 cm. long, 2.2 cm. broad near the base, articulated with short, broadly triangular sheaths which rise from the pseudobulb, linear-ligulate gradually narrowed to an acute minutely complicate apex, complicate or conduplicate below, coriaceous, many-nerved with the mid-nerve more or less sulcate above and very conspicuous beneath and with about nine nerves more or less prominent on the under side. Peduncle very stout, apparently ± 1 cm. thick. Raceme very loosely flowered. Bracts of the inflorescence spreading, about 2.3 cm. long, 1.1 cm. wide, oblong-ovate, strongly concave, obtuse. Pedicels of mature flowers 7–10 cm. long, 2.3–13.2 cm. distant, ascending or becoming slightly decurved. Flowers large and showy, perianth spreading in development, about 6.5–7 cm. across, maculate. Sepals and petals similar. Lateral sepals 3.1–3.5 cm. long, 1.65–2 cm. wide, oblong-oval, broadly rounded above, with undulate margins. Dorsal sepal about 3.4 cm. long, 2 cm. wide. Petals about 3.35 cm. long, 2.3 cm. wide, broader than the sepals, broadly oval to suborbicular-oval. Lip much smaller, adnate to the column by a very small fleshy conduplicate claw, three-lobed with the lateral lobes erect and embracing the column, when spread out flabellate-subquadrate, broadly cordate-truncate at the base, about

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1.8 cm. long, 2.6 cm. broad between the apices of the lateral lobes, with a group of three fleshy closely approximate united semi-orbicular erect keels in the center of the lamina; lateral lobes about 9 mm. long, 7.5 mm. wide at the base of the free portion, triangular, obtuse; middle lobe appearing deltoid in natural position with lateral margins decurved, when spread out about 7 mm. long, 8 mm. broad at the base, ovate-lingulate to ovate-triangular, broadly rounded. Column about 1.5 cm. long, very stout, strongly arcuate, subclavate, concave on the anterior face, strongly convex on the posterior surface, inconspicuously three-toothed above.

This species differs from the nearly allied *Grammatophyllum papuanum* J. J. Sm. in the narrower leaves, uniformly smaller sepals and petals, and in the shape of the lateral lobes of the lip.

KIAT, *Clemens* 55, November 1915. 3000 feet altitude. Epiphyte. Flowers yellow and maroon spotted.

41. CYMBIDIUM Sw.

Four members of this genus have been hitherto recorded from Borneo, none of which were reported from Mount Kinabalu.

1. *Cymbidium angustifolium* A. & S. *sp. nov.* Herba pro genere parva. Rhizoma crassum, lignosum. Pseudobulbi anguste cylindracei, vaginis foliorum arcte obtecti. Folia in pseudobulbo quoque circiter sex, vaginis gracilibus canaliculatis articulata, angustissime lineari-lorata, crasse coriacea. Scapus pseudobulbo approximatus, valde arcuatus. Pedunculus ad racemum vaginis lanceolatis conduplicatis imbricantibus vestitus. Racemus laxiflorus. Bractee inflorescentiae inconspicuae, anguste triangulares, acuminatae. Flores majores, patentes. Sepala lateralia oblongo-linearita, acuta, apice late carinata et mucronata. Sepalum dorsale persimile, complicato-mucronatum. Petala sepalis similia

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sed breviora. Labellum trilobatum, expansum ellipticum, carinis duabus approximatis e basi usque ad medium decurrentibus; lobi laterales erecti, porrecti, triangulari-oblongi, obtusi; lobus medius in positu naturali reflexus, expansus triangulari-ovatus, mucronatus. Gynostemium gracile, alis utrinque praeditum. Anthera pileata. Pollinia duo, triangulari-ovoidea.

Plant slender, for the genus. Rhizome stout, woody. Roots very stout, rigid, fibrous, subnumerous, longitudinally sulcate, somewhat branched, about 3–4 mm. thick. Pseudobulb up to about 5.5 cm. long, slender cylindric, provided with five to seven leaves, closely invested by the leaf sheaths and fibres of sheaths. Sheaths ±13 cm. long, slender, rigid, channeled, striate-sulcate, articulated with the blade by an uneven erosely angulate joint. Leaves up to more than 53 cm. long, 1 cm. broad, very narrowly linear-lorate, thick and coriaceous, mid-nerve prominently sulcate above and carinate beneath, lateral nerves more or less conspicuous beneath. Scape approximate to the pseudobulb, strongly arcuate, up to about 35.3 cm. long, 3 mm. thick below, peduncle up to the raceme clothed with several lanceolate, conduplicate, imbricating, scarious sheaths. Raceme loose, as many as eighteen-flowered. Bracts of the inflorescence about 6 mm. long, inconspicuous, tubular-involute, when spread out narrowly triangular, long acuminate, apparently scarious, three-nerved. Flowers rather large, perianth spreading. Lateral sepals about 2.45 cm. long, 5–5.5 mm. wide across the middle, oblong-linear, acute, broadly carinate and mucronate at the apex, about seven-nerved. Dorsal sepal very similar, about 2.5 cm. long, 5.5–6 mm. broad in the middle, complicate-mucronate. Petals oblong, about 2 cm. long, 5–5.5 mm. broad across the middle, when expanded obtuse and mucronate. Lip adnate to the column, in natural position parallel to the column, three-lobed, with the lateral lobes erect,

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when expanded elliptic in outline, about 1.8 cm. long, 1 cm. broad across the middle, two fleshy pubescent approximate keels extending from the base to the center of the lip; lateral lobes porrect, free part about 4.5 mm. long, 3 mm. wide at the base, triangular-oblong, obtuse; middle lobe in natural position reflexed, about 8 mm. long, 6 mm. wide, triangular-ovate, narrowed to an acute mucronate apex. Column about 1.1 cm. long, slender but provided on each side from the base to the apex with a conspicuous wing, very slightly arcuate. Anther pileate, shallowly two-lobed, two-celled, granular roughened. Pollinia two, triangular ovoid. Capsule about 4 cm. long, 2 cm. wide, ellipsoid, with a beak about 1 cm. long.

A less mature specimen, *Clemens 82*, has leaves 5–8.5 mm. broad with acute sharply and unequally bilobed apices. *Clemens 39* is a specimen with very mature flowers.

Cymbidium acutum Ridl. is a nearly allied species that varies in the much shorter leaves, short suberect scape, and differently marked lip.

KIAU, *Clemens 39*, November 1915. 3000 feet altitude. Flower maroon; *Clemens 74* (Type), November 1915. 3000 feet altitude. Flower wine purple with cream colored stripe on lip; *Clemens 82*, November 1915. 3000 feet altitude. Flower dark wine color.

2. *Cymbidium pubescens* Lindl. in Bot. Reg. (1840) Misc. 75.

KINABALU, *Haslam*, July–August 1916.

3. *Cymbidium sanguinolentum* Teijsm. & Binn. in Nat. Tijdschr. Ned. Ind. 24 (1862) 318.

These collections show the dorsal sepal and the petals slightly narrower and the middle lobe of the lip longer than broad.

KIAU, *Clemens 50*, November 1915. 3000 feet altitude. Flowers light yellow with purple stripes; *Clemens 51*, November 1915. 3000 feet altitude. Flowers maroon and yellow.

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42. *ACRIOPSIS* Reinw. ex Bl.

Four species of this genus have been found previously in Borneo, but none from Mount Kinabalu.

1. *Acriopsis indica* Wight Ic. 5 (1852) t. 1748, f. 1.

KINABALU, Haslam, July–August 1916.

43. *THECOSTELE* Reichb. f.

Two members of this genus are recorded from Borneo, but none previously from Mount Kinabalu.

1. *Thecostele alata* (Roxb.) Par. & Reichb. f. in Trans. Linn. Soc. 30 (1874) 144, t. 29. *Cymbidium alatum* Roxb. Fl. Ind. 3 (1832) 459. *Thecostele Zollingeri* Reichb. f. in Bonpl. 5 (1857) 37.

KINABALU, Clemens, November–December, 1915.

2. *Thecostele Maingayi* Hook. f. Fl. Brit. Ind. 6 (1890) 20.

The Bornean collection shows one pseudobulb larger than the type, one leaf up to 21 cm. long and 3.8 cm. wide and the lip bearing distinctly lamelliform keels between the lateral lobes.

KINABALU, Clemens, October 1915. Terrestrial. Flower white.

44. *THRIXSPERMUM* Lour.

Sixteen members of this genus had been reported from Borneo, but none from Mount Kinabalu.

1. *Thrixspermum crescentiforme* A. & S. sp. nov. Herba nana. Caulis gracilis ramis nonnullis, vaginis foliorum omnino obtectus. Folia numerosa, disticha, patentia, lineari-oblonga, acuta, ad basim complicatam angustata, coriacea. Pedunculi patententes vel reflexi, folia subaequales, filiformes, vaginas foliorum perforantes. Racemus perbrevis. Bracteae inflorescentiae densae, deflexae, triangulares, cymbiformes, rigidae. Flos parvus, in sicco pellucidus. Sepala lateralia obovata, acuta, obliqua. Sepalum dorsale obovato-oblongum, apice late rotundatum. Petala

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oblongo-oblancoolata, obliqua, apice late rotundata. Labellum basi sacco semigloboso instructum, crescentiformi-obtriangulare, trilobatum; lobi laterales parvi, triangulares, acuti, porrecti; lobus medius latissime triangularis, acutus. Gynostemium breve, crassum, pede lato concavo praeditum.

Plant small, polyphyllous. Roots numerous, fibrous, flexuous, puncturing the leaf sheaths, usually one to each internode, longitudinally sulcate, ± 7 mm. thick. Stem somewhat branching, about 8.5 cm. long measuring along a branch (but broken off below), entirely concealed by leaf sheaths which are tubular, loose, scarious below, coriaceous and rigid-nervose above. Leaves distichous, spreading, ± 4 cm. long, 6 mm. broad, linear-oblong, acute with a dorsal mucro just below the apex, narrowed to a complicate sessile base, coriaceous, rising at intervals of about 4 mm. Peduncles spreading or reflexed, 3.3–4.2 cm. long including the raceme, filiform, puncturing the leaf sheaths approximate to and just above a root, provided at the base with one or two minute tubular imbricating sheaths, with a similar sheath below the middle, and occasionally an isolated spreading rigid triangular bract near the raceme. Raceme very short, up to 5 mm. long. Bracts of the inflorescence dense, decurved-spreading, about 2 mm. long, triangular, cymbiform, very thick, rigid. Pedicellate ovary relatively long and slender, about 4 mm. long. Flower small, pellucid in the dried specimen. Lateral sepals about 6.1 mm. long, 3.5 mm. broad above the middle, obovate, more or less complicate-acute, very oblique, indistinctly five-nerved, adnate to the foot of the column. Dorsal sepal about 6.1 mm. long, 2.6 mm. broad above the middle, obovate-oblong, broadly rounded above, indistinctly three- to five-nerved. Petals about 5.8 mm. long, 1.6 mm. wide above the middle, oblong-oblancoolata, oblique, broadly rounded at the apex, three-nerved. Lip provided

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below with a hemispherical sac, when expanded about 4 mm. long and 7 mm. broad, crescentic-obtriangular, three-lobed, with a small quadrate reflexed lamina near the center, entire anterior margin fringed with long clavate cilia; lateral lobes small, about .8 mm. long, 1 mm. broad at the base of the free part, triangular, acute, more or less falcately incurved; middle lobe very broadly triangular, acute, about 1 mm. long, 5.5 mm. wide to the base of the side lobes. Column short, stout, about 1.5 mm. long, provided with a broad concave foot.

This species resembles in habit *Thrixspermum maculatum* Schltr. and *T. Trichoglottis* (Hook. f.) O. K. The lip of this plant is very like that of *T. agusanense* Ames, from which it differs in the very short peduncles and smaller flowers. *T. crescentiforme* recalls a slender form of *T. Wenzelii* Ames, but the flower and lip are very dissimilar. *T. anceps* Reichb. f. differs from this species chiefly in the much larger vegetative parts. The name is in allusion to the general form of the lip.

MAREI PAREI SPUR, *Clemens* 238, November 1915. Flower white tinged with pink.

2. *Thrixspermum triangulare* A. & S. sp. nov. Herba robusta. Caulis crassus, lignosus, vaginis foliorum omnino obtectus. Radices crassae, fibrosae, rigidae, vaginas perforantes. Folia disticha, patentia, lineari-lanceolata vel linearia, apice obtuso saepissime oblique bilobata, ad basim complicatam paulo angustata, coriacea. Pedunculi folia multo excedentes, patenti-adscendentes. Rachis complanata. Bractee inflorescentiae distichae, equitantes, ovato-triangulares, cymbiformes. Flos mediocris, in sicco pellucidus. Sepala lateralia ovato-oblonga, apice late rotundata, sub apice dorso cornuta. Sepalum dorsale oblongo-ellipticum, simile. Petala elliptico-oblonga, apice rotundata. Labellum basi gynostemii adnatum, in circuitu orbiculare, distincte tri-

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lobatum, parte media longitudinali incrassata, medio in disco callus triangularis valde carnosus stat; lobi laterales subquadrati, membranacei, marginibus anterioribus et lateralibus angulum acutum facientibus; lobus medius triangularis, marginibus præcipue valdissime carnosus. Gynostemium breve, crassum.

Plant robust, when fresh apparently fleshy. Stems stout, woody, entirely concealed by leaf sheaths, sheathed stem ± 6 mm. thick. Roots puncturing the leaf sheaths, stout, fibrous, flexuous, rigid, longitudinally sulcate, about 2–3 mm. thick, apparently unbranched. Leaf sheaths more or less coriaceous and striate-nerve. Leaves distichous, spreading, up to 16.5 cm. long, 2.2 cm. broad below the middle (immature blades sometimes 9 cm. long, 1.5 cm. broad), linear-lanceolate to linear, rounded at the more or less obliquely bilobed apex, slightly narrowed to a complicate sessile base, rising at intervals of ± 2 cm., coriaceous, apparently fleshy in the living specimen, many-nerved with the mid-nerve more or less sulcate above and sharply carinate beneath. Peduncles puncturing the leaf sheaths, conspicuously exceeding the leaves, spreading-ascending, about 15.8–29 cm. long including the raceme, provided with several inconspicuous tubular sheaths which are imbricating at the base and remote above. Rachis about 7–16.5 cm. long (sometimes very short), more or less arcuate, laterally flattened, zigzag with short intervals, sulcate in the dried specimen and apparently fleshy in the living plant. Bracts of the inflorescence about 6–6.5 mm. long, distichous, equitant, about 5 mm. apart, strongly complanate with a broad dorsal keel, ovate-triangular, clasping, rounded at the apex, cymbiform, rugose in the dried plant. Flowers medium-sized, when expanded about 3 cm. broad, pellucid in the dried specimen. Lateral sepals about 1.5 cm. long, 8.4 mm. broad below the middle, ovate-oblong, five-nerved, just below the broadly rounded apex provided dor-

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sally with a blunt fleshy horn. Dorsal sepal about 1.5 cm. long, 7 mm. broad in the middle, oblong-elliptic, rounded at the apex, dorsally similarly but less distinctly horned, five-nerved. Petals about 1.5 cm. long, 6.5 mm. broad across the middle, elliptic-oblong, rounded at the apex, five-nerved. Lip immovably joined to the foot of the column, in outline orbicular, about 1.2 cm. long, 1.25 cm. broad, sharply three-lobed with the lateral lobes erect, somewhat saccate at the base with the central portion longitudinally fleshy-thickened on both surfaces, in the center of the disc there is a fleshy triangular callus which is about 3 mm. long, 3.5 mm. wide at the base and 2 mm. high with the lateral walls at the base especially high; lateral lobes membranaceous, about 6 mm. long and 4 mm. broad, subquadrate with the anterior and lateral margins shallowly concave and forming a sharp angle, dorsal margin gently convex; middle lobe about 5 mm. long, 6 mm. broad at the base, triangular, extremely fleshy-thickened, especially the margins which are cellular pubescent. Column short, stout, fleshy, about 3 mm. long, provided with a winged foot.

A collection of this plant by Haslam shows a stouter form with thicker roots, leaves up to 17 cm. long, peduncle including the raceme up to 39.5 cm. long with rachis 25.2 cm. long, but the flower slightly smaller than that of the type which was preserved in formalin.

This is a species that has apparently no close relatives, but in flower structure it appears nearest to *Thriasperrum amplexicaule* (Bl.) Reichb. f., which is a more slender delicate plant and has much smaller clasping leaves and differently proportioned lip. In the dried specimens of the lip, the fleshy consistency is absent and the central callus is indicated by a pair of triangular laminae converging in front.

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KINABALU, *Haslam*, July–August, 1916. KAMBOBANGAH, *Clemens 201* (Type), November 1915. Flower white and pink.

45. *AERIDES* *Lour.*

Three species of this small genus have been definitely found in Borneo, but none previously on Mount Kinabalu.

1. *Aerides odoratum* *Lour.* Fl. Cochinch. (1790) 525.

KINABALU, *Clemens*, November–December 1915. KIAU, *Clemens 43*, November 1915. 3000 feet altitude. Petals white with purple tips, spur golden yellow with purple end; *Clemens 69*, November 1915. 3000 feet altitude. Flower yellow with pink spur; *Clemens 81*, November 1915. 3000 feet altitude. “Bud green with purple tips and spots inside;” *Clemens 183*, November 1915. 3000 feet altitude. Flower white and purple, petals yellow, spur with green tip; *Clemens 307*, November 1915. Flowers yellow with brownish spurs.

46. *VANDA* *Jones.*

Two endemic members of this genus are recorded as native of Borneo, of which one is restricted to Mount Kinabalu.

1. *Vanda Gibbsiae* *Rolfe* in Gibbs in Journ. Linn. Soc. 42 (1914) 158.

One of the specimens collected by Haslam shows a pair of capsules which are oblong-cylindric, about 9 cm. long, 3 cm. broad.

KINABALU, *Haslam*, July–August 1916. KIAU, bridle-path to Koung, *Gibbs 3970*,¹ February 1910. 2500 feet altitude. Epiphyte one meter high, in secondary forest. Flowers yellow spotted with brown. LOBONG GORGE, *Clemens 311*, November–December 1915. “Petals brown and yellow, pink teeth.”

47. *TRICHOGLOTTIS* *Bl.*

Of the eleven members of this genus recorded from Borneo, only one was formerly known from Mount Kinabalu.

1. *Trichoglottis kinabaluensis* *Rolfe* in Gibbs in Journ. Linn. Soc. 42 (1914) 157.

The plants of the Clemens collections manifest some slight

¹ This is the type of the species.

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variations from the type. *Clemens 31* shows plants 28–34 cm. high, with leaves up to 13.3 cm. long and 2.1 cm. broad; *Clemens 315* presents only the lateral branches of the plant, with shorter leaves than the type, as well as a rather short spur. Both collections show slightly longer lateral lobes of the lip.

GURULAU SPUR, above Kiau, *Gibbs 3993*, February 1910. 5500 feet altitude, in high forest jungle. Epiphyte, with brown flowers; *Clemens 315*, November 1915. Flower brown, petals mottled, column yellow. KIAU, *Clemens 31*, November 1915. 3000 feet altitude. Flower pinkish and yellowish brown.

2. *Trichoglottis magnicallosa* A. & S. *sp. nov.* Herba valida. Radices in visu paucae, crassae, rigidae, lignosae. Caulis suberectus, vaginis coriaceis foliorum pro parte obtectus. Folia disticha, late patentia, oblongo-elliptica (raro oblonga), apice oblique bilobata et mucronata, basi complicata, coriacea. Inflorescentiae numerosae, in visu uni- vel triflorae. Flores magni, spectabiles. Perianthium late patens, crassius. Sepala oblanceolata, apice latissime rotundata. Petala cuneato-spathulata, apice latissime rotundata. Labellum multo minus, trilobatum; lobi laterales parvi patentes, lineares, apice rotundati, crassi; lobus medius linearis, valde pubescens, apice obscure emarginatus, callo permagno convexo e basi ad ultra medium praeditus; lamella ovata pubescens in basi concava stat. Gynostemium breve, crassum.

Plant robust, about 50–69 cm. high. Roots puncturing the lower leaf sheaths, very stout and rigid, longitudinally sulcate, woody, about 3 mm. thick. Stem suberect or gently arcuate, zigzag, about 4.5–5.5 mm. thick, partly concealed by the tubular, coriaceous, striate-nervose leaf sheaths. Leaves distichous, horizontally spreading, up to 24 cm. long and 4.5 cm. wide, but averaging about 13.5 cm. long, 3.7 cm. broad, oblong-elliptic or more rarely oblong, terminating in rounded lobules that are

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very oblique and separated by a mucro, complicate at the base, thickly coriaceous, many-nerved with the mid-nerve more or less sulcate above and prominently carinate beneath, rising at intervals of about 3–4 cm. Inflorescences numerous, apparently one- to three-flowered, puncturing the lower part of the leaf sheaths. Flowers (all detached) about 4.5 cm. across, showy, sub-fleshy with spreading segments. Sepals, and to a less extent the petals, under surface broadly sulcate in the dried specimen. Lateral sepals about 2.2 cm. long, 1 cm. broad above, oblanceolate, very broadly rounded at the apex. Dorsal sepal about 2.3 cm. long, 1 cm. wide above, very similar. Petals about 2.2 cm. long, 9 mm. broad above, 2 mm. wide at the base, cuneate-spatulate, very broadly rounded above, mid-nerve sometimes conspicuously sulcate above and carinate beneath. Lip small, adnate to the base of the column, about 1.1 cm. long, 1–2 mm. broad, narrowly linear, three-lobed; lateral lobes spreading, about 4.5 mm. long on the upper margin, 3.5 mm. long on the lower margin, linear, slightly broader above, obliquely rounded at the apex, fleshy; middle lobe linear, thick and fleshy, slightly broader above then narrowed to an obscurely emarginate apex, with a minute blunt tooth on each side near the base, densely pubescent, furnished with a very convex, fleshy, pubescent callus occupying the entire width of the mid-lobe and terminating abruptly about 4 mm. from the apex of the lip where the callus is about 2 mm. in height; an ovate pubescent lamella stands at the slightly concave base of the lip. Column about 4.5 mm. long and broad, stout, short, pubescent.

This species is a near ally of *Trichoglottis Uexkülliana* J. J. Sm., but the Kinabalu plant has much longer sepals and different mid-lobe of the lip.

KINABALU, *Haslam*, July–August 1916.

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3. *Trichoglottis tenuis* A. & S. *sp. nov.* Herba pergracilis. Radices pro planta crassae, rigidae, fibrosae, vaginas infimas perforantes. Caulis ad basim ramosus, gracillimus, plus minusve valde arcuatus, vaginis foliorum coriaceis omnino obtectus. Folia disticha, late patentia, linearia, oblique et obscure bilobata, basi complicata, coriacea. Inflorescentiae numerosae, saepissime biflorae. Flores perparvi, in sicco pellucidi. Sepala lateralia triangularia, acuta, basi antice abrupte dilatata et calcar adnata. Sepalum dorsale oblongum, apice eroso rotundatum, concavum. Petala falcato-ob lanceolata, apice late rotundata. Labellum conspicue calcaratum, trilobatum; lobi laterales erecti, falcato-triangularis, obtusi; lobus medius triangularis, basi in auriculas rotundatas dilatatus, deinde ad apicem acuminatum sensim angustatus; calcar conicum, apice rotundatum. Gynostemium breve, crassum, apice dentatum.

Plant very slender. Roots puncturing the lower leaf sheaths, stout, rigid, fibrous, flexuous, deeply longitudinally sulcate, about 1.1 mm. thick. Stem about 37 cm. long, very slender, about 1.1 mm. thick, branching below, branches more or less strongly arcuate, entirely concealed by the striate-nervose, appressed-tubular, coriaceous leaf sheaths. Leaves about 5–7.4 cm. long, 3–4 mm. wide, distichous, horizontally spreading, narrowly linear, slightly oblique and falcate in the dried specimen, acuminate to a very obliquely bilobed apex, slightly narrowed to a sessile complicated base, coriaceous, many-nerved with the mid-nerve more or less sulcate above and carinate beneath, rising at intervals of ± 1.3 cm. Inflorescences numerous, usually two-flowered, in fascicles puncturing the lower part of each leaf sheath nearly opposite the leaf. Flowers very small, pellucid in the dried specimen. Lateral sepals about 3 mm. long, 2.5 mm. wide at the base, triangular in outline, at the base adnate to the spur by an abrupt

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triangular rounded auricle, acute or subacute and apparently complicate with a dorsal keel at the apex, three-nerved. Dorsal sepal about 3 mm. long, 1 mm. wide, oblong, rounded and erose at the apex, concave, three-nerved. Petals about 2.5 mm. long, .75 mm. broad above, falcate-oblancheolate, broadly rounded at the apex, one-nerved. Lip prominently spurred, three-lobed; lateral lobes erect, about .8 mm. long and broad at the base, triangular-falcate and decurved, incurved at the apex and obtuse when expanded, joined by a pubescent keel or callus; middle lobe \pm 2 mm. long, 1.5 mm. wide near the base, triangular, on each side auriculate-dilated below and long acuminate to a sharp apex; spur about 2.3 mm. long, conic, rounded at the apex, provided within at the base with a small thin subquadrate truncate or shallowly retuse pubescent lamella. Column short, stout, about 2 mm. long, shallowly dentate above.

This species is a very close ally of *Trichoglottis lanceolaria* Bl., but the former has apparently a somewhat smaller and less fleshy flower with very different lateral lobes of lip and a differently proportioned middle lobe.

KIAU, *Clemens 60*, November 1915. 3000 feet altitude. Flowers white, yellow and maroon.

48. *SCHOENORCHIS* *Reinw. ex Bl.*

Two members of this small genus have been recorded from Borneo, but previously none from Mount Kinabalu.

1. *Schoenorchis micrantha* *Bl. Bijdr. (1825) 362. Saccola-bium perpusillum Hook. f. Fl. Brit. Ind. 6 (1890) 56.*

KINABALU, *Clemens*, November–December 1915. KIAU, *Clemens 58*, November 1915. 3000 feet altitude. Flower pinkish white. LOBONG CAVE, *Clemens 113*, November 1915. 5000 feet altitude. Flower white.

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49. **SACCOLABIUM** *Bl.*

Seventeen representatives of this genus are known from Borneo, but only one from Mount Kinabalu.

1. **Saccolabium kinabaluense** *Rolfe* in *Gibbs* in *Journ. Linn. Soc.* 42 (1914) 158.

LOBONG, *Gibbs* 4111, February 1910. 5000 feet altitude. Epiphyte in high forest. Flowers yellow with a white lip.

50. **MALLEOLA** *J. J. Sm. & Schltr.*

Hitherto no species of this genus have been found in Borneo. It is a group recently distinguished from *Robiquetia* Gaudich. by the smaller flowers, the short hammer-shaped or malleoliform column and the dilated stipe of the pollinia.

1. **Malleola kinabaluensis** *A. & S. sp. nov.* Herba subcrassa. Caulis suberectus, vaginis foliorum omnino obtectus. Folia disticha, late patentia, oblongo-elliptica vel anguste oblonga, obliquissime et obtuse bilobata, ad basim complicatam angustata, coriacea. Pedunculi duo, cum rachide folia multo excedentes, oppositifolii, suberecti vel arcuato-deflexi. Rachis laxissime multiflora. Bracteae inflorescentiae perparvae, triangulari-lanceolatae, patentes. Flores parvi, in sicco pellucidi. Sepala lateralia suborbiculari-obovata, acuta, obliquissima. Sepalum dorsale valdissime cucullatum vel complanato-pileatum, obtusum. Petala ovata, late obtusa, obliqua. Labellum longe calcaratum, trilobatum; lobi laterales erecti, parvi, oblique triangulares, obtusi; lobus medius subulatus, parvus, arcuato-decurvus; calcar a latere visum angulum obtusum faciens, parte inferiore lateraliter complanata, dimidio anteriore dorso compresso et antice profunde sulcato. Gynostemium breve, crassum, malleoliforme.

Plant stout. Roots numerous on the lower part of the stem, fibrous, flexuous, many-grooved in the dried specimen, somewhat

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branched, very finely pubescent. Stems suberect from a more or less decumbent root-like base, about 10–17 cm. long (but broken off below; a very dwarf plant is about 5 cm. high), zigzag, entirely invested by the laterally flattened, coriaceous, striate-nervose leaf sheaths. Leaves about five to eleven, distichous, spreading, 8.5–11.1 cm. long, 1.7–2.1 cm. broad (the dwarf plant shows a leaf 1.1 cm. wide), oblong-elliptic to narrowly oblong, sometimes slightly oblique, very prominently obliquely and obtusely bilobed at the apex, cuneate-narrowed to a sessile complicate base, coriaceous, many-nerved with the mid-nerve conspicuously carinate beneath, rising at intervals of ± 1.1 cm. Peduncles two, puncturing the middle leaf sheaths opposite a leaf-base, with the raceme included much exceeding the leaves, suberect to arcuate-deflexed, up to the rachis 3–6 cm. long, at the base and below the middle provided with a very small, loose, scarious, infundibuliform sheath. Rachis about 12–22 cm. long, very loosely many-flowered, sinuously zigzag, striate-sulcate, very minutely papillate. Bracts of the inflorescence very small, spreading, about 2.7 mm. long, triangular-lanceolate, deeply concave with involute margins. Flower about 9 mm. long from the upper margin of the dorsal sepal to the apex of the spur, perianth spreading, pellucid in the dried specimen. Lateral sepals about 3 mm. long, 2.75 mm. broad above the middle, suborbicular-obovate, acute, very oblique, with three subapproximate nerves. Dorsal sepal about 4 mm. long, apparently 3–3.8 mm. broad, very cucullate or complanate-pileate, obtuse or subacute. Petals about 3 mm. long, 2 mm. wide, ovate, broadly obtuse, oblique, three-nerved. Lip three-lobed, prominently spurred, 7–8 mm. long from the apex of the erect lateral lobes to the tip of the spur; lateral lobes small, obliquely triangular, about 1.5 mm. long and broad at the base, fleshy, rounded at the apex, provided without with an

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oblique thickened ridge; middle lobe subulate, in natural position arcuate-decurved, fleshy, about 1.5 mm. long when expanded, sulcate, obtuse, at the base terminating within the spur in an upcurved fleshy cylindrical tubercle which is about .5 mm. long; spur about 5.5 mm. long, when viewed from the side forming an obtuse angle in the middle, obliquely laterally compressed to about the middle, then abruptly dorso-ventrally compressed and provided on the anterior surface with a deep groove, apex broadly rounded. Column short, fleshy, about 1.8 mm. high, viewed from the side subquadrate-malleoliform, furnished with a minute tubercle at the base. Anther pileate. Pollinia two, subglobose, on the apex of a slender membranaceous cuneate-dilated stipe which is about 2.2 mm. long.

A great range of vegetative variation is shown by the collections of this plant. *Clemens 87* exhibits longer stouter roots, a leaf measuring 12.3 cm. long and 2.84 cm. broad, and a scape about 33 cm. long; *Clemens 133* is a small immature plant showing one leaf 5.4 cm. long and 9.5 mm. broad; *Clemens 353* displays a stem ± 20 cm. tall with evidences of thirteen leaves; *Clemens 176* shows a leaf 3.1 cm. broad.

This plant is very close to *Malleola Witteana* J. J. Sm. & Schltr., but it differs from that species in being much less stout and fleshy, in having the leaves longer in proportion to breadth, in the decurved middle lobe of the lip and in the color of the flowers. (PLATE 96.)

KIAU, *Clemens 87*, November 1915. 3000 feet altitude. Flower cream-white; *Clemens 163*, November 1915. 3000 feet altitude. "Flower, white shoe with yellow heel;" *Clemens 176*, November 1915. 3000 feet altitude. "White shoe, yellow heel;" *Clemens 330* (Type), November 1915. Flower white and yellow; *Clemens 353*, November 1915. "Flower, white shoe and purple heel." LOBONG CAVE, *Clemens 111*, November 1915. 5000 feet altitude. "Flower, white shoe and pink and yellow heel;" *Clemens 133*, November 1915. 5000 feet altitude. "Flower, white shoe with brownish heel."

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2. *Malleola transversisaccata* A. & S. *sp. nov.* Herba crassior, arcuata. Radices numerosae, fibrosae, rigidae. Caulis vaginis coriaceis foliorum omnino obtectus. Folia disticha, late patentia, elliptico-oblonga vel linearia, apice oblique bilobata, ad basim complicatam angustata, coriacea. Pedunculi circiter tres, oppositifolii, simplices. Rachis densissime multiflora. Bractee inflorescentiae triangulares, acuminatae, reflexae. Flores parvi, in sicco pellucidi. Sepala lateralialia late ovata, obliqua, obtusa. Sepalum dorsale ovatum, cucullatum, apice rotundatum. Petala ovata, acuta. Labellum conspicue calcaratum; lobi laterales inconspicui, retrorsum extensi; lobus medius conspicuus, adscendens, angustissime triangularis; calcar cylindraceum, ad apicem in saccum transverse ovoideum dilatatum. Gynostemium parvum, malleoforme. Anthera pileata. Pollinia duo ad summam stipitis cuneato-dilatati.

Plant rather stout, arcuate. Roots numerous below, fibrous, rigid, flexuous, conspicuously sulcate, sparsely branched, 1–2 mm. thick. Stem merging into a root-like portion below, about 15–26 cm. long (but broken off at the base; a dwarf plant has stem 6.2 cm. long), entirely concealed by the leaf sheaths, zigzag. Leaf sheaths — the lower becoming fibrous, the upper loose — infundibuliform, laterally flattened, coriaceous, striate-nervose. Leaves eight to ten, distichous, widely spreading, about 8.5–10.6 cm. long, 1.25–2.35 cm. wide, at intervals of ± 1.5 cm., lance-oblong, elliptic-oblong or linear, rounded at the apex and very obliquely bilobed with vertically semi-orbicular lobules which are minutely erose, obliquely narrowed to a complicate sessile base, coriaceous, many-nerved with the mid-nerve more or less sulcate above and prominently carinate beneath. Peduncles about three, slightly shorter than or little surpassing the leaves, puncturing the middle or upper sheaths opposite the leaf-bases, spreading-arcuate or de-

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curved, rather stout, 1–1.5 mm. thick, portion up to the raceme 2.6–6 cm. long, provided with about three very small scarios sheaths which are tubular at the base and infundibuliform above. Rachis about 5.5–7 cm. long. Raceme densely many-flowered. Bracts of the inflorescence up to 3.5 mm. long, triangular, acuminate, cucullate, reflexed in development. Pedicellate ovary about 6 mm. long, very slender, apparently lepidote. Flowers small, pellucid in the dried specimen. Lateral sepals about 4 mm. long, 2.7 mm. wide across the middle, broadly ovate, oblique, apical margins involute but when expanded forming an obtuse apex, adnate to the spur, three-nerved. Dorsal sepal about 3.8 mm. long, 2.6 mm. broad, ovate, rounded at the apex, cucullate, three-nerved. Petals about 3 mm. long, 2 mm. broad, ovate, acute, three-nerved. Lip with a conspicuous spur, three-lobed; lateral lobes small, oblong-falcate, extended backward, furnished on the upper margin midway to the middle lobe with a minute tooth, free portion about .8 mm. long, rounded at the apex; middle lobe prominent, in natural position spreading, when immature ascending, in maturity slightly decurved, when expanded narrowly triangular-lanceolate, upper portion sulcate-involute and thickened, just below the base of the mid-lobe within there is a more or less distinct oblong fleshy callus; spur— dorsally measured from base to apex — about 5–5.5 mm. long, narrowly cylindric, abruptly dilated at the apex into a transversely ovoid porrect sac. Column small, malleoliform. Anther pileate. Pollinia two, subglobose, at the summit of a slender membranaceous cuneate-dilated stipe.

Dwarf specimens are represented by *Clemens* 67 and 246. In the former plant the leaves are subcoriaceous, the peduncle short and a fresher flower shows suborbicular lateral sepals about 4 mm. long and 3.5 mm. broad, dorsal sepal about 4 mm. long, and suborbicular petals about 3.2 mm. long and 2.5 mm. wide.

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In habit this plant suggests *Sarcanthus koeteiensis* (Schltr.) J. J. Sm., but the leaves of this species are much shorter and the flowers altogether different.

KIAU, *Clemens 67*, November 1915. 3000 feet altitude. Flower yellow with white column; *Clemens 166* (Type), November 1915. 3000 feet altitude. Flower orange with light yellow spur. MAREI PAREI SPUR, *Clemens 246*, November 1915. "Flower green."

51. *SARCANTHUS* Lindl.

Of the ten species of this genus credited to Borneo, none were hitherto recorded from Mount Kinabalu.

1. *Sarcanthus Merrillianus* Ames *sp. nov.* Herba robusta. Caules elongati, teretes. Folia linearia, disticha, crasse coriacea, acuta. Pedunculi perbreves, oppositifolii. Bractee inflorescentiae squamiformes. Flores longipedicellati. Sepala lateralia obovato-oblonga, obliqua, obtusa. Sepalum dorsale ovatum, apice late rotundatum, valde concavum, apice minute denticulatum. Petala oblongo-spathulata, apice late rotundata, ad apicem minute denticulata. Labellum calcaratum, trilobatum; lobi laterales erecti, transverse oblongi, truncati; lobus medius triangularis, obtusus; calcar conspicuum, cylindraceum, apice rotundatum, intus in pariete antico callo minuto et in pariete postico callo ligulato sursum curvato instructum. Gynostemium crassum.

Plant stout, apparently erect. Roots stout, rigid, fibrous, flexuous, longitudinally sulcate, branched, about 2–3 mm. thick. Stems ±3 dm. tall, about 5 mm. thick, terete, entirely concealed by the sheaths of the leaves. Leaf sheaths ±3 cm. long, tubular, thickly coriaceous, rigid, striate-nervose and finely rugose with transverse reticulations between the longitudinal nerves. Leaves up to 2 dm. long, ±8 mm. wide, distichous, linear-ligulate to linear-lanceolate, acute, conduplicate at the base, very thickly coriaceous, apparently very fleshy in the living plant. Peduncles about

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1.5 cm. long, stout, puncturing the leaf sheaths about opposite the leaf bases. Racemes abbreviated, ± 7 mm. long, about ten-flowered. Bracts of the inflorescence scarcely 1 mm. long, scale-like. Pedicel and ovary ± 1.5 cm. long, very slender, spreading. Flowers about 1.5 cm. long. Lateral sepals about 4.5 mm. long, 3 mm. wide, obovate-oblong, oblique, obtuse, somewhat cucullate and dorsally cornute at the apex, prominently one-nerved. Dorsal sepal about 4 mm. long, 2.8 mm. broad when expanded, ovate, strongly concave, broadly rounded at the apex which is sometimes obliquely bilobed, minutely denticulate above. Petals about 3.5 mm. long, 2 mm. wide above the middle, oblong-spatulate, broadly rounded at the apex, minutely denticulate above the middle. Lip prominently spurred, three-lobed; lateral lobes about 2–2.5 mm. across the apex, transversely oblong, indistinct, truncate, erect; middle lobe ± 1.5 mm. long, triangular, obtuse, upcurved, below the apex fleshy-thickened within; spur about 11 mm. long, cylindric, curved, obtuse, provided on the anterior wall below the base of the mid-lobe with a small callus and on the posterior wall about 4 mm. from the tip with an upcurved ligulate blunt callus that is longitudinally sulcate beneath. Column 3 mm. long, short, fleshy, lacking a distinct foot. Anther triangular, cucullate, prolonged in front into a triangular beak. Pollinia globose, on a ligulate membranaceous stipe, disc elliptic.

The very short peduncles and long-spurred flowers make this species distinct. According to the collector's notes the flowers are entirely indigo blue including the pedicels. (PLATE 97.)

MAREI PAREI SPUR, *Clemens* (Type), November 1915. Flowers indigo blue in all parts; *Clemens* 267, November 1915. High on trees. Flowers indigo blue; *Clemens* 368, December 1915. Flowers indigo.

52. *MICROSACCUS Bl.*

No members of this small genus have previously been found in Borneo.

1. *Microsaccus longicalcaratus A. & S. sp. nov.* Herba pro genere robusta. Caules plus minusve arcuati, saepissime furcati, vaginis foliorum imbricatis complanatis omnino obtecti. Folia numerosa, perdensa, disticha, equitantia, a latere visa lanceolata, obliqua, leviter falcata, decurva. Inflorescentiae in visu uniflorae, in axillis foliorum superiorum. Flores parvi, in sicco pellucidi. Sepala lateralialia lanceolata, obliqua, apice cucullata. Sepalum dorsale oblongo-ovatum, acutum, concavum. Petala linearia, obtusa. Labellum calcaratum; lamina unguiculata, suborbicularis, utrinque late rotundata, antice in medio subito in apicem triangularem contracta; calcar cylindraceum, arcuatum, apice bilobato. Gynostemium breve, crassum.

Plant, for the genus, very tall and stout. Roots clustered at the base of the plant, numerous, fibrous, flexuous, longitudinally sulcate, $\pm .75$ mm. thick. Stems up to more than 36 cm. long, simple or usually once-forked, rarely with three branches, usually more or less arcuate, entirely concealed by the leaves and imbricating leaf sheaths. Leaves very dense and numerous, distichous, equitant, spreading, about 1.5–2 cm. long, 5–6 mm. wide below, viewed from the side lanceolate, very oblique, more or less decurved, obtuse, articulated with the complanate sheaths, rigidly coriaceous but pellucid, more or less rugose and apparently very thick and fleshy in the living plant. Inflorescences apparently one-flowered, in the axils of the leaves, much shorter than the leaves even in late development. Flowers small, pellucid in the dried specimen, apparently dark-colored. Lateral sepals adnate to the spur, about 5 mm. long, 2.5 mm. wide below the middle, lanceolate, very oblique, apex cucullate and dorsally carinate,

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conspicuously one-nerved. Dorsal sepal about 4.5 mm. long, 2–2.5 mm. wide, oblong-ovate, acute, strongly concave, dorsally carinate, prominently one-nerved. Petals about 4 mm. long, 1 mm. broad below, linear, obtuse, one-nerved. Lip spurred, dilated from a distinct claw into a suborbicular blade; claw about 1.5 mm. long, 1.25 mm. broad, mostly occupied by a fleshy longitudinal callus; lamina about 4.7 mm. long, 5 mm. wide, broadly rounded on each side, with a small abruptly triangular obtuse apex (lip might thus be termed three-lobed), sub-fleshy in texture; spur conspicuous, strongly arcuate, in natural position about 5 mm. long, cylindric-conic, broad below tapering to a bilobed apex, sulcate on the dorsal and ventral surfaces near the apex, provided within — midway on the anterior wall — with a small longitudinal callus. Column short, stout. Ovary becoming about 1 cm. long, cylindric-ellipsoid.

This species, while showing the general attributes of the genus, is very tall, stouter than usual, and the flower possesses a very long spur. The flowers are very advanced and lack anther and pollinia.

KIAU, *Clemens* 342, November 1915.

PLATE 80

ORCHIDACEÆ

PLATE 80: *Chlorosa Clemensii*

Plant, natural size, drawn from the type (*Clemens 399*). 1, upper sepal. 2, petal. 3, lateral sepal. 4, labellum.

CHLOROSA Clemensii A.S.

1889



Pl. 80

PLATE 81

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PLATE 81: *Coelogyne radioferens*

Plant, natural size (reconstructed from specimens of *Clemens 200*). The part shown in detail is the labellum, the basal keels being concealed by the hooded base.



COELOGYNE
radioferens A.S.

PLATE 82

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PLATE 82

Dendrochilum imbricatum. I. Inflorescence, drawn natural size. 1, labellum.

Dendrochilum quinquelobum. II. Inflorescence, drawn natural size. 2, flower enlarged.

Dendrochilum alatum. III. Plant, drawn natural size. 3, gynostemium enlarged. 4, labellum enlarged.

Dendrochilum perspicabile. IV. Plant, drawn natural size. 5, labellum enlarged.

D. imbricatum Ames



D. quinquelobum Ames
II



D. perspicabile Ames



DENDROCHILUM
alatum Ames

PLATE 83

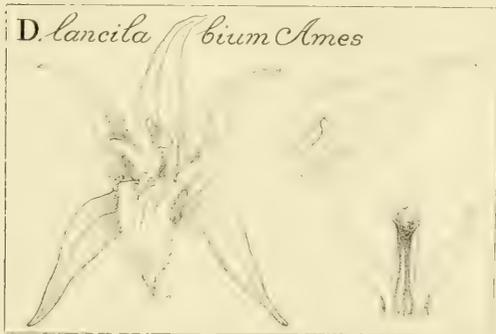
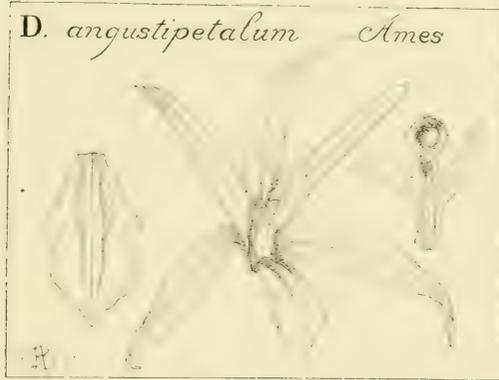
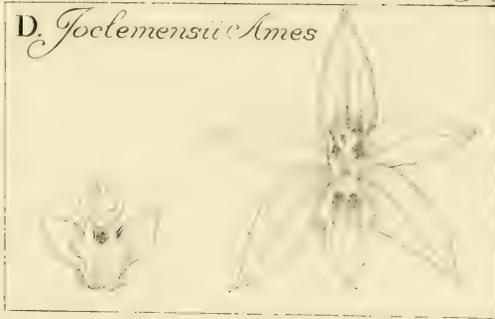
ORCHIDACEÆ

PLATE 83

Dendrochilum Joclemensii. Flower and gynostemium enlarged.

Dendrochilum angustipetalum. Flower enlarged. Labellum enlarged, at left. Gynostemium enlarged, at right.

Dendrochilum lancilabium. Flower enlarged. Labellum enlarged. Gynostemium enlarged.



DENDROCHILUM

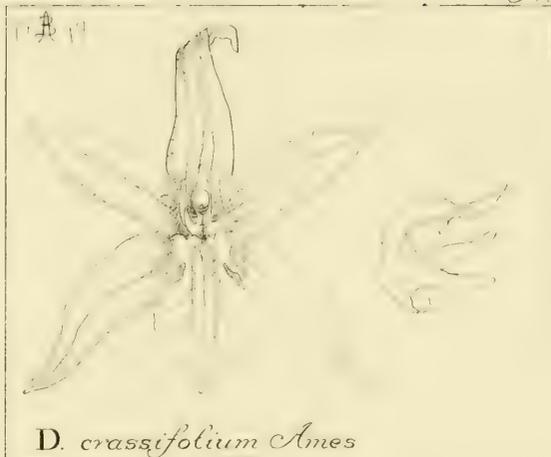
PLATE 84

ORCHIDACEÆ

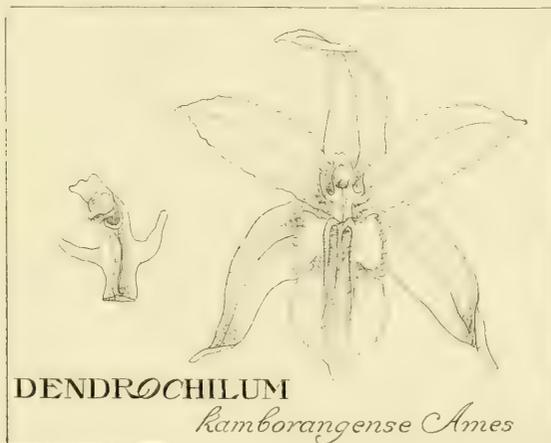
PLATE 84

Dendrochilum crassifolium. Flower enlarged.
Gynostemium, side view.

Dendrochilum kamborangense. Flower enlarged.
Gynostemium, front view.



D. crassifolium Ames



DENDROCHILUM
kamborangense Ames

PLATE 85

ORCHIDACEÆ

PLATE 85: *Dendrochilum Haslamii*

Plant, natural size, drawn from the type.
Flower enlarged.

DENDROCHILUM

Haslamii Ames



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PLATE 86

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PLATE 86: *Pholidota pectinata*
Inflorescence, natural size. Flower enlarged.
Labellum and gynostemium, side view.

Pl. 86



PHOLIDOTA
pectinata Ames

PLATE 87

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PLATE 87: *Nabalua Clemensii*

Plant, natural size. 1, bracts of the inflorescence. 2, gynostemium much enlarged. 3, labellum enlarged. 4, flower.



NABALUIA
Clemensii Ames

PLATE 88

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PLATE 88

Malaxis graciliscapa. Flower much enlarged.

Malaxis multiflora. 1, labellum. 2, upper sepal.
3, petal. 4, lateral sepal, all much enlarged.

Malaxis variabilis. 5, labellum. 6, lateral sepal.
7, upper sepal. 8, petal, all much enlarged.

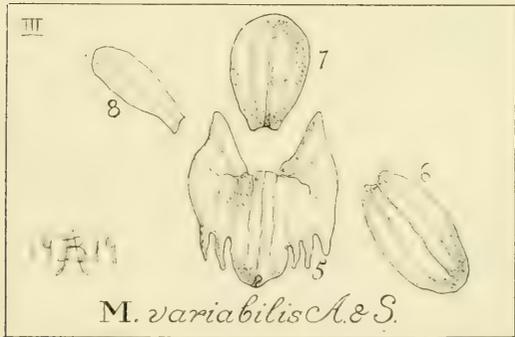
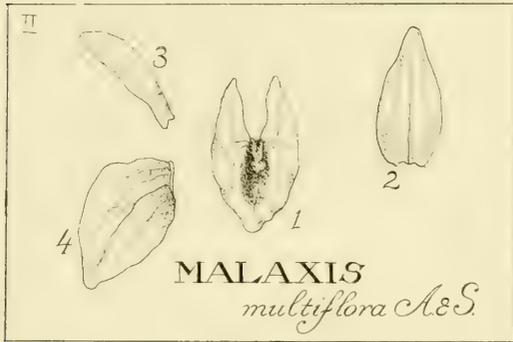
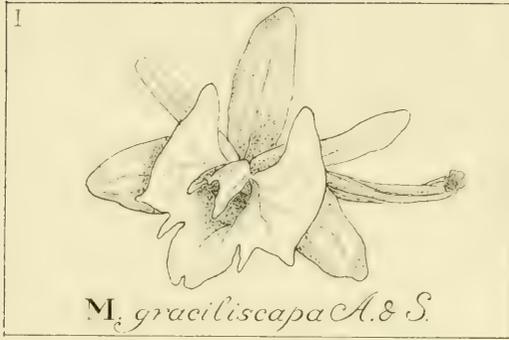


PLATE 89

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PLATE 89

Oberonia kinabaluensis. I. Plant, natural size.
1, flower much enlarged.

Oberonia affinis. II. Plant, natural size. 2, flower
much enlarged.

5439

O. affinis A. & S.



OBERONIA kinabaluensis A. & S.

PLATE 90

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PLATE 90

Oberonia patentifolia. I. Plant, natural size.
1, flower much enlarged.

Oberonia triangularis. II. Plant, natural size.
2, labellum much enlarged, tip turned upwards.
3, another plant, natural size, in bud and in
fruit.

OBERONIA
patentifolia A. & S.



PLATE 91

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PLATE 91: *Dendrobium minimum*
Plant, natural size. Labellum enlarged.



Pl. 9,

DENDROBIUM

minimum A. & S.

PLATE 92

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PLATE 92: *Eria magnicallosa*
Upper part of plant, natural size. Labellum.



ERIA magnicallosa A.S.

PLATE 93

ORCHIDACEÆ

PLATE 93: *Chilopogon kinabaluensis*

Plant, natural size, drawn in flower and fruit.
Labellum enlarged, showing concave base and
the callus on the disc.

CHILOPOGON *kinabaluensis* A.S.

No. 3



1919

PLATE 94

ORCHIDACEÆ

PLATE 94: *Bulbophyllum eximium*

Plant, drawn natural size. Flower enlarged.
Labellum enlarged.

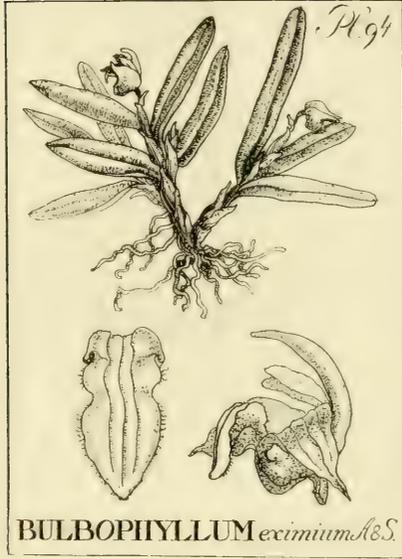


PLATE 95

ORCHIDACEÆ

PLATE 95: *Bulbophyllum lanceolatum*

Plant, drawn natural size. 1, petal enlarged.
2, labellum enlarged, side view. 3, labellum enlarged, spread out.



BULBOPHYLLUM *lanceolatum* A. & S.

PLATE 96

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PLATE 96: *Malleola kinabaluensis*

Plant, drawn natural size. Labellum enlarged,
showing saccate spur and the three lobes.

MALLEOLA *kinabaluensis* A&S.

Pl. 96



PLATE 97

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PLATE 97: *Sarcanthus Merrillianus*
Plant, drawn natural size.

SARCANTHUS *Merrillianus* Ames



Pl. 97

NOTES ON PHILIPPINE ORCHIDS

NOTES ON PHILIPPINE ORCHIDS

WITH DESCRIPTION OF NEW SPECIES, VII

SINCE the publication of my enumeration of the genera and species of Philippine orchids in the fifth fascicle of the present work numerous collections have been received, both from the Bureau of Science and from private collectors, that have contained new or noteworthy species. Although it has been impossible on account of the war to make a detailed study of the material that has accumulated, I have set aside from time to time, specimens that seem to be obviously new to the Philippine flora. Such of these as proved to be undescribed or worthy of attention are included in the following list.

It has become apparent that numerous genera of Philippine orchids need to be thoroughly reworked if we are to profit from the material that has been referred, often tentatively, to various species that were originally described from a limited number of specimens or from a single plant. This is true especially of *Bulbophyllum*, *Dendrobium*, *Dendrochilum*, *Eria*, *Liparis* and *Malaxis*. In these genera there are many species that may be too laxly defined or too closely circumscribed. Critical work in the field may be necessary, together with a careful study of Malayan types, to solve some of the problems suggested by *Malaxis*. This genus constitutes a very puzzling group which, when studied from herbarium material, presents an exasperating number of perplexities. *Dendrochilum* needs to be examined very thoroughly from the point of view of distribution. It would seem that many species of the section *Acoridium* are localized or restricted in their range to the higher altitudes of isolated mountains. Here we have an opportunity for investigations that may conclusively prove that

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many species of *Dendrochilum* are characterized by a remarkable tendency toward montane endemism. Of course it is quite probable that the apparent isolation of *Dendrochilum irigense* Ames on Mount Iriga, of *D. ocellatum* Pfitz. on Mount Data and of *D. sphacelatum* Pfitz. on Mount Santo Tomas, to mention only a few of many examples, may be the result of incomplete knowledge of their actual distribution. If it were not for the repeated discovery of some of these species in their original stations, and for their absence from collections made elsewhere, the suggestion that deductions as to restricted distribution are premature at this time might be seriously entertained. At least until there is evidence to the contrary, it will be well to act on the hypothesis that the alpine species of *Dendrochilum* are often endemic on isolated mountains.

Although the evidence obtained from an examination of recent collections indicates that we have made substantial progress toward a comprehensive survey of the Philippine orchid flora, it is highly probable that unexplored and lightly touched regions, especially the mountainous regions of Mindanao and Mindoro, will bring to light many new species. It is very desirable that Mount Halcon should be ascended again for botanical purposes. Some of the species obtained on this mountain by Merrill in 1906 have not since appeared in collections from other sources, and many of them are represented in herbaria by very scanty material. Mount Data would seem to have an exceptionally interesting orchid flora, and an effort to assemble it would be distinctly worth while. Some of the species described from specimens collected on Mount Data should again be sought for. I have in mind especially *Dendrochilum oliganthum* Pfitz. and *D. ocellatum* Pfitz., two very remarkable species that are poorly represented by the material obtained in 1905 by Merrill. Even though the

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botanical activities of the Bureau of Science and of private collectors have been pretty constant during the last fifteen years, there are numerous orchids that are represented in herbaria by the specimens of a single collection. This is in part accounted for by the tendency of orchids to occur sporadically, but is largely due to the fact that there are regions in which botanical exploration has been limited to a single effort or to a cursory examination.

From time to time the relationship of the Philippine flora to that of the other Malayan islands has been discussed. In the fifth fascicle of this work I referred to the subject very briefly and indicated that the alliance between the orchid floras of the Philippines, Celebes and Java was somewhat close. Recently I have had an opportunity to study the Bornean collections of Chaplain Joseph Clemens. Although these were confined to Mount Kinabalu in British North Borneo, they tend to show that the relationship between the orchid flora of the Philippines and that of Borneo is not so close as geographical considerations would seem to indicate. In my studies I was deeply impressed by the absence of species from the Bornean collections that are common to the higher altitudes of the Philippines. Under *Dendrochilum* in the enumeration of the orchids of Mount Kinabalu I have discussed this point at some length, and the remarks made therein are applicable in general to the other Bornean orchid genera.

Until we know more about the floras of Borneo and Sumatra it will be impossible to arrive at satisfactory conclusions regarding the distribution of orchids in the Malayan tropics. It is becoming clear that endemism is more pronounced than we had believed, and that many of those species now supposed to extend over a wide range may prove to be made up of several different species, each one restricted to a well-defined area. Of course there are dominant species, such for example, as *Spiranthes sinensis* (Pers.)

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Ames and *Eulophia squalida* Lindl. that extend over a wide range, but the majority of orchids, if conclusions based on present knowledge are to be relied on, are held within comparatively small geographical areas and are restrained in their distribution by influences of which we have little or no understanding. This lesson is easily learned from a study of those Philippine species that seem to be localized on an island or within a province.

In the following list the genera are arranged, with a few exceptions, in the sequence adopted in the fifth fascicle of Orchidaceae. This arrangement follows closely the system proposed by Engler and Prantl.

HABENARIA Willd.

Habenaria malintana (Blanco) Merrill Sp. Blancoanae (1918) 112. *Thelymitra malintana* Blanco Flora de Filipinas (1837) 642. *Habenaria pelorioides* Par. & Reichb. f. in Trans. Linn. Soc. 30 (1874) 135, 139, t. 27, f. A, 1-3. *Habenaria trinervis* Naves Novis. App. (1880) 250 non Wight.

If Professor Elmer D. Merrill's conclusions are adopted, the synonymy given above would seem to be correct for the Philippine plant that has been referred to *Habenaria pelorioides* Par. & Reichb. f. in my previous lists of Philippine orchids. Merrill, with exceptional opportunities for exactitude and finality, has given concentrated attention to the task of clarifying obscure species described by Blanco, so that his conclusions must be regarded as authoritative. Aside from the very rambling description published in Flora de Filipinas, there are references that, once the clue to the species is given, seem to leave little, if any, room for doubt as to the plant Blanco wished to characterize. In the Novissima Appendix Naves referred *Thelymitra malintana* to the synonymy of *Habenaria trinervia* Wight, but on

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what assumption I do not know. In the Philippines *Habenaria malintana* appears to be common in Luzon.

VANILLA *Juss.*

Vanilla calopogon *Reichb. f.* *Otia Bot. Hamb. Fasc. 1* (1878) 40.

This appears to be a very rare species. Among the collections examined I have seen only three sets of specimens. *Vanilla calopogon* *Reichb. f.* is readily distinguished from *V. ovalis* *Blanco*, the only other species of the genus heretofore reported from the Philippine Islands, by its leafless stems and white flowers. Up to the present time this species has been found only in Luzon. The following collection is worthy of a record.

Luzon, Ilicos Norte Province, Burgos, *M. Ramos Bur. Sci. 32928*, July 20, 1918. In dry thickets. Flowers white.

LECANORCHIS *Bl.*

Lecanorchis javanica *Bl.* *Mus. Bot. Lugd.-Bat. 2* (1856) 188. *L. triloba* *J. J. Sm.* in *Bull. Dépt. Agric. Ind. Néerl. 19* (1908) 26.

In Fascicle V of this work, I adopted for this species the name proposed by J. J. Smith in *Bull. Dépt. Agric. Ind. Néerl.* Smith is now of the opinion that *L. triloba* should be added to the synonymy of *L. javanica* *Bl.*, on the assumption that Blume must have described his species from a peloric form in which the labelum was entire instead of being normal and three-lobed. The type of *L. javanica* at Leiden is in poor condition and insufficient to establish beyond doubt that Smith is correct. Smith has examined material from western Java that is characterized by a three-lobed lip, and his studies have convinced him that *L. triloba* is not a distinct species, but simply the normal state of *L. javanica*.

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PHILIPPINAEA *Schltr. & Ames gen. nov.*

Sepala lateralia lanceolata, extus glanduloso-pubescentia, saccum labelli occludentia. Sepalum dorsale petalis adhaerens, extus glanduloso-pubescentia, concavum. Petala membranacea, oblongo-lanceolata, sepalum dorsale aequantia. Labellum gynostemio adnatum, basi saccato-gibbosa; saccus scrotiformis, intus utrinque squamis clavatis ornatus; lamina labelli in partes duas divisa, pars basalis orbicularis antice pectinato-dentata, pars apicalis unguiculata, dilatata, obtuse triangularis. Discus labelli bicarinatus. Gynostemium valde elongatum, sepalum dorsale aequans; stigma indivisum; rostellum profunde bifidum, divisionibus inaequaliter bilobatis, lobis exterioribus obtusis, lobis interioribus elongatis, lineari-triangularibus, acutis. Clinandrium tubulare. Anthera elongata, navicularis. Pollinia sectilia, sessilia in disco rostellii. Ovarium glanduloso-pubescentia. Herba terrestris, succulenta, caulescens, inferne repens; foliis alternis, congestis, in petiolum latum vaginantem angustatis; scapo laxo vaginato, elongato; floribus in racemo elongato dispositis.

Philippinaea Wenzelii (*Ames*) *Schltr. & Ames comb. nov.*
Adenostylis Wenzelii *Ames* *Orchidaceae* 5 (1915) 41.

The genus *Philippinaea* differs from *Adenostylis* in the details of the gynostemium and labellum. From the African members of *Platylepis* it is separable generically by the lip characters, although in the elongated column and in the rostellar divisions it shows close relationship with *Platylepis* through *P. goodyeroides* *A. Rich.*

Philippinaea is endemic in the Philippines. It is monotypic and from evidence based on collections is only known from Leyte, Mindanao and Luzon. The material on which the genus is founded was originally referred to *Adenostylis* and published in Fascicle V of *Orchidaceae* as *A. Wenzelii*. Before publication I invited the

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opinion of Dr. Rudolf Schlechter as to its generic characters. He agreed with me that the species was new and probably referable to the section *Monochilus* of *Adenostylis*. Later Dr. Schlechter revised his opinion and we agreed that a new genus should be recognized to receive the Philippine species. Further studies indicated relationship to the genus *Platylepis* which has representatives in Africa, Mascarene Islands, New Guinea, etc. It would seem to indicate affinity to *Platylepis* through Papuan and Pacific types of which the relationship to African species of *Platylepis* is not yet wholly clear.

Present records prove that *Philippinaea* is the only endemic orchid genus of the Philippine Islands. If it should remain so, it would be within reason to assume that the majority of the orchid species of the Philippines have originated in the archipelago and that their phylogeny may be traced to the species of Celebes, Java, Borneo and Sumatra. (PLATE 100.)

LEYTE, Dagami, *C. A. Wenzel 0210* (Type), July 21, 1913. 60 meters altitude. Flowers white; Ormoc, *Wenzel 0119*, April 28, 1913. Terrestrial in forest. 200 meters altitude. Flowers white; Jaro, *Wenzel 0510*, July 25, 1914. 500 meters altitude. Terrestrial in forest. Sepals and petals green, labellum white and pink. MINDANAO, Province of Agusan, Mount Urdaneta, *A. D. E. Elmer 13884*, September 1912. Erect, succulent, terrestrial herb in good soil of deep humus in forest, along the side of the Catangan Creek, at 3000 feet altitude. LUZON, Province of Sorsogón, Mount Balusan, *Elmer 16668*, July 1916.

COELOGYNE *Lindl.*

Coelogyne Loheri Rolfe in Kew Bull. (1908) 414.

The labellum of this species was originally described as five-carinate. I find that the number of carinae is variable. In material that I have referred to this species, three carinae seem to constitute the average. A specimen in the United States National Herbarium, *Loher 549*, that I regard as a duplicate type of *C. Loheri*, has a tricarinate labellum. In comparison with its Philippine allies,

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the narrow leaves constitute the most conspicuous differentiating character in the recognition of this species.

Luzon, Bontoc Subprovince, *Father M. Vanoverbergh 1197*, March–May 1911; *Vanoverbergh 2867*, April 4, 1913. 1700 meters altitude; *Vanoverbergh 3906*, June–July 1914. 1700 meters altitude. Flowers white and yellowish-brown; *Vanoverbergh 4041*, 1916.

Coelogyne quinquelamellata *Ames sp. nov.* Radices fibratae, ramosae; pseudobulbi diphylli, 4–9 cm. longi, anguste pyriformes vel ampullacei, subtetragoni, prope basim ± 1.5 cm. in crassitudine, valde rugosi, juniores vaginis coriaceis acutis tecti. Vaginae distichae, in sicco rigidae, ± 5 cm. longae. Folia 10–30 cm. longa, 1.5–4.5 cm. lata, oblongo-elliptica, utrinque attenuata, acuta, valde coriacea, in sicco nervosa, erecta, scapo longiora, breviter petiolata. Scapus erectus, rigidus, ± 3 dm. longus, initio foliis juvenilibus synanthus, versus antheseos finem hysternanthus, folia demum superans, basi nudus, multiflorus, compressus. Flores rubri, succedanei. Rachis flexuosa. Bractee inflorescentiae elongatae, 2.5 cm. longae, glumaceae, lanceolatae, acutae, ovaria pedicellata superantes, cum floribus deciduae, super flores arcissime imbricatae. Sepala lateralalia 11 mm. longa, ± 4 mm. lata, lanceolata, acuta. Sepalum dorsale 12 mm. longum, circa 7 mm. latum, ovato-lanceolatum, acutum, valde concavum, suberectum. Petala linearia, 9 mm. longa, 1 mm. lata, prope apicem attenuata. Labellum simplex, 7 mm. longum, circa 1 cm. latum, transverse ellipticum, minute apiculatum, prope basim lamellis quinque, obtuse triangularibus, erectis, 1–2 mm. longis, abbreviatis praeditum. Gynostemium arcuatum, apice late alatum.

This very distinct species belongs to the section Longifoliae. It is at once distinguishable from all other members of the genus, heretofore reported from the Philippine Islands, by means of the five abbreviated lamellae at the base of the labellum. In

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general habit the plant resembles *Coelogyne longifolia* Lindl. Wenzel describes the flowers as red in all specimens except the one collected on August 30, 1917. In this specimen the sepals and petals are orange, while the labellum is orange and white.

MINDANAO, Surigao Province, *C. A. Wenzel 01206* (Type), September 22, 1917. Epiphyte in forest. 150 meters altitude. Flowers red; *Wenzel 01175*, August 23, 1917; *Wenzel 01179*, August 20, 1917; *Wenzel 01182*, August 30, 1917.

DENDROCHILUM *Bl.*

Dendrochilum (§ *Acoridium*) *binuangense* *Ames sp. nov.*
Radices fibratae. Pseudobulbi ± 1 cm. longi, semifusiformes, in sicco plurisulcati, monophylli, juniores vaginis inclusi. Folium 4–8 cm. longum, 6–11 mm. latum, anguste oblongo-ellipticum, utrinque attenuatum, obtusum, coriaceum, in sicco prominenter trinervium, nervis lateralibus submarginatis. Petiolus abbreviatus. Pedunculus cum racemo ± 1 dm. longus, folio multo longior, infra inflorescentiam bracteis infundibuliformibus ornatus. Racemus ± 8 cm. longus, gracilis, elongatus, arcuatus, multiflorus. Flores distichi, albidii, circa 1 mm. distantes. Bractee inflorescentiae circa 4 mm. longae, glumaceae, semiovatae, acuminatae, valde acutae, ovaria pedicellata superantes. Sepala lateralialia 3.75–4 mm. longa, circa 1 mm. lata, oblongo-lanceolata, acuminata, valde acuta, uninervia. Sepalum dorsale circa 4 mm. longum, 1 mm. latum, anguste oblongo-lanceolatum, acuminatum, acutum, uninervium. Petala 3 mm. longa, anguste oblongo-lanceolata, acuta, uninervia. Labellum minutum, trilobatum, lobis lateralibus columnam excedentibus; lobi laterales vix 1 mm. longi, circa 1 mm. lati ad apicem, subcuneati, truncato-obtusi, lobum medium multo excedentes; lobus medius tridentatus, carnosus, vix .5 mm. longus, dentibus triangularibus subaequalibus; discus valde concavus, callo minuto lineari ornatus. Calli

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duo, complanati, unus prope basim lobi lateralis utriusque. Columna minuta, rostellum prominens.

Dendrochilum binuangense at first glance resembles *D. microchilum* (Schltr.) Ames so closely that it might readily be mistaken for it. The floral bracts are acuminate and end in a sharp triangular point, and the lateral lobes of the labellum are conspicuously longer than the middle lobe, exceeding the column when erect. In *D. microchilum*, on the other hand, the floral bracts are obtuse and the lateral lobes of the labellum are not much longer than the middle lobe.

Luzon, Province of Tayabas, Mount Binuang, *Ramos & Edaño Bur. Sci.* 28620, May 27, 1917. 500 meters altitude. Found on the summit of the mountain on a tree. Flowers white.

Dendrochilum (§ *Acoridium*) *cinnabarinum* *Pfitz.* in *Engl. Pflanzenreich* IV, 50. II. B. 7 (1907) 104.

This very distinct species, of which a detailed account was given in *Orchidaceae* 3 (1908) 10, t. 27, was originally reported from Benguet Province, Luzon, without precise data. Since its discovery by A. Loher it has been collected several times, but always on Mount Pulog, and would seem to be restricted in its distribution.

Luzon, Benguet Province, Mount Pulog, *Elmer D. Merrill* 6475, May 1909. In mossy forest. 7500 feet altitude; *R. C. McGregor Bur. Sci.* 8844, July 1909; *Curran, Merritt & Zschokke For. Bur.* 16348, January 1909. In hard wood forest on tree. 8800 feet altitude. Flowers coral red; *George Boettcher*, June 1918. Flowers blood red.

Dendrochilum (§ *Platyclinis*) *ecallosum* *Ames sp. nov.* Radices fibratae, elongatae. Pseudobulbi caespitosi, 12–20 mm. longi, pyriformes, in sicco valde rugosi, longitudinaliter sulcati, flavescens, usque ad apicem attenuati, monophylli. Folium petiolatum, cum petiolo 6–10 cm. longum, 1.3–2 cm. latum, oblongo-ellipticum, subacutum, in sicco nervosum, nervo marginali

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utrinque addito, coriaceum, in petiolum subito contractum. Petiolus ± 1.5 cm. longus, superne sulcatus. Pedunculus cum racemo folio fere explanato synanthus eoque fere duplo longior, nutans, gracilis, 1.5–2 dm. longus. Racemus 7 cm. longus, subdensiflorus. Bracteae inflorescentiae 3 mm. longae, glumaceae, convolutae, ovaria pedicellata superantes, subacutae. Flores distichi, 2 mm. distantes in racemo, in sicco flavescens. Pedicellus cum ovario 2 mm. longus. Sepala lateralia 3.5 mm. longa, 1 mm. lata, oblongo-lanceolata, acuta, trinervia, subpatentia. Sepalum dorsale 3.5 mm. longum, 1.5 mm. latum, oblongo-lanceolatum, acutum, trinervium. Petala circa 3 mm. longa, 1 mm. lata, oblongo-elliptica, acuta, trinervia. Labellum circa 3 mm. longum, super medium 1.5 mm. latum, oblanceolatum, acutum, trinervium, ecallosum. Columna crassa, 1 mm. longa, columnae *Dendrochili bicallosi* similis, lacinia utraque reducta in dentem truncatum alae terminali adsistentem, cujus illa pars fieri videtur; ala terminalis truncata, denticulata.

Dendrochilum ecallosum is very closely related to *D. propinquum* Ames, but differs from it in the much smaller dimensions of all its parts. The ecallose labellum and marginate leaves serve to distinguish it from *D. bicallosum* Ames.

CATANDUANES ISLAND, Mount Mariquidon, *M. Ramos Bur. Sci. 30240*, November 30, 1917. 140 meters altitude. On tree in forest. Flowers salmon colored.

Dendrochilum (§ *Acoridium*) **Loheri** *Ames* *Orchidaceae* 3 (1908) 12, t. 27.

This rare species which is represented by material recently collected on Mount Santo Tomas by Boettcher was originally found in Benguet Province, Luzon, by A. Loher and distributed without being localized. On the evidence of herbarium material it would seem to be confined to Mount Santo Tomas and Mount Pulog.

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Luzon, Benguet Province, Mount Pulog, *Elmer D. Merrill 6476*, May 1909; Mount Santo Tomas, *George Boettcher*, May 1918. Flowers rose colored.

Dendrochilum (§ *Platyclinis*) ***niveum*** *Ames sp. nov.* Radices validae, glabrae. Pseudobulbi caespitosi, statu juvenili vaginis tubulatis tecti. Vaginae usque ad 4 cm. longae, obtusae. Folium ligulatum, circa 1 dm. longum, 2 cm. latum, utrinque attenuatum, in sicco nervosum, nervo medio subtus magis prominenti. Pedunculus cum racemo 21 cm. longus, gracilis, infra inflorescentiam bractea singula ornatus. Racemus gracilis, 12 cm. longus, laxiflorus. Bracteae inflorescentiae glumaceae, ± 3.5 mm. longae, convolutae, ovaria pedicellata superantes. Pedicellus cum ovario circa 3 mm. longus. Flores distichi, nivei, circa 3 mm. distantes. Sepala lateralia 5–6 mm. longa, circa 1.5 mm. lata infra medium, triangulari-lanceolata, acuminata, valde acuta, trinervia. Sepalum dorsale 5–6 mm. longum, vix 2 mm. latum, anguste oblongo-lanceolatum, acuminatum, acutum, trinervium. Petala 5 mm. longa, circa 1 mm. lata, oblongo-lanceolata, minutissime denticulata, acuminata, valde acuta, trinervia. Labellum usque ad 3 mm. longum, trilobatum, callo parvo in nervo utroque paulo infra medium; lobi laterales tertiam partem labelli aequantes, rotundati, obtusi, minutissime denticulati; lobus medius suborbicularis, 2 mm. longus, vix 2 mm. latus, subito acutus vel obtusus. Columna circa 2 mm. longa; stelidia lateralia prope medium columnae exserta, longe lineari-triangularia, acuta, ala apicalem haud aequantia; ala terminalis variabilis, minutissime lobulata vel retusa.

The nearest affinity of *Dendrochilum niveum* appears to be *D. filiforme* Lindl., which has smaller flowers in denser racemes and a very different labellum. The type consists of a single plant in which the pseudobulb is immature and still clothed by the

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elongated tubular sheath that conceals the petiole of the leaf and the base of the peduncle.

LUZON, Kalinga Province, *George Boettcher*, March 19, 1918. 1000 meters altitude. Flowers white.

Dendrochilum (§ *Platyclinis*) ***propinquum*** *Ames sp. nov.* Radices fibratae, elongatae. Rhizoma repens. Pseudobulbi 2.5–3.3 cm. longi, anguste pyriformes, approximati, superne attenuati, monophylli, juniores vaginis tubulatis acutis pseudobulbum superantibus inclusi, in sicco valde rugosi. Folium petiolatum, 17–20 cm. longum, circa 3 cm. latum, oblongo-lanceolatum, utrinque attenuatum, nervosum, subacutum, nervo marginali utrinque addito, medio subtus multo magis prominenti, lamina folii coriacea. Petiolus sulcatus. Pedunculus folio fere explanato synanthus eoque fere duplo longior, nutans, subdensiflorus. Racemus gracilis, 12–16 cm. longus. Bractea inflorescentiae circa 5 mm. longae, convolutae, glumaceae, ovaria pedicellata superantes, obtusae, persistentes. Flores distichi, flavidi. Sepala lateralibus 4.5–5 mm. longa, 2 mm. lata, ovato-lanceolata, subacuta, trinervia, ecarinata, nervo medio solo subtus prominenti. Sepalum dorsale 5 mm. longum, oblongum, obtusum, trinervium. Petala 4 mm. longa, 2.5 mm. lata, cuneato-ovata, obtusa, trinervia. Labellum simile, simplex, 4 mm. longum, 2.5 mm. latum, breviter unguiculatum, prope basim incrassatum, ad apicem subacutum; discus ecallosus, trinervius, nervis incrassatis. Columna crassa, 1.75 mm. longa, columnae *Dendrochili bicallosi* similis, lacinia utraque reducta in dentem obtusum alae terminali adsistentem, cujus illa pars fieri videtur; ala terminalis paucidentata.

Dendrochilum propinquum is a near ally of *D. bicallosum* Ames. From this species it differs conspicuously in the ecallose lip which is similar to the petals.

The structure of the column brings *D. propinquum* into that

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small group of Philippine *Dendrochilum* species which appears to be transitional between § *Platyclinis* and § *Acoridium*. The lateral arms or stelidia are apical, but have the aspect of being lobes of the terminal wing.

The flowers are reddish-brown in dried specimens. The collector's notes describe them as having been yellow in living plants.

In fruiting specimens, surely referable to this species, the mature capsules are spherical and about 8 mm. in diameter.

The prominent marginal veins of the leaf are a conspicuous differentiating character between this species and *D. bicallosum*.

LEYTE, Jaro, C. A. *Wenzel 0805* (Type), December 27, 1914. Epiphyte in forest. 700 meters altitude. Flowers yellow; *Wenzel 0809*, December 27, 1914. Epiphyte in forest. 700 meters altitude. Flowers yellow.

***Dendrochilum* (§ *Acoridium*) *purpureum* Ames sp. nov.** Radices fibratae, validae, elongatae. Pseudobulbi ± 2 cm. longi, anguste pyriformes, in sicco rugosi, longitudinaliter et irregulariter sulcati, statu juvenili vaginis arcte adpressis vestiti, monophylli. Bracteae vel vaginae longe tubulatae, usque ad 7 cm. longae, in sicco brunneae, petiolum folii ocludentes. Folium cum petiolo ± 1.5 dm. longum, 1–2 cm. latum, ligulatum, utrinque attenuatum, acutum, in sicco prominenter quinquenervium. Pedunculus cum racemo usque ad 2.5 dm. longus, gracilis, folio longior, infra inflorescentiam bracteis sterilibus imbricatis vestitus. Racemus ± 8 cm. longus. Flores purpurei, distichi, in racemo subdenso dispositi, circa 2 mm. distantes, valde carnosi. Bracteae inflorescentiae circa 2 mm. longae, glumaceae, ovaria pedicellata superantes, obtusae. Pedicellus cum ovario vix 2 mm. longus. Sepala petalaeque valde carnosae. Sepala lateralia circa 4 mm. longa, 2 mm. lata, lanceolata, acuta, trinervia. Sepalum dorsale 5 mm. longum, 2 mm. latum, anguste oblongo-ellipticum, acutum, trinervium.

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Petala circa 4 mm. longa, 3 mm. lata, cuneato-ovata vel sagittata, variabilia, acuminata, acuta, trinervia. Labellum simplex, integrum, valde carnosum, 2 mm. longum, 1 mm. latum, trulliforme, obtusum, sessile, subcordatum, prope basim in foveam excavatum, ecallosum. Gynostemium breve.

In general aspect this species resembles *Dendrochilum philippinense* Pfitz., but is distinguishable from it by the simple trowel-shaped labellum. When immature the pseudobulbs are concealed by tubular bracts the lowermost of which are much reduced. The uppermost bract conceals the petiole of the leaf and the base of the peduncle. As the plants mature these bracts gradually disintegrate and are finally represented only by fibrous remains.

Luzon, Apayo Province, Mount Pasoan, *George Boettcher*, January 1, 1918. 2000 meters altitude. Flowers purple.

Dendrochilum (§ *Acoridium*) *sphacelatum* (*Ames*) *Pfitz.* in Engl. Pflanzenreich IV, 50. II. B. 7 (1907) 112.

The absence of this species from the wealth of material received from the Philippines since 1905 had led me to believe that it represented, perhaps, an aberrant form of the more common and widely distributed *D. tenellum* Ames. Very recently George Boettcher visited the type station and secured an abundance of specimens that correspond in detail with the type. A re-examination of the material in my herbarium substantiates the conclusions presented in *Orchidaceae* 1 (1905) 2, t. 1. *D. sphacelatum* in its distribution confirms my belief that those species of *Dendrochilum* that are alpestrine in their requirements are very often confined to particular mountains or mountain ranges. This is a subject on which the attention of collectors should be concentrated.

Luzon, Benguet Province, Mount Santo Tomas, *George Boettcher*, May 1918.

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MALAXIS *Soland.* ex Sw.

Malaxis cuneipetala *Ames sp. nov.* Radices fibratae. Caules abbreviati, ± 3 cm. alti, vaginis foliorum obtecti. Folia conferta, petiolata; lamina ± 1 dm. longa, usque ad 4.5 cm. lata, lanceolata vel ovato-lanceolata, acuminata, acuta, chartacea, prominenter septemnervia. Petiolus late sulcatus, ± 6 cm. longus, circa 6 mm. latus, ad basim imbricatus. Pedunculus gracilis, elongatus, cum racemo usque ad 2 dm. longus, multiflorus. Flores aurantiaci, succedanei, in racemo subdenso dispositi. Bractee inflorescentiae demum dependentes, 3–10 mm. longae, in sicco chartaceae, lineari-lanceolatae, valde acutae. Pedicellus cum ovario circa 5 mm. longus. Sepala lateralalia 4 mm. longa, 3 mm. lata, orbicularia, valde obtusa. Sepalum dorsale 5 mm. longum, 2.5 mm. latum, oblongum, obtusum, trinervium, prope basim sensim attenuatum. Petala cuneiformia, usque ad 4.5 mm. longa, 3.5–4 mm. lata, ad basim valde attenuata, unguiculata. Labellum cum auriculis circa 4.5 mm. longum, 2.5 mm. latum, ambitu ellipticum, antice utrinque unilobulatum, lobo intermedio semirobundato, bifido, .75 mm. longo, 1 mm. lato, auriculis 1.75 mm. longis, circa 1 mm. latis, falcatis, obtusis, convergentibus. Gynostemium breve.

Malaxis cuneipetala is remarkable because of its extraordinarily wide cuneiform or cuneate-rhombic petals which are wider than the sepals. The front part of the labellum is trilobed at the tip, the lateral lobes or rather lobules being much shorter and narrower than the bifid middle lobe.

LEYTE, C. A. *Wenzel 0724*, November 24, 1914. Terrestrial in forest. 800 meters altitude. Flowers orange.

Malaxis negrosiana *Ames* in *Elmer Leaf. Phil. Bot.* 5 (1912) 1561.

Several specimens from Leyte referable to this species exhibit

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slight differences from the type. The stems are shorter, about 2 cm. in length, tumid at the base. The plants are much smaller with the lanceolate leaves 1 dm. long, 1.5–3 cm. wide, prominently five-nerved. The peduncle including the raceme is about 1 dm. long. The auricles of the labellum are 1 mm. long.

LEYTE, C. A. *Wenzel 0641*, November 12, 1914. Epiphyte. Flowers lilac. 600 meters altitude.

Malaxis propinqua *Ames sp. nov.* Herba parvula, terrestris, 8–15 cm. alta cum racemo, di- vel trifoliata. Caulis aliquid crassus, 2–3 cm. longus, ad basim tumidus vel bulbosus, bracteis tubulatis scariosis vestitus. Folia succulenta, conferta, inaequalia, 1.5–4 cm. longa, 7–33 mm. lata, lanceolata et valde ovata, subacuta, subcordata, amplexicaulia, conspicue quinque- ad septemnervia in sicco. Scapus cum racemo 5.5–12 cm. longus, longitudinaliter sulcatus, infra racemum paucibracteatus. Bractee inflorescentiae ± 3 mm. longae, anguste lanceolatae, acuminatae, in sicco scariosae, dependentes. Racemus 2–7 cm. longus. Pedicellus cum ovario circa 1 mm. longus, bracteis multo brevior. Sepala lateralalia 2.5 mm. longa, elliptica, obtusa. Sepalum dorsale circa 3 mm. longum, ellipticum, obtusum. Petala linearia, ± 3 mm. longa. Labellum crassum, 5 mm. longum, obscure trilobulatum infra columnam, subpanduriformi-sagittatum, apice profunde bifido, basi auriculata; auriculae falcatae, subacutae, circa 1 mm. longae. Callus in disco crescentiformis. Columna generis.

The nearest ally of *Malaxis propinqua* seems to be *M. Mackinnonii* (*Duthie*) *Ames comb. nov.* (*Microstylis Mackinnonii* *Duthie* in *Journ. As. Soc. Beng.* 71, pt. 2 (1902) 37). In general aspect there is a striking similarity between these two species, although *M. propinqua* appears to be normally smaller in its vegetative parts. The callus on the disc of the labellum in *M. propinqua* is a raised fleshy rim which divides the blade into basal and

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apical parts. This fleshy rim crosses the disc in a circular line at the point where the margin is indented to give the subpan-duriform aspect described above. The labellum of *M. Mackin-nonii*, as it appears in specimens of the type number preserved in my herbarium, is more strongly trilobed in front of the column than the labellum of *M. propinqua*. This trilobed condition is clearly shown in the analytical drawings on plate 95 of Du-thie's Orchids of the Northwestern Himalayas (Ann. Roy. Bot. Gard. Calc. 9, pt. 2 (1906)). From the tips of the falcate basal lobes of the labellum to the tips of the terminal lobules *M. Mac-kinnonii*, in specimens before me, measures 4 mm. in length. The labellum of *M. propinqua* measured similarly is 5 mm. long. From the material I have examined, *M. Mackinnonii*, while it sometimes bears three leaves, is usually bifoliate. All of the specimens in my herbarium, in fact, are bifoliate. *M. propinqua*, on the other hand, usually has a well-developed third leaf, and from the material examined would seem to be rarely bifoliate. These differences coupled with the widely separated habitats of the specimens may be taken as safe guides to specific differen-tiation.

Luzon, Bontoc Subprovince, *Vanoverbergh 3916*, July 19, 1914. On hills. 1200 meters altitude. Flowers pinkish violet.

Malaxis Taylorii *Ames sp. nov.* Aff. *M. Wenzelio*. Caules 4.5 cm. longi, vaginis foliorum tecti, quadrifoliati. Folia cum petiolo usque ad 1.5 dm. longa, ± 4 cm. lata, in sicco prominenter quinquenervia, chartacea, ovato-lanceolata, acuminata, valde acuta. Petioli usque ad 6 cm. longi, canaliculati. Pedunculus 2.8 cm. longus, gracilis, multiflorus. Flores subdensi, in racemo elongato ± 1.5 dm. longo dispositi. Bractee inflorescentiae line-ares, usque ad 7 mm. longae. Pedicelli graciles, cum ovario 5 mm. longi. Sepala lateralia 4.5–5 mm. longa, ± 2 mm. lata, oblique

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ovalia, obtusa, trinervia. Sepalum dorsale 5 mm. longum, circa 2 mm. latum, valde convexum, oblongo-ellipticum, obtusum. Petala 5 mm. longa, linearia, uninervia. Labellum cum auriculis 7 mm. longum, 4 mm. latum, antice utrinque in dentes duos fissum; lobus terminalis bifidus vel tridentatus dentibus lateralibus longioribus; auriculæ 3.5 mm. longae, acutae vel obtusae, triangulares, elongatae; fovea margine superiore leviter semi-lunato-incrassata. Gynostemium breve.

The type consists of a single plant preserved in the Herbarium of the Bureau of Science at Manila. The leaves may be more or less than four. The labellum indicates a wide range of variation in the shape, length and position of the teeth. The two lateral teeth on each side of the tridentate or simply bifid middle lobe are narrowly triangular in shape, about 1 mm. long. The middle lobe is variable, sometimes being deeply bifid. When it is tridentate the lateral teeth are much longer than the middle one. In the type the dried flowers are yellowish. The color of fresh flowers is not described in the collector's notes.

MINDANAO, Agusan Province, *E. H. Taylor*, April 10, 1913.

OBERONIA *Lindl.*

Oberonia leytensis *Ames sp. nov.* Herba tenella, epiphytica, caulibus circa 3 cm. longis, dense 6–8-foliatis, basibus foliorum omnino absconditis. Folia ensiformia, usque ad 3 cm. longa, 3–4 mm. lata a latere visa, incrassata, adscendentia, equitantia. Pedunculus cum racemo usque ad 7 cm. longus, valde arcuatus, gracilis, circa 4 mm. in diametro. Bracteae inflorescentiae pedicellis longiores, circa 1 mm. longae, triangulari-lanceolatae, acutae, irregulariter denticulatae vel crenulatae. Flores subverticillati, minuti, in racemo laxo dispositi, rubri (in sicco flavidi). Pedicelli glabri, 1 mm. longi. Sepala lateralia 1 mm. longa,

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ovata, acuta. Sepalum dorsale simile. Petala oblonga vel subspathulata, 1 mm. longa, valde obtusa. Labellum circa 1 mm. longum, ad basim auriculato-cordatum, ad apicem rotundatum bilobatum, prope medium leviter constrictum vel angustatum. Columna simplex.

In habit *Oberonia leytenis* suggests *O. brevifolia* Lindl. The sinus formed by the lobes of the lip is distinctly triangular. Five or more flowers make up the whorls of the arching or drooping raceme. *O. mindorensis* Ames has a very similar lip, but the habit of the plant is much more robust and the petals are linear. (PLATE 98.)

LEYTE, C. A. *Wenzel 0945*, June 4, 1915. Epiphyte at sea level.

Oberonia surigaensis Ames *sp. nov.* Planta *O. Wenzelii* habitu omnino congruens. Radices valde elongatae, fibratae. Caules abbreviati, ± 8 mm. longi, complanati. Folia usque ad 1.5 dm. longa, 7–10 mm. lata a latere visa, falcata, prope basim equitantia, quam inflorescentia longiora, super medium attenuata. Scapus cum racemo circa 1 dm. longus, pergracilis, densiflorus, floribus rubris. Racemus 9 cm. longus, 4 mm. in diametro. Flores verticillati, minuti. Rachis costatus, glaber. Bractee inflorescentiae minutae, paucidentatae, triangulares, acutae. Sepala lateralibus circa 1 mm. longa, triangulari-ovata, subacuta. Sepalum dorsale simile. Petala anguste oblonga, vix .5 mm. lata, prope apicem leviter dilatata et paucidentata. Labellum 1 mm. longum, circa 1 mm. latum prope basim, concavum, profunde retusum, ovatum, margine valde denticulatum, dentibus simplicibus vel bifurcatis. Columna generis.

Oberonia surigaensis is closely related to *O. Wenzelii* Ames, from which species it differs in part in the denticulation of the labellum. The teeth on the labellum of *O. Wenzelii* are confined to the margin of the basal half and are inconspicuously, if at all,

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bifurcated. In *O. surigaensis* the margin of the labellum is denticulate up to the deeply retuse tip, some of the teeth being conspicuously bifurcated. In dried specimens the labellum is pale orange, the sepals and petals nearly white.

MINDANAO, Surigao Province, *C. A. Wenzel 01159*, June 4, 1917. 150 meters altitude. Epiphyte in forest. Flowers red.

LIPARIS *L. C. Rich.*

Liparis jarensis *Ames sp. nov.* Aff. *L. Glossulæ* Reichb. f., sed in habitu satis dissimilis. Herba epiphytica. Rhizoma repens. Radices elongatae, patentés, albidæ. Folium 2.5–4.5 dm. longum, 2.3–5 cm. latum, in sicco prominenter nervosum, petiolatum; lamina oblongo-lanceolata, acuminata, acuta, in sicco chartacea, in petiolum elongatum sulcatum 4–6 cm. longum contracta. Scapus cum racemo usque ad 3 dm. longus, quam folium brevior, infra racemum paucibracteatus, bracteis acutis 3–4 cm. distantibus. Flores virides, in racemo laxo dispositi, bracteis subtendentibus anguste lanceolatis, circa 1 cm. longis, in sicco scariosis. Pedicelli graciles, elongati, cum ovario usque ad 17 mm. longi, vix adscendentes. Sepala lateralia 1 cm. longa, 2 mm. lata, anguste oblonga, acuta. Sepalum dorsale angustius, 11 mm. longum, 1.5 mm. latum, acutum. Petala linearia, 13 mm. longa, 1 mm. lata, uninervia. Labellum suborbiculare, 9 mm. longum, 7.5 mm. latum, apiculatum, denticulatum, basim versus cuneatum, prope basim columnæ callus late crescentiformis stat. Columna valde arcuata, super medium alata.

The flower indicates affinity with *Liparis Glossula* Reichb. f., but the leaves are much narrower than in that species. In several specimens examined the leaf and flower shoot arise from between two erect, rigid, ensiform foliaceous sheaths. By the time the leaf has reached its normal size the flowers produced on the subtending scape begin to expand.

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LEYTE, Jaro, *C. A. Wenzel 0799* (Type), December 1, 1914. Epiphyte in forest. 700 meters altitude. Flower green; *Wenzel 0813*, December 1, 1914. In forest. 700 meters altitude; *Wenzel 0708*, December 2, 1914. Epiphyte. 600 meters altitude. Flower flesh color.

Liparis monophylla *Ames sp. nov.* Herba epiphytica. Pseudobulbi approximati, 3–10 cm. longi, circa 1 cm. in diametro prope basim pseudobulborum, juniores vaginis foliaceis inclusi, complanati, monophylli. Folium subcoriaceum, variabile, 1.5–4.5 dm. longum, usque ad 7 cm. latum, prominenter nervosum, petiolatum; lamina elliptico-oblonga, acuta, utrinque attenuata, quam pedunculus longior. Petiolus latus, circa 3 cm. longus. Bractee inflorescentiae \pm 6 mm. longae, lineares, scariosae, acutae, in sicco albidae, pedicellum aequantes vel excedentes. Pedunculus infra racemum paucibracteatus, brevis, cum racemo 14–22 cm. longus. Flores mediocres, numerosi, in racemo denso cylindraceo spicato dispositi. Racemus \pm 1.5 dm. longus, circa 1 cm. in diametro, erectus, floribus approximatis. Sepala lateralia oblonga, 3.5 mm. longa, utrinque angustata, subacuta, trinervia. Sepalum dorsale simile. Petala 3.5 mm. longa, linearia, obtusa, uninervia. Labelum crassum, 3 mm. longum, 1.5 mm. latum prope medium, subquadratum, truncatum, obtuse apiculatum, parte basali gynostemio subparallela, parte apicali reflexa. Callus prope columnam in disco labelli, minutus. Gynostemium circa 2 mm. longum, arcuatum.

Liparis monophylla is similar in habit to *L. serrulata* Schltr. It is separable from *L. parviflora* Lindl. by the form of the labelum and by the monophyllous pseudobulbs.

In the material examined the flower shoot was without exception much shorter than the leaf, even in fruiting specimens.

LEYTE, Jaro, *C. A. Wenzel 0673*, November 7, 1914. Epiphyte in forest. Flowers flesh color.

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Liparis pallida *Lindl.* Gen. & Sp. Orch. (1830) 31; Miq. Fl. Ind. Bat. 3 (1859) 622; Ridl. in Journ. Linn. Soc. 22 (1886) 296. *Malaxis pallida* *Bl.* Bijdr. (1825) 391. *Leptorchis pallida* *O. K.* Rev. Gen. Pl. 2 (1891) 671.

LEYTE, Jaro, *C. A. Wenzel 0930*, January 30, 1915. In forest. 700 meters altitude. Flowers orange yellow; *Wenzel 0908*, March 1, 1915. In forest. 600 meters altitude; *Wenzel 0775*, November 28, 1914. In forest. 500 meters altitude. Sepals and petals brown, labellum green.

Liparis rizalensis *Ames sp. nov.* Pseudobulbi approximati, 3–4 cm. longi, lageniformes, complanati, in sicco valde rugosi, di- vel triphylli. Folia 6–15 cm. longa, ± 2.5 cm. lata, articulata, nervosa, coriacea, oblongo-oblongata, valde obtusa, quam inflorescentia breviora. Pedunculus terminalis, cum racemo usque ad 3 dm. longus, exalatus. Racemus usque ad 20 cm. longus, subclavatus, multiflorus, arcuatus, cylindraceus, 2 cm. in diametro. Flores ± 5 mm. distantes, in sicco flavescentes. Bracteae inflorescentiae scariosae, ± 6 mm. longae, oblongo-lanceolatae, acuminatae, acutae, pedicellis longiores. Sepala lateralalia 5 mm. longa, 1.75 mm. lata, anguste elliptica, obtusa, trinervia. Sepalum dorsale simile, valde convexum. Petala linearia, 5 mm. longa, .5 mm. lata, obtusa. Labellum 6 mm. longum, crassum, margine minute ciliolato; parte apicali usque ad medium bilobata, 3 mm. longa, 2.5 mm. lata, lobis irregulariter denticulatis; parte basali 3 mm. longa, canaliculata, incrassata, gynostemio subparallela, prope basim leviter bicarinata, cordata. Gynostemium incrassatum, prope medium constrictum, prope apicem utrinque alatum.

Liparis rizalensis is a near ally of *L. pallida* Lindl., *L. bicolor* J. J. Sm., and *L. latifolia* Lindl. The oblique carinate calli at the base of the lip in front of the column and the three-leaved pseudobulbs are distinguishing characters. It is a member of the large and perplexing section *Blepharoglossum*.

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LUZON, Rizal Province, *M. Ramos Bur. Sci.* 24070, December 14, 1915.
Epiphyte in river forest.

DENDROBIUM *Sw.*

Dendrobium (§ *Ceratobium*) *busuangense* *Ames sp. nov.*
Caules elongati, 2 m. alti vel altiores, ± 1 cm. in diametro, flavidi, foliosi. Folia ± 7.5 cm. longa, ± 4.5 cm. lata, elliptica, obtusa, valde coriacea, in sicco prominenter nervosa, inaequaliter bilobulata. Vaginae tubulatae, internodiis subaequilongae vel paulo breviores. Inflorescentiae laxae racemosae, plus minusve quindecim-florae, pedunculo tereti, ± 5 dm. longo, nonnullis vaginulis tubulatis donato, rachide circa 2 dm. longa. Bracteae inflorescentiae triangulares, acutae, 3 mm. longae. Pedicellus cum ovario gracilis, 4–5 cm. longus. Sepala lateralia 2.5 cm. longa, triangularia, obtusa, apiculata, cum pede gynostemii mentum 1 cm. longum acutum formantia. Sepalum dorsale 2.5 cm. longum, 8 mm. latum, oblongo-lanceolatum, obtusum, septemnervium. Petala 3.5–3.8 cm. longa, 5 mm. lata, erecta, torta, haud undulata, oblonga, obtusa. Labellum 3.2 cm. longum, trilobulatum, subtus canaliculato-concavum, supra tricostatum costa intermedia apice aliformi-elevata; lobi laterales semiovati, margine undulati et irregulariter denticulati; lobus medius ± 1 cm. longus, vix 1 cm. latus, oblongus, obtusus. Gynostemium bialatum. Clinandrium denticulatum.

Dendrobium busuangense is a near ally of *D. conanthum* Schltr. The general aspect and habit of the plant suggest *D. taurinum* Lindl., the only other representative of the section *Ceratobium* known to occur in the Philippine Islands, but it is easily distinguishable from that species by the very different labellum and by the color of the flowers. The sepals and mentum are very pale lavender-purple. The twisted petals and the labellum are green-

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ish, tinged with lavender-purple. The carinae of the labellum extend onto the middle lobe, the lateral ones terminating in minute rounded wart-like protuberances. Toward the base and middle of the labellum the lateral carinae are much higher than elsewhere. The middle carina is represented by a thickening of the mid-nerve until it reaches the mid-lobe on which it terminates in an erect plate nearly 4 mm. high. In this respect the general appearance of the middle carina recalls *D. conanthum*. (PLATE 101.)

CALAMIANES ISLANDS, Busuanga, *E. H. Taylor*, October 1918. Type from a plant cultivated at Manila. (The flowers last about two months.)

Dendrobium (§ *Rhopalanthè*) *polytrichum* *Ames* in *Phil. Journ. Sci.* 2 (1907) 328; *Orchidaceae* 2 (1908) 183.

The use of the stems of this species in decorative work in weaving recalls the similar use of *Dendrobium utile* *J. J. Sm.* in the Moluccas where the stems enter into the fabrication of small articles such as cigar pouches.

LUZON, MINDORO.

ERIA *Lindl.*

Eria mindanaensis *Ames* in *Elmer's Leaflets of Phil. Bot.* 5 (1912) 1577.

The original specimens of this species were secured by *A. D. E. Elmer* on Mount Giting-giting on the island of Sibuyan. Why the specific name *mindanaensis* was given to it I am unable to explain. The only material I have seen, aside from specimens recently received from Panay, is that which constitutes the type in my herbarium. I have not received any specimens from Mindanao that are referable to the Sibuyan plants. In June 1919 *A. Martelino* and *G. Edaño* collected on Mount Salibong-bong, Capiz Province, Panay, and among other orchids they se-

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cured excellent material of *E. mindanaensis*. While working on this material for the Bureau of Science Herbarium I discovered the error herein noted.

ISLAND OF PANAY, Capiz Province, Mount Salibongbong, *Martelino & Edaño Bur. Sci. 35633*, June 21, 1919. Summit of the mountain. 2000 feet altitude. Sepals and petals yellow, lip pink; Libacao, Capiz Province, *Martelino & Edaño Bur. Sci. 35379*, June 12, 1919. On tree at low altitude. Flowers white. Stems 1.5 dm. tall.

AGROSTOPHYLLUM *Bl.*

Agrostophyllum leytense *Ames sp. nov.* Herba gracilis. Caules elongati, vaginis foliorum obtecti, ± 2 dm. longi, valde complanati. Folia disticha, ± 2 cm. longa, ± 4 mm. lata, obcuneato-oblonga, bilobata, breviter mucronata. Vaginae foliorum caulem obtegentes, bicuspidatae, circa 7 mm. longae, longitudinaliter rugosae. Flores in capitulis sublaxis circa 1 cm. longis dispositi, albidi. Pedunculi abbreviati, vaginulis paucis imbricantibus obtecti. Bractee flores subtendentes glumaceae, oblongo-lanceolatae. Sepala lateralia circa 3.5 mm. longa, prope basim 2.5 mm. lata, late triangulari-ovata, acuta, mentum apertum formantia. Sepalum dorsale 3.5 mm. longum, oblongo-ovatum, valde concavum. Petala circa 3 mm. longa, subspathulata, acuta. Labellum circa 3.5 mm. longum, leviter saccatum vel valde concavum prope columnam, oblongo-ovatum, subacutum, ecallosum, marginibus involutis. Gynostemium breve, incrassatum.

Agrostophyllum leytense is allied to *A. celebicum* Schltr. and *A. stipulatum* Schltr.

LEYTE, Jaro, *C. A. Wenzel 0597* (Type), October 13, 1914. In forest. 700 meters altitude. Sepals and petals white. Lip yellowish; *Wenzel 0632*, November 10, 1914. Epiphyte in forest. 600 meters altitude; *Wenzel 0654*, November 14, 1914. Epiphyte in forest. 600 meters altitude.

SPATHOGLOTTIS *Bl.*

Spathoglottis Vanoverberghii *Ames sp. nov.* *S. tomentosa* *Ames* *Orch.* 2 (1908) 163, non Lindl. (as to specimens from Luzon). Pseudobulbi breviter cylindracei, circa 3 cm. longi, 2.5 cm. in diametro prope basim, valde rugosi, vaginis tecti. Folia (non visa) in anthesi absunt. Pedunculus ± 2 dm. altus, rigidus, erectus, superne minute tomentosus, infra racemum bracteis quattuor ± 15 mm. longis tubularibus oblique truncatis acutis. Bractee inflorescentiae ± 1 cm. longae, cymbiformes, late ovatae, dense pubescentes, pedicellis breviores. Flores succedanei, in racemo usque ad 18 cm. longo dispositi; rachis sub anthesi abbreviata. Pedicelli cum ovario graciles, pubescentes, 2–3 cm. longi. Sepala lateralia ± 2 cm. longa, 7–8 mm. lata, elliptico-lanceolata, acuta, pubescentia. Sepalum dorsale simile. Petala 2 cm. longa, 12–13 mm. lata, late ovata, obtusa. Labelum 1.3–1.4 cm. longum, trilobatum; lobi laterales 1–1.2 cm. longi, usque ad 6 mm. lati, oblongi, subdolabriformes; lobus medius 1.1 cm. longus, unguiculatus, prope basim bilobulatus lobulis pubescentibus, apice flabellatus, retusus; in disco, prope basim labelli, callo crescentiformi valde incrassato. Gynostemium circa 13 mm. longum, gracile, arcuatum, utrinque alatum.

LUZON, Bontoc Subprovince, *Father M. Vanoverbergh 163*, December 18, 1910.

BULBOPHYLLUM *Thou.*

Bulbophyllum (§*Sestochilus*) *costatum* *Ames sp. nov.* Radices fibratae, ramosae. Rhizoma repens, lignosum. Pseudobulbi 2–3 cm. longi, pyriformes, rugosi, circa 2 cm. inter se, monophylli. Folium cum petiolo ± 1.3 dm. longum, 3–4 cm. latum, erectum, valde coriaceum, oblongo-ellipticum. Petiolus ± 3 cm. longus, rigidus. Scapus ± 7 cm. longus, a basi pseudobulbi ortus,

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erectus, foliis brevior, uniflorus, paucibracteatus, bracteis tubularibus 1–1.5 cm. longis. Sepala lateralia 2.8 cm. longa, ± 8 mm. lata, lanceolata, acuta, septemnervia, purpureo-striata. Sepalum dorsale 2.8 cm. longum, valde concavum, extus quinquecostatum costis valde pustulatis, purpureo-maculatum, acutum. Petala vix 3 cm. longa, prope basim 6 mm. lata, triangulari-falcata, usque ad apicem attenuata, acuta, purpureo-maculata, pustulata. Labellum vix 1 cm. longum, valde curvatum, linguiforme, disco bicarinato, retusum vel bilobulatum, extus et intus minute glanduloso-pubescentis, prope apicem pustulatum. Stelidia gynostemii 3 mm. longa.

Allied to *Bulbophyllum maculosum* Ames, but distinct from that species in the elongated scapes and blunt-tipped leaves.

LEYTE, C. A. Wenzel 0665, November 15, 1914. Epiphyte in forest. 600 meters altitude. Flowers yellow marked with six purple stripes on the lateral sepals and spotted with purple on the upper sepal and petals.

Bulbophyllum (§ *Racemosae*) **hortensoides** Ames *sp. nov.*
 Radices numerosae, fibratae, elongatae. Rhizoma repens, pseudobulbis approximatis, more sectionis quam maxime subpressis, ± 4 mm. altis, circa 6 mm. in diametro, unifoliatis. Folium coriaceum, cum petiolo 2.5–3.5 dm. longum; lamina 2 dm. longa, usque ad 4.5 cm. lata, anguste oblongo-elliptica, in sicco valde nervosa, nervis prominentibus. Petiolus circa 9 cm. longus, circa 4 mm. in diametro, sulcatus, rigidus, in sicco valde rugosus, subteres. Scapus ± 20 cm. longus, a basi pseudobulbi ortus, cum racemo foliis brevior, infra racemum bracteis laxis ancipitibus imbricantibus. Racemus ± 12 cm. longus, densiflorus, cylindraceus, ± 1 cm. in diametro, bracteosus. Bractee inflorescentiae 5–10 mm. longae, in sicco scariosae, lineari-triangulares, acuminatae, pedicello cum ovario longiores. Flores flavidi. Sepala lateralia triangularia, circa 1 cm. longa, prope basim vix 3 mm. lata,

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trinervia, caudata. Sepalum dorsale 9 mm. longum, triangulari-lanceolatum, acutum. Petala minuta, 2 mm. longa, .75 mm. lata, oblonga, acuta, uninervia. Labellum vix 3 mm. longum, lingu-latum, trilobatum; lobi laterales erecti, rotundati; lobus medius oblongus, obtusus, callo oblongo in disco, minute verruculosus. Gynostemium antice bicuspidatum.

Closely allied with *Bulbophyllum hortense* J. J. Sm. which has longer, looser racemes and very different flowers in which the lateral sepals are more caudate at the tip and less triangular. *B. odoratum* Lindl., another nearly related species, is in part distinguished by its triangular sepals that are hardly, if at all, caudate. Among Philippine species, *B. hortensoides* is most closely allied with *B. leytense* Ames, from which it differs in the structure of the labellum. As in *B. prianganense* J. J. Sm., *B. hortense* J. J. Sm. and *B. leytense* Ames, the scape is concealed from its base to the lowermost flower of the raceme by conspicuous, ancipitous, imbricating, foliaceous sheaths. The elongated callus, rounded in front, that reaches almost to the apex of the middle lobe of the labellum is of diacritical value in separating *B. hortensoides* from its Philippine allies. When highly magnified the sepals are pustulose.

LEYTE, Jaro, C. A. *Wenzel 0771* (Type), November 28, 1914. In forest. Epiphyte. 600 meters altitude. Flowers yellow; *Wenzel 0649*, November 13, 1914. In forest. 600 meters altitude.

Bulbophyllum (§ Racemosae) **jarense** Ames *sp. nov.* Radices fibratae, circa 2 mm. in crassitudine, numerosae. Pseudobulbi valde abbreviati, circa 6 mm. alti, ± 5 mm. in diametro, longitudinaliter rugosi, vaginis mox in fibras solutis inclusi, monophylli. Folium longe petiolatum, cum petiolo ± 3.5 dm. longum, valde coriaceum, rigidum; lamina anguste elliptica vel oblanceolata, circa 25 cm. longa, 7.5–10 cm. lata, obtusa, nervosa; peti-

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olus circa 1 dm. longus, sulcatus, in sicco 3 mm. in diametro. Scapus elongatus, circa 3.5 dm. longus, gracilis, infra racemum bracteis 2.5–3.5 cm. longis, laxis ancipitibus approximatis vix imbricantibus vestitus. Racemus elongatus, usque ad 27 cm. longus, circa 2 cm. in diametro, subdensiflorus. Bractee inflorescentiae 6–7 mm. longae, lineari-triangulares, in sicco scariosae, acutae, pedicellis longiores. Pedicellus cum ovario 3 mm. longus, glaber. Flores numerosi, circa 8 mm. longi, glabri. Sepala lateralia lineari-triangularia, circa 8 mm. longa, prope medium 1.5 mm. lata, prope apicem valde incrassata, sulcata, breviter caudata, mentum rotundatum formantia. Sepalum dorsale simile, marginibus involutis. Petala vix 7 mm. longa, .5 mm. lata, linearia, acuta, super medium usque ad apicem incrassata. Labellum 3 mm. longum, lingulatum, limbo anguste oblongo-lanceolato; lobi laterales rotundati, erecti; discus bicarinatus, carinis elongatis, flexuosis. Gynostemium crassum, antice bicuspidatum, cuspidibus elongatis, valde acutis.

Bulbophyllum jarense is a near relative of *B. hortensoides* from which species it is distinguishable through its longer petals, bicarinate lip and denser racemes of flesh colored flowers spotted with red.

LEYTE, Jaro, *C. A. Wenzel 0761*, November 27, 1914. Epiphyte in forest. 500 meters altitude. Flowers flesh color and red.

Bulbophyllum (§ *Racemosae*) **masaganapense** *Ames sp. nov.* Rhizoma repens. Radices numerosae, ramosae, glabrae. Pseudobulbi abbreviati, 3–4 mm. alti, ±3 cm. distantes, monophylli. Folium cum petiolo 14–30 cm. longum, coriaceum, erectum, in sicco nervosum; lamina oblonga, 9–19 cm. longa, circa 3 cm. lata, utrinque attenuata, obtusa, petiolo rigido ±6 cm. longo sulcato. Scapus 10–21 cm. longus, adscendens, infra racemum bracteis tubulatis usque ad 2 cm. longis vestitus. Racemus

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laxiflorus, ± 1 dm. longus, ± 1 cm. in diametro. Bractee inflorescentiae lanceolatae, ± 8 mm. longae. Flores albidii, circa 1 cm. longi, carnosii. Sepala lateralia circa 9 mm. longa, basi 4.5 mm. lata, triangularia, breviter caudata, prope apicem marginibus involutis, mentum apertum formantia. Sepalum dorsale oblongum, 8.5 mm. longum, 2.5 mm. latum, super medium attenuatum, acuminatum, acutum, trinervium, ad basim concavum. Petala quam sepala multo minora, 4.5 mm. longa, circa 2 mm. lata, subspathulata, obtusa, minute papillosa, carnosaa, nervo medio conspicuo. Labellum 5.5 mm. longum, carnosum, lingulatum, lamina super lobos laterales anguste elliptica, obtusa; lobi laterales seniorbiculares; discus prope basim bicallosus, callis carnosii papilliformibus. Gynostemium breve, antice breviter bicuspidatum.

Bulbophyllum masaganapense is closely related to *B. leytense* Ames from which it differs in its greater size, looser raceme, larger flowers and longer floral bracts.

LEYTE, Jaro, Masaganap, *C. A. Wenzel 0681*, November 19, 1914. Epiphyte in forest. 600 meters altitude. Flower white.

Bulbophyllum (§ Pelma) **philippinense** *Ames sp. nov.* Rhizoma flexuosum, elongatum. Pseudobulbi arete adpressi, 1.5–2 cm. longi, remoti, fusiformes, monophylli, in sicco valde longitudinaliter rugosi, flavidi, leviter arcuati. Folium 3–6 cm. longum, 5–13 mm. latum, oblongo-lanceolatum, utrinque attenuatum, acutum, breviter petiolatum, in sicco vix coriaceum, nervosum. Inflorescentiae ad nodos rhizomatis, brevissimae, racemosae, pauciflorae, circa 1 cm. longae. Bractee inflorescentiae infundibuliformes, scariosae, circa 2 mm. longae. Flores parvi, sepala petalaeque carnea, labello aurantiaco. Sepala lateralia 2.5 mm. longa, 1 mm. lata, lanceolata, ad apicem cucullato-conduplicata, apiculata, carinata. Sepalum dorsale simile, 2 mm. longum. Petala cuneato-oblonga, truncato-obtusa, circa 1.5 mm. longa,

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uninervia. Labellum 1 mm. longum, circa 1 mm. latum, circa .5 mm. in crassitudine, quadrilaterum, cum pede columnae continuum, infra apicem insertum, postice excavatum. Pes columnae ad apicem liber, erectus, lamellam transversam simulans.

Bulbophyllum philippinense is a member of the group to which belong *B. colliferum* J. J. Sm., *B. fractiflexum* J. J. Sm., and *B. Pelma* J. J. Sm. From the nearly related *B. absconditum* J. J. Sm. and *B. neo-caledonicum* Schltr. it is distinguished by the several-flowered inflorescence. For the species of this alliance Schlechter has proposed the section *Pelma* based on the bitypic genus *Pelma* proposed by A. Finet. In Fedde's *Repertorium* 10 (1912) 488, J. J. Smith had previously suggested the advisability of uniting *B. absconditum* and *B. subcubicum* J. J. Sm. into a section for which the name *Pelma* might well be adopted. Schlechter includes in § *Pelma* a number of species that have more than one flower on the peduncle and thus differ from the species on which Finet relied for the characterization of his genus. The foot of the column is free and erect and at the tip appears like a transverse lamella. The labellum is inserted below the tip of the column-foot on its outer side. As at present limited the section *Pelma* includes no less than twenty-seven species, the greater part of which are natives of New Guinea.

LEYTE, Jaro, C. A. *Wenzel* 0659, November 13, 1914. Epiphyte in forest. 500 meters altitude. Sepals and petals flesh color, labellum orange.

Bulbophyllum (§ *Racemosae*) ***sempiternum*** *Ames* sp. nov. Rhizoma longe repens, radicibus flexuosis instructum. Pseudobulbi subapproximati vel 2 cm. distantes, parvi, cylindricei, 2-3 mm. alti, longitudinaliter rugosi, monophylli. Folium cum petiolo ±20 cm. longum, ±2 cm. latum, variabile, anguste oblongo-oblancheolatum, ad basim valde attenuatum, obtusum, valde coriaceum; petiolus ±5 cm. longus, rigidus, erectus, sulcatus; lamina

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±15 cm. longa, nervosa, nervo intermedio prominenti. Scapus cum racemo ±3 dm. longus, gracilis, infra racemum bracteis tubulatis vestitus. Bractee inflorescentiae 5–10 mm. longae, rigidae, triangulari-lanceolatae, valde acutae, ±5 mm. distantes, quam pedicellus cum ovario longiores. Racemus elongatus, ±15 cm. longus. Flores carnei et aurantiaci, numerosi, succedanei, eodem tempore perpauci aperti. Sepala lateralia 5 mm. longa, triangularia, acuta, carnosia, mentum apertum formantia. Sepalum dorsale 5 mm. longum, oblongo-lanceolatum, concavum. Petala 2 mm. longa, lanceolata. Labellum 2.5 mm. longum, linguiforme, carnosum, ecallosum. Gynostemium breve, antice bicuspidatum.

This species is represented in my herbarium by numerous specimens that exhibit a wide range of variation. The rigid bracts of the inflorescence, that in dried specimens have the appearance of thorns or spines; the elongated racemes, that sometimes have expanding flowers at the tip and ripe capsules at the base; the narrowly oblong-ob lanceolate leaves, that in dried specimens take on a bronzy hue are characteristics that set this species apart from its Philippine allies. The flowering season must be a long one, as the flowers seem to open in succession, few being expanded at one time.

LEYTE, C. A. *Wenzel 0595* (Type), October 12, 1914. Flowers flesh color, lip orange; *Wenzel 0893*, February 28, 1915. In forest. 700 meters altitude; *Wenzel 0589*, October 10, 1914; *Wenzel 0260*, February 11, 1914. 750 meters altitude; *Wenzel 0555*, October 1, 1914. 500 meters altitude; *Wenzel 0841*, February 10, 1915. 500 meters altitude; *Wenzel 0287*, March 4, 1914; *Wenzel 0849*, February 11, 1915. 600 meters altitude; *Wenzel 0607*, October 23, 1914; *Wenzel 0675*, November 17, 1914. 600 meters altitude; *Wenzel 0546*, September 27, 1914. 700 meters altitude; *Wenzel 0810*, December 31, 1914. 700 meters altitude; *Wenzel 0848*, February 11, 1915. 600 meters altitude; *Wenzel 0873*. 700 meters altitude; *Wenzel 0472*, June 26, 1914. 500 meters altitude; *Wenzel 0820*, December 15, 1914. 700 meters altitude; *Wenzel 0610*, November 7, 1914.

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500 meters altitude; *Wenzel 0913*, February 2, 1915. 500 meters altitude; *Wenzel 0524*, September 9, 1914. 500 meters altitude; *Wenzel 0751*, November 25, 1914. 500 meters altitude; *Wenzel 0442*, June 10, 1914. 500 meters altitude.

GEODORUM *Jackson.*

Geodorum nutans (*Presl*) *Ames* *Orchidaceae* 2 (1908) 164.

Native names for this species are *Camaog*, *Lubi lubi* and *Cola* from the Spanish *cola* meaning glue. This plant is used for its adhesive properties. The rhizomes are split and the pulp rubbed on surfaces that are to be fastened together. It serves in the Philippines as a glue in the manufacture of musical instruments. The economic importance of the plant is indicated in Blanco's name, *Arethusa glutinosa*. The rhizomes contain about fourteen per cent of a water-soluble adhesive. Cf. Wells in *Phil. Journ. Sci.* 14 (1919) 4.

BABUYANES ISLANDS, LUZON, NEGROS, MINDANAO, PALAWAN, POLILLO.

ACRIOPSIS *Reinw.* ex Bl.

Acriopsis floribunda *Ames* *sp. nov.* *Planta Acriopsi javanicæ* habitu omnino congruens, pseudobulbis caespitosis, 4–7 cm. longis, ovatis, costatis et annulatis, foliis ternis, coriaceis, oblongo-ligulatis, erecto-patentibus, acutis vel subobtusis, ± 1.5 dm. longis, 8–18 mm. latis. Scapus ± 3 dm. longus, gracillimus, erectus, plus minusve flexuosus, vaginis nonnullis late ovatis amplectentibus. Flores numerosi, in panicula laxa dispositi. Bractee inflorescentiae minutae, 1 mm. longae, acutae, in sicco scariosae, quam pedicellus multo breviores. Pedicellus cum ovario ± 6 mm. longus, pergracilis, glaber. Sepala subpatentia, ligulata, obtusa, lateralialia ad apicem inter se connata, 8 mm. longa, ± 2 mm. lata, valde convexa vel cymbiformia. Sepalum dorsale 8 mm. longum, arcuatum, valde concavum, obtusum. Petala obovato-spathulata,

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obtusissima, sepalis paulo breviora, quinquenervia, 3 mm. lata prope apicem. Labellum 6 mm. longum, trilobum, basi fere usque ad stigma columnae connatum, deinde liberum, porrectum, late et breviter unguiculatum; lobi laterales 1 mm. longi, subquadrati; lobus medius elongatus, anguste spathulatus, valde obtusus, ± 4 mm. longus, 1 mm. latus prope apicem; discus inter lobos laterales longitudinaliter bilamellatus, lamellis membranaeis erectis, in appendices duas quadratas productus. Columna more generis elongata, basi antice ungue labelli connata, calcar gibbosum formans. Clinandrium more generis permagnum, cucullatum, marginibus crenulatum, antheram obtusam ocludens. Rostellum triangulare. Stelidia (vel appendices stigmaticae) antice producta, rostello duplo longiora, obtusa, ad apicem callosa. Pollinia elongata, 1 mm. longa, utrinque attenuata.

Acriopsis floribunda is similar to *A. sumatrana* Schltr. in the crenulate margined clinandrium. It is at once separable from *A. javanica* Reinw. ex Bl. by means of the much larger flowers, the elongated linear-spatulate middle lobe of the labellum and the callosities of the stelidia tips of the column.

BUCAS GRANDE ISLAND, *Ramos & Pascasio Bur. Sci. 35112*, June 10, 1919. In dry forest on trunk of tree. Flowers greenish yellow.

***Acriopsis indica* Wight** Icon. 5 (1852) t. 1748, f. 1.

This species has not heretofore been reported as a native of the Philippines. It is readily distinguished from *Acriopsis floribunda* and *A. javanica* by the simple labellum.

LUZON, Kalinga Subprovince, *George Boettcher*, 1918. Flowers yellow.
INDIA, JAVA, BORNEO.

KINGIELLA *Rolfe*.

Kingiella philippinensis (*Ames*) *Rolfe* in Orch. Rev. 25 (1917) 197. *Doritis philippinensis* *Ames* Orch. 2 (1908) 235, fig.

The type of the genus *Doritis*, *D. pulcherrima* Lindl., proves

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to be *Phalaenopsis Esmeralda* Reichb. f. Rolfe maintains this species as a true *Doritis* and for the species referred to *Doritis* proposes a new generic concept with the name *Kingiella*.

LUZON, PALAWAN.

VANDA *Jones*.

Vanda luzonica *Loher* ex Rolfe in *Orch. Rev.* 23 (1915) 137, f. 12, p. 371; *Bot. Mag.* (1917) t. 8709.

Pedicele and ovary white. Flowers odorless. Sepals white, irregularly splotched and stained near the apex with rose purple. Petals similar, but with the purplish markings extending in broken lines to the base. Labellum rose purple with six purple basal lines; lateral lobes white. Spur white. This description was taken from a fresh specimen which bloomed in the collection of Edwin S. Webster at Chestnut Hill, Massachusetts, in January 1920. This specimen differs from the one figured in the *Botanical Magazine* in that the purple markings on the sepals and petals are diffuse and not concentrated.

Vanda tricolor Lindl. is the nearest relative of the species.

LUZON.

EUANTHE *Schltr.*

Euanthe Sanderiana *Schltr.* *Die Orchideen* (1915) 567. *Esmeralda Sanderiana* *Reichb. f.* in *Gard. Chron.* n. s. 17 (1882) 588. *Vanda Sanderiana* *Reichb. f.* in *Gard. Chron.* n. s. 17 (1882) 588.

MINDANAO.

SACCOLABIUM *Bl.*

Saccolabium tenellum *Ames* *sp. nov.* Herba epiphytica. Caulis brevis, vix 1 cm. altus, complanatus, vaginis foliorum obtectus. Folia 2-3 cm. longa, ± 7 mm. lata, oblongo-lanceolata,

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inaequaliter bilobata, quam pedunculus breviora. Pedunculus cum racemo 3–6 cm. longus, multiflorus, angulatus. Bracteae inflorescentiae ± 1 mm. longae, pedicellis breviores, lineari-lanceolatae. Racemus usque ad 4 cm. longus. Flores minuti, virides, labello albido. Sepala petalaeque uninervia. Sepala lateralia circa 2 mm. longa, prope apicem incrassata. Sepalum dorsale simile. Petala subspathulata, obtusa. Labellum circa 2 mm. longum, leviter trilobatum, basi gynostemii adfixum, profunde saccatum; lobi laterales vix distincti; lobus medius carnosus, semiovatus, obtusus. Gynostemium generis, apodum. (PLATE 99.)

LEYTE, *C. A. Wenzel 0988*, April 18, 1912. In forest at sea level.

POMATOCALPA *Breda*.

Pomatocalpa Merrillii *Schltr.* in Fedde Rep. Beihefte 1 (1913) 988. *Cleisostoma Kunstleri* *Ames* in Phil. Journ. Sci. C. Bot. 6 (1911) 54, not Hook. f.

NEGROS, POLILLO, PERAK.

MICROSACCUS *Bl.*

Microsaccus brevifolius *J. J. Sm.* in Ic. Bogor. 3 (1906) 63, t. 225.

Material that agrees satisfactorily with Smith's diagnosis of *M. brevifolius* has recently been received from Mindanao, District of Davao. It is the second representative of the genus to be reported from the Philippines. From *M. Wenzelii* *Ames* it is separable through the more slender habit, the distichous equitant leaves being only about 1 cm. long.

MINDANAO, District of Davao, Madaum, *C. A. Wenzel 010003*, December 20, 1915. Found at sea level. Epiphyte in forest.

TAENIOPHYLLUM *Bl.*

Taeniophyllum leytense *Ames sp. nov.* Herba epiphytica, polyrhiza, radicibus numerosissimis, filiformibus, elongatis, flexuosis, glabris, applanatis, patentibus, 2–10 cm. longis, 1–1.5 mm. latis. Caules vix distincti. Scapus gracilis, usque ad 4.5 cm. longus, vix .5 mm. in crassitudine. Racemus usque ad 2 cm. longus, fractiflexus, floribus 2 mm. longis, viridibus; sepalis circa 2 mm. longis, lineari-lanceolatis, acutis, usque ad medium fere cum petalis connatis, lateralibus margine anteriore liberis. Petala sepalis latiora. Labellum concavum, lanceolatum, acutum; lamina lanceolata, apice superne appendice subulata refracta donato. Saccus rotundatus, lateraliter compressus. Gynostemium incrassatum, minutum.

This species is closely allied to *Taeniophyllum usneoides* Schltr. from Celebes, but is smaller with much more slender and shorter scapes. Also closely allied to *T. glandulosum* Bl. from Java.

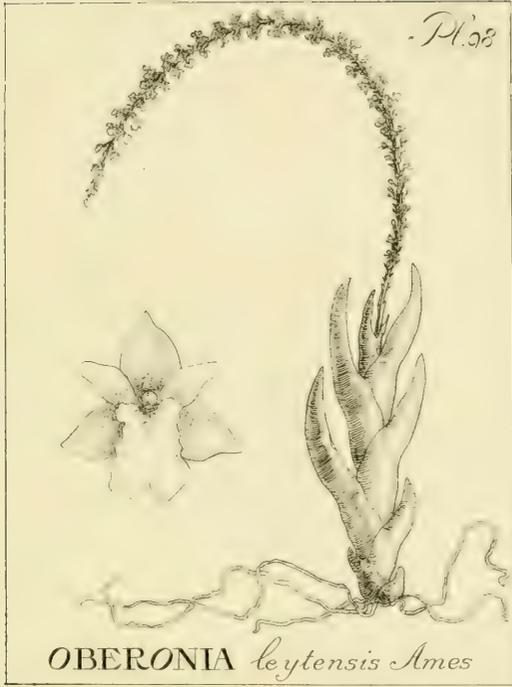
LEYTE, C. A. *Wenzel 0998*, May 14, 1916. At sea level.

The preceding papers in this series were published in the Philippine Journal of Science: I in vol. 4. C. Botany, pp. 593–600; II in vol. 4. C. Botany, pp. 663–676; III in vol. 6. C. Botany, pp. 35–56; IV in vol. 7. C. Botany, pp. 1–27; V in vol. 7. C. Botany, pp. 125–143; VI in vol. 8. C. Botany, pp. 407–440.

PLATE 98

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PLATE 98 : *Oberonia leytensis*
Plant, drawn natural size. Flower much enlarged.



OBERONIA *leytensis* Ames

PLATE 99

ORCHIDACEÆ

PLATE 99: *Saccolabium tenellum*

Plant, drawn natural size. Flower much enlarged.



PLATE 100

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PLATE 100: *Philippinaca Wenzelii*

I. Plant reduced one half. II. Inflorescence natural size. 1, labellum and gynostemium, pollinia removed. 2, labellum and gynostemium, pollinia in position. 3, pollinia. 4, labellum sac open to show clavate processes on the lateral wall.

PHILIPPINAEA

Wenzelii
Schltr. & Ames



PLATE 101

ORCHIDACEÆ

PLATE 101: *Dendrobium busuangense*
Plant and inflorescence, drawn natural size. Lip,
drawn natural size. All drawn from the type.

Pl. 101



DENDROBIUM *busuangense* Ames

SUMMARY OF NEW GENERA

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